
Engineering Review of Closure and Post-Closure Plans and Cost Estimates

Are Plans Current And are Cost Estimate Valid?

Yes

Senior Engineer Provides Validation Memorandum to PM and Branch Chief

PM works with Financial Assurance Unit to Update Financial Assurance Mechanism

No

Senior Engineer Provides Deficiencies Memorandum to PM and Branch Chief

Work with PM and Facility Operator to Develop Valid Closure/Post Closure Plans and Cost Estimates

May 18, 2015
# Review of Closure and Post-Closure Plans and Cost Estimates

## Contents

1. Cost Estimate Review Tracking System ........................................................................................................... 5
2. Cost Estimate Review Process .......................................................................................................................... 8
3. Standardized Unit Specific Cost Estimates for Closure and Post-Closure Care .............................................. 11
   3.1 Statutory Authority ....................................................................................................................................... 11
   3.2 Regulatory Standards ................................................................................................................................... 12
   3.3 Unit Specific Closure and Post-Closure Standards ..................................................................................... 13
      66264.178, Closure of Container Storage Areas .............................................................................................. 13
      66264.197, Closure and Post-Closure Care for Tank Systems .......................................................................... 13
      66264.228, Closure and Post-Closure Care for Surface Impoundments ............................................................ 13
      66264.258, Closure and Post-Closure Care for Waste Piles ........................................................................... 13
      66264.310, Closure and Post-Closure Care for Landfills ................................................................................. 13
      66264.1102. Closure and Post-Closure Care for Containment Buildings ......................................................... 13
   3.4 Closure and Post-Closure Activities and Phases ....................................................................................... 15
Appendix A - Cost Estimate Review Statutory Authority ......................................................................................... 22
   HSC 25246 - Requirement for Closure and Post-Closure Plan with Cost Estimates ............................................ 24
   HSC 25247 - Review and Approval of Plans with Cost Estimate ....................................................................... 24
   HSC 25205 - Authority to Deny Permit if Financial Assurance Not Established or Maintained ................. 24
   HSC 25200.10 - Financial Assurance for Corrective Actions ........................................................................... 24
   HSC 25205.7 - Cost Reimbursement .................................................................................................................. 25
   HSC 25110.8.5 - Inadequate Financial Assurance is a Class I or II Violation .................................................... 25
Appendix B - Regulatory Standards for Closure & Post-Closure Cost Estimates .................................................. 26
   Article 8. Financial Requirements ..................................................................................................................... 30
      § 66264.140. Applicability ............................................................................................................................... 30
      § 66264.142. Cost Estimate for Closure ........................................................................................................... 31
      § 66264.144. Cost Estimate for Postclosure Care ............................................................................................ 32
   Article 7. Closure and Post-Closure ................................................................................................................... 33
      § 66264.112 Closure Plan Contents .................................................................................................................. 33
      § 66264.118 Post-Closure Plan Contents ......................................................................................................... 34
   Corrective Actions Plans and Cost Estimates ..................................................................................................... 36
Appendix C - Unit Specific Cost Estimate Spreadsheets .......................................................................................... 37
Purpose

The purpose of this Work Plan is to provide a process for reviewing Closure and Post-Closure Plans and Cost Estimates to achieving DTSC’s “Fix the Foundation” Goal (4.i). This goal requires the Office of Permitting to maintain a strong Financial Assurance program at all permitted facilities that reflect the actual cost of all closure and post-closure requirements and to create an ongoing system to update the estimates on a 5 year cycle. The following graph illustrates the age distribution of 40 permitted Hazardous Waste Facilities with Closure or Post-Closure Cost Estimates over 5 years old as of January 2015. These Facilities are currently undergoing review in accordance with this Work Plan.
Recent reviews of Closure and Post-Closure Plans and Cost Estimates for permitted hazardous waste facilities by DTSC engineering staff found significant errors and omissions resulting in a lack of financial assurance funding for the facility. For example, one facility was under funded by $27 million and did not include funding for Corrective Action. Another facility was underfunded by $13 million and did not include environmental monitoring or corrective action cost. DTSC staff have required the owners and operators of these facilities to update their Closure and Post-Closure Cost Plans and Cost Estimates and to increase the amount of their Financial Assurance Mechanisms to cover the revised estimated cost of Closure, Post-Closure Care and Corrective Action at these facilities.

This Work Plan implements the DTSC Budget Change Proposal (BCP) Number 4 for Fiscal Year 2014-15. This BCP establishes a limited-term 2 year position to perform Cost Estimate reviews and updates to reduce the taxpayer exposure from underfunded facilities. The Work Plan is designed to: (1) eliminate the backlog of cost estimate reviews over five years old, (2) establish a system to ensure timely reviews are conducted at least every five years and (3) reduce liability and risks to California Taxpayers by having adequate financial resources in place.

This Work Plan includes the following elements that are defined in the corresponding section of this Work Plan:

**Section 1 Cost Estimate Review Tracking System**

This section presents a system for prioritization and tracking the review of 40 closure, and post-closure plans and cost estimates that are over five years old. This section also provides a system for tracking all cost estimate reviews for permitted facilities to ensure they are completed at least every five years.

**Section 2 Cost Estimate Review Process**

This section includes a process for the review of Closure and Post-Closure Plans with Cost Estimates, to ensure adequate Financial Assurance mechanisms are in place, and for informing DTSC management of the results of each review.

**Section 3 Unit Specific Cost Estimate Spreadsheets**

This section provides the statutory authority, regulatory standards, and process for the development of Unit Specific Cost Estimate Spreadsheets that will expedite the development and review of the Cost Estimates by qualified engineers.
1. **Cost Estimate Review Tracking System**

The progress of this Work Plan will be monitored by tracking the number of permitted hazardous waste facilities in the following cost estimates review process categories:

- Greater than 5 years old and the review has been completed or is in process,
- Greater than 5 years old and a review is required, and
- Less than 5 years old and a high permit priority.

Biweekly status reports will be provided to the Office of Permitting Branch Chief and Permitting Division Chief to ensure the reviews of the 40 cost estimates over 5 years old are completed by June 30, 2016. The reports will include the following Cost Estimate Review status graph and the list of 40 permitted facilities with their Cost Estimate Review status.

![Cost Estimate Review Status Graph]

<table>
<thead>
<tr>
<th>Number</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Greater than 5 years old and the review has been completed or is in process,</td>
</tr>
<tr>
<td>35</td>
<td>Greater than 5 years old and a review is required,</td>
</tr>
<tr>
<td>19</td>
<td>Less than 5 years old and a high permit priority</td>
</tr>
</tbody>
</table>
The 40 facilities with cost estimates over 5 years old are listed below and prioritized based on their permit renewal due dates as reported to the California Legislature.

<table>
<thead>
<tr>
<th>Priority Number</th>
<th>FACILITY NAME</th>
<th>CITY</th>
<th>PUBLIC NOTICE</th>
<th>PROJECTED PERMIT DATE</th>
<th>LEGISLATURE DATE</th>
<th>Cost Estimate Review Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CROSBY &amp; OVERTON</td>
<td>LONG BEACH</td>
<td></td>
<td>No Activity Scheduled</td>
<td>6/30/2014</td>
<td>7/30/2014 Required</td>
</tr>
<tr>
<td>2</td>
<td>BEST ENVIRONMENTAL LLC</td>
<td>LANCASTER</td>
<td>9/16/2015</td>
<td>11/3/2015</td>
<td>6/30/2014</td>
<td>Required</td>
</tr>
<tr>
<td>3</td>
<td>RAMOS ENVIRONMENTAL SERVICES</td>
<td>WEST SACRAMENTO</td>
<td>2/1/2015</td>
<td>3/30/2014</td>
<td>9/30/2014</td>
<td>Required</td>
</tr>
<tr>
<td>4</td>
<td>RIVERBANK OIL TRANSFER, LLC **</td>
<td>RIVERBANK</td>
<td>2/27/2016</td>
<td>6/30/2016</td>
<td>12/30/2014</td>
<td>Required</td>
</tr>
<tr>
<td>5</td>
<td>JOHN SMITH ROAD LANDFILL</td>
<td>HOLLISTER</td>
<td>6/1/2015</td>
<td>8/15/2015</td>
<td>12/31/2014</td>
<td>Required</td>
</tr>
<tr>
<td>6</td>
<td>CLEAN HAROBRS BUTTONWILLOW LLC</td>
<td>BUTTONWILLOW</td>
<td>9/15/2016</td>
<td>2/15/2017</td>
<td>6/15/2015</td>
<td>Required</td>
</tr>
<tr>
<td>7</td>
<td>KW PLASTICS OF CALIFORNIA</td>
<td>BAKERSFIELD</td>
<td>10/1/2015</td>
<td>1/1/2016</td>
<td>12/30/2015</td>
<td>12/29/2014 Required</td>
</tr>
<tr>
<td>9</td>
<td>TFX AVIATION INC</td>
<td>NEWBURY PARK</td>
<td></td>
<td>No projection date</td>
<td>10/7/2017</td>
<td>Required</td>
</tr>
<tr>
<td>10</td>
<td>EPC WESTSIDE DISPOSAL FACILITY</td>
<td>FELLOWS</td>
<td></td>
<td>No projection date</td>
<td>6/28/2018</td>
<td>Required</td>
</tr>
<tr>
<td>11</td>
<td>ACME FILL CORPORATION</td>
<td></td>
<td>8/6/2014</td>
<td>3/14/2015</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>12</td>
<td>BAKERSFIELD TRANSFER INC **</td>
<td></td>
<td>2/9/2015</td>
<td>4/30/2015</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>13</td>
<td>KAISER VENTURES INC</td>
<td></td>
<td>3/15/2015</td>
<td>5/1/2015</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>14</td>
<td>RIVERBANK OIL TRANSFER, LLC **</td>
<td></td>
<td>2/27/2016</td>
<td>6/30/2016</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>15</td>
<td>AEROJET ROCKETDYNE, INC. **</td>
<td></td>
<td>6/3/2020</td>
<td>6/30/2020</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>16</td>
<td>AEROJET ROCKETDYNE, INC. **</td>
<td></td>
<td>6/3/2020</td>
<td>6/30/2020</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>17</td>
<td>UNITED TECHNOLOGIES CORP PRATT AND WHITNEY ROCKETDYNE SAN JOSE</td>
<td></td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>18</td>
<td>ADVANCED ENVIRONMENTAL INC</td>
<td>FONTANA</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>19</td>
<td>BAKERSFIELD TRANSFER INC **</td>
<td>BAKERSFIELD</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>20</td>
<td>RHO-CHEM LLC</td>
<td>INGLEWOOD</td>
<td></td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>21</td>
<td>SAFETY-KLEEN OF CALIFORNIA INC - FRESNO</td>
<td>FRESNO</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>22</td>
<td>ECS REFINING</td>
<td>SANTA CLARA</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>23</td>
<td>SAFETY-KLEEN OF CALIFORNIA INC - SANTA MARIA</td>
<td>SANTA MARIA</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>24</td>
<td>WORLD OIL - SAN JOAQUIN LLC</td>
<td>PARLIER</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>25</td>
<td>ASBURY ENVIRONMENTAL SERVICES</td>
<td>CHICO</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>26</td>
<td>SAFETY-KLEEN OF CALIFORNIA INC - CARSON</td>
<td>CARSON</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>27</td>
<td>CRANE'S WASTE OIL INC</td>
<td>WELDON</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>28</td>
<td>ASBURY ENVIRONMENTAL SERVICES-FORTUNA</td>
<td>FORTUNA</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>29</td>
<td>AERC COM INC</td>
<td>HAYWARD</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>30</td>
<td>ASBURY ENVIRONMENTAL SERVICES-CHICO II LLC</td>
<td>CHICO</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>31</td>
<td>SAFETY-KLEEN OF CALIFORNIA INC - DAVIS</td>
<td>DAVIS</td>
<td>-</td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>32</td>
<td>BKK SANITARY LANDFILL</td>
<td>WEST COVINA</td>
<td></td>
<td>No Activity Scheduled</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>33</td>
<td>UNITED TECHNOLOGIES CORP PRATT AND WHITNEY ROCKETDYNE SAN JOSE</td>
<td></td>
<td>12/23/2014</td>
<td>No projection date</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>34</td>
<td>SAFETY-KLEEN SYSTEMS INC</td>
<td>SACRAMENTO</td>
<td>-</td>
<td>No projection date</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>35</td>
<td>PACIFIC GAS &amp; ELECTRIC/ DIABLO CANYON</td>
<td>AVILA BEACH</td>
<td>-</td>
<td>No projection date</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>36</td>
<td>AMERICAN OIL COMPANY</td>
<td>VAN NUYS</td>
<td>-</td>
<td>No projection date</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>37</td>
<td>SAFETY-KLEEN SYSTEMS INC</td>
<td>SANTA ANA</td>
<td>-</td>
<td>No projection date</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>38</td>
<td>TECHALLOY CO INC</td>
<td>PERRIS</td>
<td>-</td>
<td>No projection date</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>39</td>
<td>WEST COUNTY LANDFILL</td>
<td>RICHMOND</td>
<td>-</td>
<td>No projection date</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>40</td>
<td>VEOLIA ES TECHNICAL SOLUTIONS LLC AZUSA</td>
<td>AZUSA</td>
<td>-</td>
<td>No projection date</td>
<td></td>
<td>Required</td>
</tr>
</tbody>
</table>
Nineteen additional facilities with cost estimates less than five years old have also been reviewed based on the priorities established by the Permitting Division. These include facilities with cost estimates well below the expected cost for closure and post-closure care. For example, the Exide Technologies cost estimate and financial assurance fund was increased from $11 million to $38 million and the Du Pont Financial Assurance was increased from $6 million to $19 million to include costs for corrective actions and site wide groundwater monitoring.

**Review Status for Cost Estimates < 5 Years Old (Fiscal Year 2014/15)**

<table>
<thead>
<tr>
<th>FACILITY NAME</th>
<th>CITY</th>
<th>PROJECTED PERMIT DATE</th>
<th>LEGISLATURE DATE</th>
<th>CE Review Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>VEOLIA ES TECHNICAL SOLUTIONS LLC RICHMOND</td>
<td>RICHMOND</td>
<td>No projection date</td>
<td>7/6/2014</td>
<td>11/15/2012</td>
</tr>
<tr>
<td>VINE HILL COMPLEX</td>
<td>MARTINEZ</td>
<td>6/29/2015</td>
<td>8/1/2014</td>
<td>In Process</td>
</tr>
<tr>
<td>DEMENNO/KERDOON</td>
<td>COMPTON</td>
<td>6/30/2015</td>
<td>9/30/2014</td>
<td>9/16/2013</td>
</tr>
<tr>
<td>PHIBRO-TECH INC</td>
<td>SANTA FE SPRINGS</td>
<td>9/1/2015</td>
<td>12/30/2014</td>
<td>In Process</td>
</tr>
<tr>
<td>CHEVRON USA INC RICHMOND REFINERY **</td>
<td>RICHMOND</td>
<td>11/30/2015</td>
<td>12/30/2014</td>
<td>11/20/2014</td>
</tr>
<tr>
<td>CLEAN HARBORS ENVIRONMENTAL SERVICES INC PORT OF REDWOOD CITY</td>
<td>REDWOOD CITY</td>
<td>5/1/2016</td>
<td>12/31/2014</td>
<td>2/3/2015</td>
</tr>
<tr>
<td>CLEAN HARBORS WESTMORLAND LLC</td>
<td>WESTMORLAND</td>
<td>12/15/2015</td>
<td>1/15/2015</td>
<td>10/9/2014</td>
</tr>
<tr>
<td>EVOQUA WATER TECHNOLOGIES LLC</td>
<td>LOS ANGELES</td>
<td>8/31/2015</td>
<td>3/30/2015</td>
<td>2/24/2015</td>
</tr>
<tr>
<td>FORWARD LANDFILL</td>
<td>STOCKTON</td>
<td>7/30/2015</td>
<td>6/30/2015</td>
<td>3/19/2015</td>
</tr>
<tr>
<td>TESORO CARSON REFINERY</td>
<td>CARSON</td>
<td>7/30/2015</td>
<td>6/30/2015</td>
<td>In Process</td>
</tr>
<tr>
<td>KEARNEY-KPF</td>
<td>STOCKTON</td>
<td>9/15/2015</td>
<td>6/30/2015</td>
<td>In Process</td>
</tr>
<tr>
<td>PHILLIPS 66 COMPANY - SAN FRANCISCO REFINERY **</td>
<td>RICHMOND</td>
<td>12/30/2015</td>
<td>11/30/2015</td>
<td>12/11/2014</td>
</tr>
<tr>
<td>EXIDE TECHNOLOGIES INC</td>
<td>VERNON</td>
<td>Not Applicable</td>
<td>12/31/2015</td>
<td>3/12/2015</td>
</tr>
<tr>
<td>SOUTHERN CALIFORNIA EDISON CO SAN ONOFRE NUCLEAR GENERATING STATION</td>
<td>SAN CLEMENTE</td>
<td>2/1/2016</td>
<td>1/30/2017</td>
<td>3/5/2015</td>
</tr>
<tr>
<td>E I DUPONT DE NEMOURS &amp; COMPANY INC</td>
<td>OAKLEY</td>
<td>No Activity Scheduled</td>
<td>3/15/2015</td>
<td></td>
</tr>
<tr>
<td>PHILLIPS 66 COMPANY - SAN FRANCISCO REFINERY **</td>
<td>RODEO</td>
<td>No Activity Scheduled</td>
<td>12/11/2014</td>
<td></td>
</tr>
<tr>
<td>CHEVRON USA INC RICHMOND REFINERY **</td>
<td></td>
<td>No projection date</td>
<td>11/20/2014</td>
<td></td>
</tr>
<tr>
<td>ECOLOGY CONTROL INDUSTRIES</td>
<td>RICHMOND</td>
<td>No projection date</td>
<td>6/6/2012</td>
<td></td>
</tr>
</tbody>
</table>

The Cost Estimate Review Status Sheets will be used as an ongoing system for tracking the review status cost estimates and financial assurance for closure, and post-closure and updating the data in EnviroStor.
2. Cost Estimate Review Process

The Closure and Post-Closure Plans with associated cost estimates are the legal documents that justify the amount of the Financial Assurance Mechanism. Closure and Post-Closure Care Plans are required to include the Closure and Post-Closure Cost Estimates pursuant to California Health and Safety Code section 25246, because they serve as the basis for the Closure and Post-Closure Cost Estimates. Both the plans and cost estimates need to be reviewed together along with Unit descriptions, design plans, and specifications also in the Part B Permit Application to verify the quantities used in the cost estimate.

The Closure and Post Closure Plans describe the activities required for Closure, Post-Closure and sometimes Corrective Action at the Facility. These activities should have associated cost elements in the cost estimate. This relationship is shown on the figure below.

**Closure and Post Closure Care and Financial Assurance Relationship at Hazardous Waste Facilities**
Review of Closure and Post-Closure Plans and Cost Estimates

The following review process was designed to ensure Permitted Hazardous Waste Facilities have adequate Financial Assurance for the cost of Closure and Post-Closure Care.

1. Review the Closure and Post-Closure Plans (Plans) and associated Cost Estimates to verify:
   a. the required Closure and Post-Closure Activities are included in the Plans,
   b. the Plans have been updated pursuant to §66264.112 to reflect current conditions at the site,
   c. the Cost Estimates include cost elements for all required activities in the Plans,
   d. the Cost Estimates includes quantities based on the Plans, current unit cost prices, and accurate cost calculations, and
   e. the Plans and Cost Estimate are certified by the owner and prepared under the responsible charge of a qualified engineer licensed in the state of California.

The review process can be initiated via a work request for an engineering review of the cost estimate by a trained DTSC cost estimator (e.g., P.E. with knowledge/skills).

2. If the Plans and Cost Estimates are found to be deficient, a Draft Cost Estimate Deficiencies Memorandum will be provided by the reviewer to the Senior Engineer. The Senior Engineer will discuss the cost estimate review with the Project Manager (PM), provide a quality assurance review of the cost estimate, inform the Permitting Branch Chief of the deficiencies, and finalize (sign and stamp) the Cost Estimate Deficiencies Memorandum.

3. After approval of the Deficiencies Memorandum, the cost estimate reviewer will work with the PM and the facility owner and operator to resolve deficiencies. The PM will notify the Financial Responsibility Unit, as soon as possible, if changes to the Financial Assurance Mechanism type or amount are expected.

4. When the Closure Plans and Cost Estimates:
   a. Include the required Closure Activities and associated Cost Elements,
   b. Are current pursuant to §66264.112 and reflect existing conditions at the site,
   c. Are current and accurate, and
   d. Certified by the owner and prepared under the responsible charge of a qualified engineer licensed in the state of California,

then the cost estimate reviewer will provide a Draft Validation Memorandum to the Senior Engineer. The Senior Engineer will discuss the cost estimate review with the PM, provide a quality assurance review, inform the Permitting Branch Chief of the validation, and finalize (sign and stamp) the Cost Estimate Validation Memorandum.

5. After the Branch Chief approves the Validation Memorandum the reviewer will work with the Financial Responsibility Unit to ensure the mechanisms are updated and reflect the validated cost estimate amounts.

Since the Closure and Post-Closure Plans and Cost Estimates are required to be prepared by a qualified California licensed Engineer pursuant to 22 CCR §66270.14, the review of these documents is required to be conducted under the responsible charge of a qualified California Licensed Engineer pursuant to the California Business and Professions Code 6730.2.
Review of Closure and Post-Closure Plans and Cost Estimates

This review process is illustrated on the following flowchart.

Cost Estimate Review Process


Are Plans Current And are Cost Estimate Valid?

- Yes
  - 4. Senior Engineer Provides Validation Memorandum to PM and Branch Chief
  - 5. PM works with Financial Assurance Unit to Update Financial Assurance Mechanism
- No
  - 2. Senior Engineer Provides Deficiencies Memorandum to PM and Branch Chief
  - 3. Work with PM and Facility Operator to Develop Valid Closure/Post Closure Plans and Cost Estimates
3. Standardized Unit Specific Cost Estimates for Closure and Post-Closure Care

This section provides the statutory authority, regulatory standards, and process for the development of Unit Specific Cost Estimate Spreadsheets that will expedite the development and review of the Cost Estimates.


3.1 Statutory Authority

The California Legislature found the people of the state of California face immense costs as a result of the inappropriate handling, storage, use, and disposal of hazardous waste. To mitigate these costs, the legislature enacted Article 12- Financial Responsibility for Closure and Maintenance of Facilities, in sections 25245-25249 of the Health and Safety Code (HSC), effective March 2, 1982. A summary of the Department's statutory authority is provided in the table below and explained in further details in Appendix A.

<table>
<thead>
<tr>
<th>Health and Safety Code Section</th>
<th>Statutory Authority to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSC 25245</td>
<td>Adopt and Revise Closure and Post Closure Standards and Regulations</td>
</tr>
<tr>
<td>HSC 25245.4</td>
<td>Exemptions, Unless the Department Requires a Post-Closure Permit</td>
</tr>
<tr>
<td>HSC 25246</td>
<td>Requirement for Closure and Post-Closure Plan with Cost Estimates</td>
</tr>
<tr>
<td>HSC 25247</td>
<td>Review and Approval of Plans with Cost Estimate</td>
</tr>
<tr>
<td>HSC 25205</td>
<td>Authority to Deny Permit if Financial Assurance Not Established or Maintained</td>
</tr>
<tr>
<td>HSC 25200.10</td>
<td>Financial Assurance for Corrective Actions</td>
</tr>
<tr>
<td>HSC 25205.7</td>
<td>Cost Reimbursement for Closure Plans and Cost Estimates Review</td>
</tr>
<tr>
<td>HSC 25187.2</td>
<td>Inadequate Financial Assurance is a Class I or II Violation</td>
</tr>
</tbody>
</table>

The Health and Safety Code Section 25245 provides the Department with the authority to develop and implement the following regulations in California Code of Regulations Title 22.

---

1 California Health and Safety Code section 25100
3.2 Regulatory Standards

California Code of Regulations, title 22 (22 CCR) contains the regulatory standards developed by the Department for Closure and Post-Closure Care Plans, Cost Estimates, and Financial Assurance for Hazardous Waste Facilities and for each type of Hazards Waste Management Unit. The regulations for Closure and Post-Closure Plans and Cost Estimates are located in 22 CCR Division 4.5, Chapter 14- Standards for Permitted Facilities. Chapter 14 includes the following Articles. The Articles relevant to Closure and Post-Closure Plans and Cost Estimates are highlighted in yellow.

Article 1. General
Article 2. General Facility Standards
Article 3. Preparedness and Prevention
Article 4. Contingency Plan and Emergency Procedures
Article 5. Manifest System, Recordkeeping, and Reporting
Article 6. Water Quality Monitoring and Response Programs for Permitted Facilities
Article 7. Closure and Post-Closure
Article 8. Financial Requirements
Article 9. Use and Management of Containers
Article 10. Tank Systems
Article 11. Surface Impoundments
Article 12. Waste Piles
Article 13. Land Treatment
Article 14. Landfills
Article 14.5. Residuals Repositories
Article 15. Incinerators
Article 15.5. Corrective Action for Waste Management Units
Article 15.7. Drip Pads
Article 16. Miscellaneous Units
Article 17. Environmental Monitoring and Response Programs for Air, Soil, and Soil-Pore Gas for Permitted Facilities
Article 19. Corrective Action for Solid Waste Management Units
Article 27. Air Emission Standards for Process Vents
Article 28. Air Emission Standards for Equipment Leaks
Article 28.5. Air Emission Standards, Tanks, Surface Impoundments, and Containers
Article 29. Containment Buildings

The requirements for Closure and Post-Closure Cost Estimates for Financial Assurance are in Article 8 - Financial Requirements. The Closure and Post-Closure Cost Estimates are based on the activities described in the Closure and Post-Closure Plans required under Article 7 - Closure and Post-Closure. The Plans address the Closure and Post-Closure requirements for the facility and the Unit Specific Closure and Post-Closure requirements in Articles 9-16 and 29. Post-Closure Care includes the Corrective Action requirements that have been moved from Article 19 to Article 6 and 17. Detailed regulatory requirements are included in Appendix B.
3.3 Unit Specific Closure and Post-Closure Standards

The Closure and Post-Closure Cost Estimate Standards in sections 66264.142 and 66264.144 require detailed and unit specific Closure and Post-Closure Cost Estimates that address the activities described in the Closure and Post-Closure Plans. The Unit Specific Closure and Post-Closure Plan and Cost Estimate requirements are briefly described in the following sections of California Code of Regulations Title 22 and summarized on the following table.

66264.178, Closure of Container Storage Areas
Container Storage Areas are required to be Clean Closed in accordance with a Closure Plan. The Cost Estimate is based on the activities described in the Closure Plan. The required Financial Assurance Amount is equal to the Closure Cost Estimate. Since the waste is stored in containers it is assumed that all hazardous waste and residuals can be removed from the Unit, so Post-Closure Plans are not required unless it is not practical to remove all waste and residuals. If all the waste and residuals cannot be removed from the Unit, Contingent Closure and Post-Closure Care: Plans, Cost Estimates, and Financial Assurance will be required for Closure and Post-Closure care of the Unit as a Landfill.

66264.197, Closure and Post-Closure Care for Tank Systems
Tank Systems are required to be Clean Closed in accordance with Closure Plans and Cost Estimate, but may also require Contingent Closure and Post-Closure Plans and Cost Estimates for Closure of the site as a Landfill if adequate secondary containment is not provided or all the waste residuals cannot be practically removed from the Unit. The required Financial Assurance Amount is equal to the Closure Cost Estimate or the Contingent Closure and Post-Closure Cost Estimate, whichever is greater.

66264.228, Closure and Post-Closure Care for Surface Impoundments
Surface Impoundments are required to be either Clean Closed or Closed with waste in-place. If the owner or operator choses to Clean Close the Unit, Clean Closure Plans and Cost Estimates are required. Contingent Closure and Post-Closure Care Plans and Cost Estimates for Closure as a Landfill are also required incase all the waste and residuals cannot be removed. The Financial Assurance Amount is the either equal to the amount of the Clean Closure and Contingent Closure and Post-Closure Cost Estimates if the owner intends on Clean Closing the site, or the Contingent Closure and Post-Closure Cost Estimate if the owner intends to leave waste in-place.

66264.258, Closure and Post-Closure Care for Waste Piles
The Closure and Post-Closure Plan, Cost Estimate, and Financial Assurance requirements for Waste Piles are similar to these for Surface Impoundments.

66264.310, Closure and Post-Closure Care for Landfills
Landfills can either be Clean Closed, but are normally closed with waste in-place. Closure and Post-Closure Plans and Cost Estimates are required. The Financial Assurance amount is equal to the Closure and Post-Closure Cost Estimates. If Corrective Actions are required, the cost for monitoring and maintenance is required to be included in the Post-Closure Plans and Cost Estimate pursuant to Articles 6 and 17.

66264.1102. Closure and Post-Closure Care for Containment Buildings
Containment Buildings are required to Clean Closed and have similar Closure and Post-Closure Plan, Cost Estimate, and Financial Assurance requirements as Tank Systems.
# Review of Closure and Post-Closure Plans and Cost Estimates

## Unit Specific Requirements for Closure And Post Closure Plans, Cost Estimate, and Financial Assurance

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Closure Plan and Cost Estimate</th>
<th>Contingent Closure Plan and Cost Estimate for Closure as a Landfill</th>
<th>Post-Closure Plan and Cost Estimate*</th>
<th>Contingent Post-Closure Plan and Cost Estimate for Post-Closure as a landfill*</th>
<th>Financial Assurance Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container Storage Area 66264.178</td>
<td>For removal of all hazardous waste and residuals</td>
<td>Required if all contamination soil cannot be removed**</td>
<td>Required when waste is left In-Place</td>
<td>Required when waste is left In-Place</td>
<td>For Clean Closure Cost</td>
</tr>
<tr>
<td>Tank Systems 66264.197</td>
<td>For removal of all hazardous waste and residuals</td>
<td>Required if all contamination soil cannot be removed**</td>
<td>Required with Clean Closure Plans incase all contamination is not removed</td>
<td>Required with Clean Closure Plans incase all contamination is not removed</td>
<td>For Clean Closure or Contingent Closure and Post-Closure Costs, whichever is greater.</td>
</tr>
<tr>
<td>Containment Building 66264.197</td>
<td>For removal of all hazardous waste and residuals</td>
<td>Required if all contamination soil cannot be removed**</td>
<td>Required when waste is left In-Place</td>
<td>Required when waste is left In-Place</td>
<td>For Clean Closure and Post-Closure if waste is left In-place. Contingent Closure Contingent Post-Closure Costs are also required with Clean Closure.</td>
</tr>
<tr>
<td>Surface Impoundment 66264.228</td>
<td>For removal of all hazardous waste and residuals or Closure with waste In-place</td>
<td>Required with Clean Closure Plans incase all contamination is not removed</td>
<td>Required when waste is left In-Place</td>
<td>Required with Clean Closure Plans incase all contamination is not removed</td>
<td>For Clean Closure and Post-Closure Care of Surface Impoundments</td>
</tr>
<tr>
<td>Waste Piles 66264.258</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landfill 66264.310</td>
<td>For Closure with waste In-Place***</td>
<td>For Post-Closure Care with waste In-Place***</td>
<td></td>
<td></td>
<td>For Closure, Post-Closure Cost including*</td>
</tr>
</tbody>
</table>

Notes:

*Includes Corrective Action under Article 6

** Also required if Secondary Containment does not meet the standards in 66264.193(b)-(f)

*** Landfill Closure and Post-Closure include subsections (e) through (r) of section 66264.228 Closure and Post-Closure Care of Surface Impoundments
3.4 Closure and Post Closure Activities and Phases

The Closure and Post-Closure Care activities are different for each type of Hazardous Waste Management Unit, but may include the following common phases and activities.

**Phase I Removal of Waste Inventory**

This phase is for the removal of hazardous waste from the Hazardous Waste Management Units. It includes removal of the waste from the unit, loading of the waste into a transport vehicle, transporting the waste to a facility for treatment and disposal. For cost estimate purposes the quantity of waste removed from the unit should be the maximum capacity of the unit and the cost of the removal of waste inventory should not be zero cost based on the wastes’ potential market value.

**Phase II Clean Closure**

The Closure Performance Standards require the site to be closed in a manner that minimizes the need for further maintenance. The best way to accomplish this is to Clean Close the facility by removing all waste and waste residuals from the Units and removing all equipment and structures from the facility.

**Phase III Waste Containment**

If all the waste and waste residuals cannot be removed from the facility, it can be closed in a manner that controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or run-off, or waste decomposition products to the ground or surface waters or to the atmosphere. This can be accomplished by capping the Unit and providing drainage and erosion controls for run-on and run-off, leachate collection and removal and environmental monitoring systems for: surface water, vadoze zone, groundwater, soil gas, and air.

**Phase IV Post-Closure Care**

If waste or waste residuals are contained on site (capped), post-closure maintenance of the containment systems and environmental monitoring are required until the waste no longer poses a threat to human health or the environment. The annual cost for post-closure maintenance and monitoring is required to be multiplied to account for the 30 year postclosure period.

**Phase V Corrective Actions**

If environmental monitoring detects the a significant release of contamination from the containment unit, corrective actions for surface water, soil, soil gas, or groundwater are required to bring contaminate concentrations below acceptable limits. This can be accomplished with water or soil gas extraction and treatment systems. The cost for operation of these systems can be determined based on the Corrective Action Feasibility Study required for water quality response actions under Article 6 or the cost estimate required for soil gas remediation under Article 17.

The general Closure Phase and Activities are summarized on the following table. The General Closure Process for the Phases is illustrated on the following flow chart.
### General Closure And Post-Closure Phases and Activities

<table>
<thead>
<tr>
<th>Phase I Waste Inventory Removal</th>
<th>Phase II Clean Closure</th>
<th>Phase III Waste Containment</th>
<th>Phase IV Post-Closure Care</th>
<th>Phase V Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Identify the Maximum Waste Inventory Waste Quantities</td>
<td>• Identify the Maximum Waste Inventory Waste Quantities</td>
<td>• Waste Stabilization for Surface Impoundments, and Contaminated Soil</td>
<td>• Monitoring Activities and Frequency</td>
<td>• Water Quality Treatment System Operation and Maintenance</td>
</tr>
<tr>
<td>• Waste Characterization</td>
<td>• Decontaminate and Remove at final closure: Containment Systems Equipment Structures Contaminated Soil</td>
<td>• Compaction for Waste Piles, Landfills, and Contaminated Soil</td>
<td>• Surface Water Vadose Zone Groundwater Soil Gas Air</td>
<td>• Soil Gas Extraction and Treatment System</td>
</tr>
<tr>
<td>• Waste Removal and Loading</td>
<td>• Confirmation Sampling, Analysis, and Reporting</td>
<td>• Grading of Waste to provide stable slopes, promote drainage and accommodate settlement</td>
<td>• Monitoring Equipment Inspections, Maintenance Activities, and Frequency</td>
<td></td>
</tr>
<tr>
<td>• Waste Transport</td>
<td>• Clean Closure Certification</td>
<td>• Installation of Final Cover System</td>
<td>• Surface Water Vadose Zone Groundwater Soil Gas Air</td>
<td></td>
</tr>
<tr>
<td>• Waste Treating</td>
<td></td>
<td>• Installation of Drainage Controls</td>
<td>• Soil Gas Extraction and Treatment System</td>
<td></td>
</tr>
<tr>
<td>• Waste Storing</td>
<td></td>
<td>• Modify Existing Leachate Collection and Removal System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Waste Disposal</td>
<td></td>
<td>• Installation of Gas Monitoring and Control System Air Soil Gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Identify off-site Units to be used for the Management of Hazardous Waste</td>
<td></td>
<td>• Installation of Water Quality Monitoring System for Detection or Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring for: Surface Water Vadose Zone Groundwater</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Installation of Corrective Actions Monitoring and Treatment System if required</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Remove and **Manage Hazardous Waste Inventory**

**Clean Close** - Decontaminate and Remove Hazardous Waste Management Units, Contaminated Soil, and Ancillary Equipment and Structures

- Has All Contamination Been Removed?
  - Yes: Engineer Certify Clean Closure is Complete
  - No: Clean Close - Decontaminate and Remove Hazardous Waste Management Units, Contaminated Soil, and Ancillary Equipment and Structures

**Waste Containment** - Close Unit as a Landfill and **Post-Closure Care**
- Maintain Containment System
- Perform Environmental Monitoring

**Corrective Actions**

- Is there a Significant Release of Contamination from the Unit?
  - Yes: Does the Waste Present a Potential Threat to Health or the Environment?
    - Yes: Engineer Certify Post-Closure Care Complete
    - No: No
  - No: No

- Does the Waste Present a Potential Threat to Health or the Environment?
  - Yes: Engineer Certify Post-Closure Care Complete
  - No: No
3.5 Standard Unit Specific Cost Estimate Spreadsheets

Standardized Unit Specific Cost Estimates will help to expedite the technical review process for the renewal or issuance of Hazardous Waste Facility Permits. The general Closure and Post-Closure Activities and Process will be defined for each type of Hazardous Waste Management Unit and incorporated into Standardized and Unit Specific Cost Estimate Spreadsheets under this Work Plan. Unit Specific Closure and Post Closure Activities and related Cost Estimate Spreadsheets are shown on the figure below.
To create a more user-friendly Standardized Cost Estimate Tool for Hazardous Waste Management Units in California, the Cost Estimate Worksheets from U.S. EPA Guidance Document “Evaluating Cost Estimates for Closure and Post-Closure Care for RCRA Hazardous Waste Management Units”, dated May 1994 are being combined into one Spreadsheet for each type of Hazardous Waste Management Unit. Multiple Units of the same type are allowed in a single spreadsheet and the Unit Specific Spreadsheets can be combined into a Facility Workbook as shown on the figure below.

This provides a Unit Specific Cost Estimate Spreadsheet Tool with current R.S. Means or sites specific cost data. Unit costs are being combined onto a single spreadsheet so the cost estimate can be quickly verified and updated if necessary.
To use the Cost Estimate Spreadsheet the Unit specific data is entered into the yellow cells as shown below. Blue cells area automatically calculated as described in the associated text. Multiple units can be added by copying the data entry and calculation table shown below.

### Container Storage Area

<table>
<thead>
<tr>
<th>CS-1 Container Storage Areas Inventory Worksheet</th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>The inventory worksheet will be used in completing the appropriate cost estimating worksheets to determine the cost of closure activities. If the design characteristics of the container storage area being evaluated do not conform to the format of the inventory worksheet, alternative methods should be used to make an accurate determination of the maximum permitted capacity of the unit, the area of all structures to be decontaminated and demolished, and the volume of all contaminated structures and soil to be removed. Depending on the activities being conducted, it may not be necessary to complete every section of the inventory worksheet.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 1. Maximum Permitted Capacity

Determine the maximum permitted capacity of waste in the unit to calculate the costs of transportation, treatment, and disposal.

1. **Volume of Liquid Waste**: Enter the maximum volume in gallons of liquid waste managed in the container storage area.

2. **Volume of Solid Waste**: Enter the maximum volume in cubic yards of solid waste managed in the container storage area.

3. **Percent of Loose Solid Debris**: Enter the amount of loose solid debris as a percentage of the total volume of solid waste entered in 1.B.

4. **Percent of Drummed Solid Waste**: Enter the amount of drummed solid waste as a percentage of the total volume of solid waste entered in 1.B.

5. **Percent of Baled Waste or Other Monolithic Waste**: Enter the amount of baled waste or other monolithic waste as a percentage of the total volume of solid waste entered in 1.B.

(Note: The total combined percentage entered for loose solid debris, drummed solid waste, and baled waste or other monolithic waste in 1.C through 1.E should not exceed 100 percent.)

6. **Volume of Loose Solid Debris**: This value is calculated automatically by multiplying the percent of loose solid debris by the volume of solid waste managed in the container storage area.

7. **Volume of Solid Waste in Drums**: This value is calculated automatically by multiplying the percent of drummed solid waste in drums by the volume of solid waste managed in the container storage area.

8. **Volume of Monolithic Waste**: This value is calculated automatically by multiplying the percent of baled waste or monolithic waste by the volume of solid waste managed in the container storage area.

#### 2. Surface Area of Secondary Containment System Pad

Calculate the surface area of the secondary containment system pad to calculate the costs of decontamination and demolition. Demolition of the secondary containment system pad is an additional activity that might be conducted if the pad cannot be decontaminated effectively or if the owner or operator elects to demolish the pad.

1. **Length**: Enter the length of the containment system pad (in feet) excluding any curbs or berms that may be present.

2. **Width**: Enter the width of the containment system pad (in feet) excluding any curbs or berms that may be present.

3. **Surface Area of Containment System Pad**: This value is calculated automatically by multiplying the length of the pad by the width of the pad.

4. **Surface Area of Containment System Pad in square yards**: This value is calculated automatically by dividing the surface area of the pad by 9 to convert the value from square feet to square yards.
All necessary worksheets for each Unit are combined into one spreadsheet for each type of Unit and summarized as shown on the figure below.

An example Spreadsheet under development is provided in Appendix C. Ultimately this spreadsheet will be uploaded on the DTSC webpage and available to assist engineers with the development of Unit Specific Cost Estimates for owners and operators of Hazardous Waste Facilities.
Review of Closure and Post-Closure Plans and Cost Estimates

Appendix A - Cost Estimate Review Statutory Authority
Summary of Statutory Authority Closure and Post-Closure Plans and Cost Estimates

The California Health and Safety Code (HSC) provides the Department of Toxic Substances Control (Department) with the statutory authority to require and develop regulations requiring Financial Assurance for the safe Closure and Post-Closure care of Hazardous Waste Management Facilities, so the people of California will not be burned with the cost if the owners and operators do not fulfill their Financial Responsibility. California Health and Safety Code section 25100 states, the people of the state of California face immense costs as a result of long-term threats to: public health, air, and water quality posed by the landfill disposal of many types of untreated hazardous wastes and by the inappropriate handling, storage, use, and disposal of hazardous waste. To mitigate these costs the legislature enacted Article 12- Financial Responsibility for Closure and Maintenance of Facilities, in sections 25245-25249 of the Health and Safety Code (HSC), effective March 2, 1982.

A summary of the Departments statutory authority is provided on the table below and explained in further details in the following sections.

<table>
<thead>
<tr>
<th>Health and Safety Code Section</th>
<th>Statutory Authority to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSC 25245</td>
<td>Adopt and Revise Closure and Post Closure Standards and Regulations</td>
</tr>
<tr>
<td>HSC 25245.4</td>
<td>Exemptions, Unless the Department Requires a Post-Closure Permit</td>
</tr>
<tr>
<td>HSC 25246</td>
<td>Requirement for Closure and Post-Closure Plan with Cost Estimates</td>
</tr>
<tr>
<td>HSC 25247</td>
<td>Review and Approval of Plans with Cost Estimate</td>
</tr>
<tr>
<td>HSC 25205</td>
<td>Authority to Deny Permit if Financial Assurance Not Established or Maintained.</td>
</tr>
<tr>
<td>HSC 25200.10</td>
<td>Financial Assurance for Corrective Actions</td>
</tr>
<tr>
<td>HSC 25205.7</td>
<td>Cost Reimbursement for Closure Plans and Cost Estimates Review</td>
</tr>
<tr>
<td>HSC 25110.8.5</td>
<td>Inadequate Financial Assurance is a Class I or II Violation</td>
</tr>
</tbody>
</table>

HSC 25245 - Adopt and Revise Closure and Post Closure Standards and Regulations

This section establishes the authority for the department to:

- 25245(a) - Adopt and revise standards and regulations to specify the financial assurance required for owners and operators of hazardous waste facilities for closure of the facility and subsequent post-closure maintenance for 30 years including, but not limited to the monitoring of groundwater and other aspects of the environment after closure.
- 25245 (b) - Specify policy or other terms and conditions which are necessary to establish evidence of financial assurance and carry out the purpose of this chapter, Chapter 6.5 Hazardous Waste Control,.
- 25245 (b)(1) - Assert a claim of financial responsibility against the grantor of the financial assurance even when the owner or operator of the hazardous waste facility is in bankruptcy pursuant to Title 11 of the United States Code Section.

HSC 25245.4 - Exemptions, Unless the Department Requires a Post-Closure Permit

This section allows exemptions from the financial assurance requirements for post-closure care for specific cases:
Review of Closure and Post-Closure Plans and Cost Estimates

- 25245.4 (a)(3) - A facility or transportable treatment unit operating pursuant to a permit-by-rule,
- 25245.4 (b)(3) - A generator operating under a grant of conditional authorization, and
- 25245.4 (c) - A person who treats waste pursuant to a grant of conditional exemption,

unless the department determines a Post-Closure Permit is necessary.

HSC 25246 - Requirement for Closure and Post-Closure Plan with Cost Estimates
- 25246 (a) - This section requires each owner or operator of a hazardous waste facility to submit closure and postclosure plans containing cost estimates to the department and regional board with a hazardous waste facility permit application or when otherwise requested by the department.
- 25246(b) - The department can also request an update of the plans prior to closure or an update of the postclosure plan after closure if necessary.

HSC 25247 - Review and Approval of Plans with Cost Estimate
- 25247(a) - Requires the department to review and approve the plans required under 25246 if they comply with the department’s regulations and complies with other state and federal regulations.
- 25247(b) - The department shall not approve the plans unless the water quality aspects of the plan have been approved by the regional water quality control board or the director finds that the immediate approval of the plan is necessary to protect public health, and safety, or the environment.
- 25247(c) - All actions taken under this are section subject to 25204.5, which requires incorporation of waste discharge requirements as a condition of the new, renewed or amended hazardous waste facility permit. However, 25204.5 allows the department to set more stringent standards as necessary or appropriate.
- 25247(g) - If the department determines that a postclosure permit is necessary to enforce a postclosure plan, the department may, at any time, rescind and replace an enforcement order or an enforceable agreement issued pursuant to this section by issuing a postclosure permit for the hazardous waste facility, in accordance with the procedures specified in the department’s regulations for the issuance of postclosure permits.

HSC 25205 - Authority to Deny Permit if Financial Assurance Not Established or Maintained.
Pursuant to Section 25205 of the HSC the department shall not issue or renew a permit to operate a hazardous waste facility unless the owner or operator of the facility establishes and maintains the financial assurances required pursuant to Article 12.

HSC 25200.10 - Financial Assurance for Corrective Actions
This section requires the permit to contain schedules of compliance for corrective action and assurances of financial responsibility for completing the corrective action when corrective action cannot be completed prior to issuance of the permit.
HSC 25205.7 - Cost Reimbursement
This section provides for cost reimbursement by the owner or operator for the costs incurred by the department in processing the permit application or responding to modification request including closure and post-closure plan and cost estimate review. These costs can be either recovered under a cost reimbursement agreement or through a fee structure. Additional fees are required for each individual modification. In addition this section requires a cost reimbursement agreement for all corrective action costs incurred by the department for reviewing and overseeing any corrective action work undertaken at the facility.

HSC 25110.8.5 - Inadequate Financial Assurance is a Class I or II Violation
A Class I violation is a deviation from the requirements of chapter 6.5, or any regulation, standard, requirement, or permit condition adopted pursuant to chapter 6.5 that could result in a failure to accomplish any of the following:

- Ensure adequate financial resources in the case of releases of hazardous waste or constituents.
- Ensure adequate financial resources to pay for facility closure.
- Perform emergency cleanup operations of, or other corrective actions for, releases.

The deviation is a Class II violation which is a chronic violation or committed by a recalcitrant violator. “Class II Violation” has the same meaning as defined in Section 66260.10 of Title 22 of the California Code of Regulations.
Review of Closure and Post-Closure Plans and Cost Estimates

Appendix B-Regulatory Standards for Closure & Post-Closure Cost Estimates
Review of Closure and Post-Closure Plans and Cost Estimates

Closure and Post-Closure Plans and Cost Estimate Regulations

California Code of Regulations, title 22 (22 CCR) contains the regulatory requirements developed by the Department for Closure and Post-Closure Care Plans and Financial Assurance Cost Estimates for Hazardous Waste Facilities. The regulations for Closure and Post-Closure Plans and Cost Estimates are located in 22 CCR Division 4.5 Chapter 14- Standards for Permitted Facilities which contain the following Articles. The Articles relevant to Closure and Post-Closure Plans and Cost Estimates are highlighted.

- Article 1. General
- Article 2. General Facility Standards
- Article 3. Preparedness and Prevention
- Article 4. Contingency Plan and Emergency Procedures
- Article 5. Manifest System, Recordkeeping, and Reporting
- Article 6. Water Quality Monitoring and Response Programs for Permitted Facilities
- Article 7. Closure and Post-Closure
- Article 8. Financial Requirements
- Article 9. Use and Management of Containers
- Article 10. Tank Systems
- Article 11. Surface Impoundments
- Article 12. Waste Piles
- Article 13. Land Treatment
- Article 14. Landfills
- Article 14.5. Residuals Repositories
- Article 15. Incinerators
- Article 15.5. Corrective Action for Waste Management Units
- Article 15.7. Drip Pads
- Article 16. Miscellaneous Units
- Article 17. Environmental Monitoring and Response Programs for Air, Soil, and Soil-Pore Gas for Permitted Facilities
- Article 19. Corrective Action for Solid Waste Management Units
- Article 27. Air Emission Standards for Process Vents
- Article 28. Air Emission Standards for Equipment Leaks
- Article 28.5. Air Emission Standards for Tanks, Surface Impoundments, and Containers
- Article 29. Containment Buildings

The requirements for Closure and Post-Closure Plans and Cost Estimates for Financial Assurance are in separate Articles 7 and 8 respectively, as shown above. States and the Federal government are exempt from the requirements for Financial Assurance in Article 8, however, State government shall not include municipal, local, city, county, city-county special district government or any subdivisions thereof.

In general the Closure and Post-Closure Plans describe the activities necessary for the Closure and Post-Closure Care of the Facility in accordance with the Closure Performance Standards in
22 CCR 66264.111. The cost for a third party to implement these activities should be reflected in the elements of the Closure and Post-Closure Cost Estimates.

The Closure and Post-Closure Plans and Cost Estimates shall be submitted with the permit application, in accordance with section 22 CCR 66270.14, or when otherwise requested by the Department. The Closure and Post-Closure Plans and Cost Estimates are required to be prepared under the responsible charge of a qualified California Professional Engineer and certified by the owner and engineer pursuant to 22 CCR 66270.14 and section 6735(a) of the California Business and Professions Code. The Closure and Post-Closure Plans and Cost Estimates must reflect current year dollars and the current conditions at the site or be revised via a permit modification.

The Closure Performance Standards in 22 CCR 66264.111 include the following Unit Specific Closure and Post-Closure Standards that need to be addressed for each Hazardous Waste Management Unit (HWMU) at the facility in the Closure and Post-Closure Plans and Cost Estimates.

§ 66264.178. Closure for Container Storage Areas.
§ 66264.197. Closure and Post-Closure Care for Tank Systems.
§ 66264.228. Closure and Postclosure Care for Surface Impoundments.
§ 66264.258. Closure and Post-Closure Care for Waste Piles.
§ 66264.280. Closure and Post-Closure Care for Land Treatment Units.
§ 66264.310. Closure and Post-Closure Care for Landfills.
§ 66264.351. Closure for Incinerators.
§ 66264.601. Environmental Performance Standards for Miscellaneous Units.
§ 66264.602. Monitoring, Analysis, Inspection, Response, Reporting, and Corrective Action for Miscellaneous Units.
§ 66264.603. Post-Closure Care for Miscellaneous Units.
§ 66264.1102. Closure and Post-Closure Care for Containment Buildings.

The Closure Performance Standards in 22 CCR 66264.111 require removal of the waste and waste residuals from the HWMU or Closure and Post-Closure Care of the unit in a manner that minimizes the escape of hazardous waste from the HWMU. For example, 22 CCR 66264.197 Closure and Post-Closure Care for Tank Systems, requires Tank Systems that do not have adequate secondary containment in 22 CCR 66264.193, or cannot be clean closed, to have Contingent Closure and Post-Closure Plans and Cost Estimates for Closure and Post-Closure Care of the HWMU in accordance with 22 CCR 66264.310 Closure and Post Closure Care for Landfills. The following Table 1 summarizes the Closure and Post-Closure Plan, Cost Estimate, and Financial Assurance requirements for each type of HWMU.

The following section provide the regulatory requirements in Articles 8 and 7 for the development of Closure and Post-Closure Cost Estimates and Plans. It includes specific requirements for the contents of the Closure and Post-Closure Plans and Cost Estimates that are being developed into a checklist under this Work Plan to expedite the preparation and review of Closure and Post-Closure Plans and Cost Estimates.
Table 1 Financial Assurance Amount by Unit Type

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Closure Plan and Cost Estimate</th>
<th>Contingent Closure Plan and Cost Estimate for a landfill</th>
<th>Post-Closure Plan and Cost Estimate Includes Corrective Action under Article 6</th>
<th>Contingent Post-Closure Plan and Cost Estimate for a landfill Includes Corrective Action under Article 6</th>
<th>Financial Assurance Cost Includes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container Storage Area 66264.178</td>
<td>Requires Removal of all hazardous waste and residuals</td>
<td>Required if all contamination soil cannot be removed or if Secondary Containment Does not meet the standards in 66264.193(b)-(f)</td>
<td>Required if all contamination soil cannot be removed or if Secondary Containment Does not meet the standards in 66264.193(b)-(f)</td>
<td>Clean Closure cost</td>
<td></td>
</tr>
<tr>
<td>Tank Systems 66264.197 Containment Building 66264.197</td>
<td>Requires Removal of all hazardous waste and residuals</td>
<td>Required with Clean Closure Plans incase all contamination is not removed</td>
<td>Required with Clean Closure Plans incase all contamination is not removed</td>
<td>Clean Closure or Contingent Closure and Post-Closure Costs whichever is greater.</td>
<td></td>
</tr>
<tr>
<td>Surface Impoundment 66264.228 Waste Piles 66264.258</td>
<td>Requires Removal of all hazardous waste and residuals or Closure with waste In-place</td>
<td>Required when waste is left In-Place</td>
<td>Required when waste is left In-Place</td>
<td>Clean Closure and Post-Closure if waste is left In-place. Contingent Closure Contingent Post-Closure Costs are also required with Clean Closure Plans.</td>
<td></td>
</tr>
<tr>
<td>Landfill 66264.310</td>
<td>Requires Closure for waste In-Place including (e) through (r) of section 66264.228</td>
<td>Requires Post-Closure Care for waste In-Place including (e) through (r) of section 66264.228</td>
<td>Requires Post-Closure Care for waste In-Place including (e) through (r) of section 66264.228</td>
<td>Closure, Post-Closure Cost including Corrective Actions Cost if required under Article 6</td>
<td></td>
</tr>
</tbody>
</table>
Article 8. Financial Requirements

§ 66264.140. Applicability.

(a) The requirements of sections

§ 66264.142. Cost Estimate for Closure.
§ 66264.147. Liability Requirements.

apply to owners and operators of all hazardous waste facilities, as defined in section 66260.10, except as provided otherwise in this article.

(b) The requirements of sections

§ 66264.144. Cost Estimate for Postclosure Care.
§ 66264.145. Financial Assurance for Postclosure Care.

apply only to owners and operators of:

(1) hazardous waste facilities, which are disposal facilities, as defined in section 66260.10;

(2) for purposes of this article, a facility which utilizes a temporary waste pile, as defined in section 66260.10, and surface impoundments as defined in section 66260.10, shall be considered as a disposal site until the owner or operator has demonstrated to the satisfaction of the Department that all wastes have been removed from the site;

(3) tank systems that are required under section 66264.197 to meet the requirements for landfills; and

(4) Containment buildings that are required under section 66264.1102 to meet the requirements for landfills.

(c) States and the Federal government are exempt from the requirements of this article.

(d) For purposes of this article, state government shall not include municipal, local, city, county, city-county special district government or any subdivisions thereof.

2 “Hazardous waste facility,” means: (a) all contiguous land and structures, other appurtenances, and improvements on the land used for the treatment, transfer, storage, resource recovery, disposal or recycling of hazardous waste. A hazardous waste facility may consist of one or more treatment, transfer, storage, resource recovery, disposal or recycling operational units or combinations of these units…

3 “Disposal facility” means a facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which waste will remain after closure…
§ 66264.142. Cost Estimate for Closure.

(a) The owner or operator shall prepare and submit to the Department a detailed written estimate, in current dollars, of the cost of closing the facility in accordance with the requirements in sections

§ 66264.111. Closure Performance Standard.
§ 66264.112. Closure Plan; Amendment of Plan.
§ 66264.113. Closure; Time Allowed for Closure.
§ 66264.114. Disposal or Decontamination of Equipment, Structures and Soils.
§ 66264.115. Certification of Closure.

and applicable closure requirements in sections

§ 66264.178. Closure for Container Storage Areas.
§ 66264.197. Closure and Post-Closure Care for Tank Systems.
§ 66264.228. Closure and Postclosure Care for Surface Impoundments.
§ 66264.258. Closure and Post-Closure Care for Waste Piles.
§ 66264.280. Closure and Post-Closure Care for Land Treatment Units.
§ 66264.310. Closure and Post-Closure Care for Landfills.
§ 66264.351. Closure for Incinerators.
§ 66264.601. Environmental Performance Standards for Miscellaneous Units.
§ 66264.602. Monitoring, Analysis, Inspection, Response, Reporting, and Corrective Action for Miscellaneous Units.
§ 66264.603. Post-Closure Care for Miscellaneous Units.
§ 66264.1102. Closure and Post-Closure Care for Containment Buildings.

(1) The estimate shall be submitted in accordance with sections

66270.10
And 66270.14.

4 § 66270.10. General Application Requirements.
(a) Permit application. Any person who is required to have a permit (including new applicants and permittees with expiring permits) shall complete, sign, and submit a Part A and Part B permit application to the Department as specified in this chapter.

5 § 66270.14. Contents of Part B: General Requirements. (a) Part B of the permit application consists if the general information requirements of this section, and the specific information requirements in sections 66270.14 through 66270.23 applicable to the facility. The Part B information requirements presented in sections 66270.14 through 66270.23 reflect the standards promulgated in chapter 14 of this division. These information requirements are necessary in order for the Department to determine compliance with the chapter 14 standards.... Certain technical data, such as design drawings and specifications, and engineering studies shall be certified by an independent, qualified professional engineer registered in California.

(13) a copy of the closure plan and, where applicable, the postclosure plan required by sections 66264.112, 66264.118 and 66264.197. Include, where applicable, as part of the plans, specific requirements in sections 66264.178, 66264.197, 66264.228, 66264.258, 66264.280, 66264.310, 66264.351, 66264.601 and 66264.603
(15) the most recent closure cost estimate for the facility prepared in accordance with section 66264.142 and a copy of the documentation required to demonstrate financial assurance under section 66264.143...
The estimate shall equal the cost of final closure at the point in the facility's active life when the extent and manner of its operation would make closure the most expensive, as indicated by its closure plan (see section 66264.112(b)).

(2) The closure cost estimate shall be based on the costs to the owner or operator of hiring a third party to close the facility. A third party is a party who is neither a parent nor a subsidiary of the owner or operator. (See definition of parent corporation in section 66260.10.) The owner or operator may use costs for on-site disposal if it can be demonstrated that on-site disposal capacity will exist at all times over the life of the facility.

(3) The closure cost estimate shall not incorporate any salvage value that may be realized with the sale of hazardous wastes, or non-hazardous wastes if applicable under section 66264.113(d), facility structures or equipment, land, or other assets associated with the facility at the time of partial or final closure.

(4) The owner or operator shall not incorporate a zero cost for hazardous wastes, or non-hazardous wastes if applicable under section 66264.113(d), that might have economic value.

§ 66264.144. Cost Estimate for Postclosure Care.

(a) The owner or operator of a disposal surface impoundment, disposal miscellaneous unit, land treatment unit, or landfill unit, or of a surface impoundment or waste pile required under section

§ 66264.228. Closure and Postclosure Care for Surface Impoundments.
and section
§ 66264.258. Closure and Post-Closure Care for Waste Piles.

to prepare a contingent closure and postclosure plan, shall prepare and submit to the Department a detailed written estimate, in current dollars, of the annual cost of postclosure monitoring and maintenance of the facility in accordance with the applicable postclosure regulations in sections

§ 66264.117. Post-Closure Care and Use of Property.
§ 66264.118. Post-Closure Plan; Amendment of Plan.
§ 66264.119. Post-Closure Notices.
§ 66264.120. Certification of Completion of Post-Closure Care.
§ 66264.228. Closure and Postclosure Care for Surface Impoundments.
§ 66264.258. Closure and Post-Closure Care for Waste Piles.
§ 66264.280. Closure and Post-Closure Care for Land Treatment Units.
§ 66264.310. Closure and Post-Closure Care for Landfills.
§ 66264.603. Post-Closure Care for Miscellaneous Units.

(16) where applicable, the most recent post closure cost estimate for the facility prepared in accordance with section 66264.144 plus a copy of the documentation required to demonstrate financial assurance under section 66264.145...
Review of Closure and Post-Closure Plans and Cost Estimates

(1) The postclosure cost estimate shall be based on the costs to the owner or operator of hiring a third party to conduct postclosure care activities. A third party is a party who is neither a parent nor a subsidiary of the owner or operator. (See definition of parent corporation in section 66260.10).

(2) The postclosure cost estimate is calculated by multiplying the annual postclosure cost estimate by the number of years of postclosure care required under section 66264.117…

Article 7. Closure and Post-Closure

§ 66264.112 Closure Plan Contents
The plan shall identify steps necessary to perform partial or final closure of the facility at any point during its active life and to perform final closure of the facility at the end of its active life. The closure plan shall include, at least:

(1) How and When Each HWMU will be Closed Pursuant to Closure Performance Standards
A description of how and when each hazardous waste management unit at the facility will be closed in accordance with section 66264.111;

Section 66264.111 requires the owner or operator to close the facility in a manner that:
(a) minimizes the need for further maintenance;
(b) controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or run-off, or waste decomposition products to the ground or surface waters or to the atmosphere; and
(c) complies with the closure requirements of this chapter including, but not limited to, the requirements of sections:

§ 66264.178. Closure for Container Storage Areas.
§ 66264.197. Closure and Post-Closure Care for Tank Systems.
§ 66264.228. Closure and Postclosure Care for Surface Impoundments.
§ 66264.258. Closure and Post-Closure Care for Waste Piles.
§ 66264.280. Closure and Post-Closure Care for Land Treatment Units.
§ 66264.310. Closure and Post-Closure Care for Landfills.
§ 66264.351. Closure for Incinerators.
§ 66264.601. Environmental Performance Standards for Miscellaneous Units.
§ 66264.602. Monitoring, Analysis, Inspection, Response, Reporting, and Corrective Action for Miscellaneous Units.
§ 66264.603. Post-Closure Care for Miscellaneous Units.
§ 66264.1102. Closure and Post-Closure Care for Containment Buildings.
(2) **How and When the Facility will be Closed Pursuant to Closure Performance Standards**

A description of how and when final closure of the facility will be conducted in accordance with section 66264.111. The description shall identify the maximum extent of the operations which will be unclosed during the active life of the facility.

(3) **Removal of Hazardous Waste Inventory**

Estimate the maximum inventory (type and quantity by unit) of hazardous wastes ever on-site over the active life of the facility and provide a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the type(s) of the off-site hazardous waste management units to be used, if applicable;

(4) **Clean Closure**

A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard;

(5) **Closure with Waste In-Place**

A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control;

(6) **Schedule for Closure**

A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule shall include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover shall be included);

(7) **Final Closure Year**

An estimate of the expected year of final closure.

§ 66264.118 Post-Closure Plan Contents

The plan shall be submitted with the permit application, in accordance with section 66270.14(b)(13) of this division, or when otherwise requested by the Department.

(b) **For each hazardous waste management unit subject to the requirements of this section**, the post-closure plan shall identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least:
(1) Post-Closure Monitoring Activities and Frequency
A description of the planned monitoring activities and frequencies at which they will be performed to comply with articles:

- Article 6. Water Quality Monitoring and Response Programs for Permitted Facilities,
- Article 11. Surface Impoundments,
- Article 12. Waste Piles,
- Article 13. Land Treatment,
- Article 14. Landfills, and
- Article 16. Miscellaneous Units,

of chapter 14 during the post-closure care period; and

(2) Post-Closure Maintenance Activities and Frequencies
A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure:

(A) the integrity of the cap and final cover and other containment systems in accordance with the requirements of articles:

- Article 11. Surface Impoundments,
- Article 12. Waste Piles,
- Article 13. Land Treatment,
- Article 14. Landfills, and
- Article 16. Miscellaneous Units, and

(B) the function of the monitoring equipment in accordance with the requirements of articles:

- Article 6. Water Quality Monitoring and Response Programs for Permitted Facilities,
- Article 11. Surface Impoundments,
- Article 12. Waste Piles,
- Article 13. Land Treatment,
- Article 14. Landfills, and
- Article 16. Miscellaneous Units, and

(3) Identify Responsible Person
The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure care period.
Corrective Actions Plans and Cost Estimates

The requirements for Corrective Actions have been moved from Article 19 Corrective Actions for Solid Waste Management Units, section 66264.801, to Article 6 section 66264.101 Corrective Actions for Waste Management Units. According to the Statement of Reasons for these regulations, this was done to be consistent with the federal regulations. The environmental monitoring and corrective action requirements in Article 6 for surface water, soil, and groundwater are required under Article 7 to be addressed in Closure and Postclosure Care Plans (section 66264.118(b)). Sections 66264.101 Corrective Action for Waste Management Units, requires the owner or operator of a facility seeking a permit for the transfer, treatment, storage, or disposal of hazardous waste shall institute corrective action as necessary to protect human health and the environment for all releases of hazardous waste or constituents from any solid or hazardous waste management unit at the facility, regardless of the time at which waste was placed in such unit. The permit or order will contain schedules of compliance for such corrective action (where such corrective action cannot be completed prior to issuance of the permit) and assurances of financial responsibility for completing such corrective action. Corrective Action Cost Estimates should be based on the Engineering Feasibility Study required under Article 6.
Review of Closure and Post-Closure Plans and Cost Estimates

Appendix C - Unit Specific Cost Estimate Spreadsheets
At closure, the owner or operator must remove all hazardous waste and residues of hazardous waste from the tank system. Remaining liners, tank walls, and ancillary piping containing or contaminated with hazardous waste or residues of hazardous waste, as well as soils, structures, and equipment, must be decontaminated or removed.

To meet the regulatory requirements for closure, approved closure plans prepared by an owner or operator generally will involve the following routine closure activities:

- Removal of wastes and residues from the tank system
- Purging of the tank system for tanks that contain ignitable wastes
- Decontamination of the tank system
- Sampling and analysis to confirm decontamination of components of the system
- Transportation of the wastes and residues removed
- Treatment and disposal of the wastes and residues removed
- Certification of closure

If contamination of the unit’s components is extensive, the owner or operator may elect (or be required) to conduct such additional activities as:

- Flushing of the tank and ancillary piping before decontaminating the system
- Excavation (if underground), disassembly, and loading of the tank and ancillary piping
- Demolition and removal of the containment system
- Sampling and analysis of soil under the former tank system
- Removal of contaminated soil
- Backfilling with clean soils

If the owner or operator closes the tank system with waste in place, the owner or operator is subject to requirements for closure and post-closure care for landfills.

For each activity described above, there is a corresponding activity worksheet in the system. Before selecting the activity worksheets, the user should complete the inventory worksheet. Upon completion of the inventory and all appropriate activity worksheets, the user should select the summary worksheet to calculate the total cost of closure of the unit.
## Inventory

### 1. Unit Description and Maximum Permitted Capacity
Describe the unit to determine the activities to be conducted to close it.

#### 1.A Type of Tank System
From the available list, select the type of tank system that is being evaluated. This information will be used to appropriately populate other worksheets (for example, TS_06).

#### 1.B Height or length of Tank
Enter the height or length of tank in feet.

```
1.B Height or length of Tank: 35.0 ft
```

#### 1.C Diameter of Tank
Enter the diameter of tank in feet.

```
1.C Diameter of Tank: 16.0 ft
```

#### 1.D Maximum Permitted Capacity of the Tank
This value is calculated automatically using the values in 1.B and 1.C. The user can override this calculation by selecting Enter.

```
1.D Maximum Permitted Capacity of the Tank: 52,641 gal
```

#### 1.E Total Length of Ancillary Piping
Enter the total length of ancillary piping in feet.

```
1.E Total Length of Ancillary Piping: 50 ft
```

#### 1.F Nominal Diameter of Ancillary Piping
Enter the nominal diameter of the ancillary piping in inches.

```
1.F Nominal Diameter of Ancillary Piping: 4 in
```

#### 1.G Maximum Capacity of Ancillary Piping
This value is calculated automatically from the values in 1.E and 1.F.

```
1.G Maximum Capacity of Ancillary Piping: 32.6 gal
```

#### 1.H Maximum Capacity of Tank and Ancillary Piping
This value is calculated automatically by adding the maximum capacities of the tank and of the ancillary piping.

```
1.H Maximum Capacity of Tank and Ancillary Piping: 52,674 gal
```

### 2. Surface Area of Tank System
Determine the surface area of the tank system to determine decontamination costs.

#### 2.A Surface Area of Tank (Interior and Exterior)
This value is calculated automatically using the values in 1.B and 1.C. The surface area is multiplied by 2 to account for the interior and exterior of the tank surface. If the user manually entered the tank capacity in 1.D, the user must manually enter the combined interior and exterior surface area of the tank in square feet. Tables 1 and 2 provide the inside surface areas of typical tanks; to approximate the combined interior and exterior surface area, double the interior value.

```
2.A Surface Area of Tank System: 52,674 ft²
```

### 3. Volume of Tank System to be Removed
Determine the volume of materials constituting components of the tank system to be removed to determine (1) excavation, loading, and volume of soil to backfill for in-ground or underground tanks or (2) loading for on-ground and aboveground tanks.

#### 3.A Volume of Tank System to be Removed
This value is calculated automatically by dividing the maximum permitted capacity of the tank system by 7.48 gal/cubic foot.

```
3.A Volume of Tank System to be Removed: 7,076 ft³
```
3.B Volume of Tank System to be Removed in Cubic Yards: This value is calculated automatically by dividing the volume of the tank system by 27 to convert the value from cubic feet to cubic yards.

4. Surface Area of Secondary Containment System Pad
Calculate the area of the secondary containment system pad for an aboveground or on-ground tank to calculate decontamination and demolition costs. Demolition of containment system pad is an additional activity that might be conducted if the pad cannot be effectively decontaminated or if the owner or operator elects to demolish the pad.

4.A Length: Enter the length of the containment system pad in feet.
4.B Width: Enter the width of the containment system pad in feet.
4.C Surface Area of Secondary Containment System Pad: This value is calculated automatically by multiplying the length of the pad by the width of the pad.
4.D Surface Area of Secondary Containment System Pad in Square Yards: This value is calculated automatically by dividing the surface area of the pad by 9 to convert the value from square feet to square yards.

5. Volume of Secondary Containment System Pad
Calculate the volume of the secondary containment system pad to determine removal costs. Removal of secondary containment system pad is an additional activity that might be conducted if the pad cannot be effectively decontaminated.

5.A Thickness: Enter the thickness of the pad in feet.
5.B Volume of Secondary Containment System Pad: This value is calculated automatically by multiplying the surface area of the pad by the thickness of the pad.

6. Surface Area of Secondary Containment System Berm
Calculate the area of the secondary containment system berm, or curbing, to determine the cost of decontamination and demolition costs. Demolition of secondary containment system berm is an additional activity that might be conducted if the berm cannot be effectively decontaminated or if the owner or operator elects to demolish the berm.

6.A Total Length: Sum the lengths and widths of the containment system curbing or berm and enter the total in feet.
6.B Height: Enter the height of the containment system curbing or berm in feet.
6.C Surface Area of Secondary Containment System Berm: This value is calculated automatically by multiplying the height by the total length.
6.D Surface Area of Secondary Containment System Berm in Square Yards: This value is calculated automatically by dividing the surface area by 9 to convert the value from square feet to square yards.

7. Volume of Secondary Containment System Berm
Review of Closure and Post-Closure Plans and Cost Estimates

Calculate the volume of the secondary containment system berm, or curbing, to determine the removal costs. Removal of secondary containment system berm is an additional activity that might be conducted if the berm cannot be effectively decontaminated.

7.A Thickness: Enter the thickness of the curbing or berm in feet.
7.B Volume of Secondary Containment System Berm: This value is calculated automatically by multiplying the surface area by the thickness.

8. Surface Area of Other Structures in Secondary Containment System
Calculate the surface area of additional structures that will be decontaminated or demolished, for example, ramps or sumps. Demolition of other structures is an additional activity that might be conducted if the structures cannot be effectively decontaminated or if the owner or operator elects to demolish the structures.

8.A Surface Area of Other Structures: Enter the surface area in square feet of any additional structures in the secondary containment system not previously identified.
8.B Surface Area of Other Structures in Square Yards: This value is calculated automatically by dividing the surface area by 9 to convert the value from square feet to square yards.

Calculate the volume of materials constituting other structures to determine removal costs. Removal of other structures is an additional activity that might be conducted if the structures cannot be decontaminated effectively. This volume will be used for calculating costs of transportation, treatment, and disposal of hazardous wastes and for calculating costs of backfilling.

9.A Volume of Other Structures: Enter the volume in cubic yards of additional structures.

10. Volume of Contaminated Soil to Be Removed
Calculate the volume of contaminated soil to be removed under and around the unit after the extent of contamination has been established by sampling and analysis. Removal of contaminated soil is an additional activity that might be conducted if contaminated soil is identified or if removal of contaminated soil is indicated in the closure plan.

10.A Length: Enter the length of the area of contaminated soil to be removed.
10.B Width: Enter the width of the area of contaminated soil to be removed.
10.C Depth: Enter the depth of the area of contaminated soil to be removed.
10.D Volume of Contaminated Soil to be Removed: This value is calculated automatically by multiplying the length, width, and depth of the area of contaminated soil.
10.E Volume of Contaminated Soil to be Removed in cubic yards: This value is calculated automatically by dividing the volume of contaminated soil by 27 to convert the value from cubic feet to cubic yards.
Review of Closure and Post-Closure Plans and Cost Estimates

**TS-2 Summary Worksheet**

The summary worksheet is provided to accumulate the costs calculated on the unit worksheets and the support worksheets. The summary worksheet displays the name of every worksheet associated with closure of the unit, including the support worksheets. Some of the activities listed on the summary worksheet are routine. The owner or operator might elect or be required to conduct additional activities.

Once all the activity costs have been totaled, the engineering expenses and contingency costs will be applied automatically. The summary worksheet then is used to calculate the total cost of closure of the unit.

**Engineering Expenses:** The cost of engineering design and management typically range from 7 to 15 percent of the total cost of closure. The unit-specific summary worksheets in this manual apply a fixed 10 percent to the subtotal of closure costs for the unit to account for the costs of management and engineering design. This approach is similar to that taken in costing procedures for remedial design and remedial action prescribed for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program. The user can replace this value with one that is more appropriate by selecting Enter.

**Contingency Allowance:** In accordance with standard engineering practices, unit-specific summary worksheets incorporate an additional 20 percent of the total cost of all specified closure or post-closure care activities into the final cost to account for contingencies and unforeseen expenses. The user can replace this value with one that is more appropriate by selecting Enter.

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Removal of Waste (TS-03)</td>
<td>$ -</td>
</tr>
<tr>
<td>2. Tanks System Purging (ignitable waste only) (TS-04)</td>
<td>$ -</td>
</tr>
<tr>
<td>3. Flushing the Tank Piping (TS-05)</td>
<td>$ -</td>
</tr>
<tr>
<td>4. Excavation, Disassembly, and Loading (TS-06)</td>
<td>$ -</td>
</tr>
<tr>
<td>5. Demolition and Removal of Container Systems (TS-07)</td>
<td>$ -</td>
</tr>
<tr>
<td>6. Removal of Soil (TS-08)</td>
<td>$ -</td>
</tr>
<tr>
<td>7. Backfill and Grading (BF-01)</td>
<td>$ -</td>
</tr>
<tr>
<td>8. Decontamination (DC-01)</td>
<td>$ -</td>
</tr>
<tr>
<td>9. Sampling and Analysis (SA-02)</td>
<td>$ -</td>
</tr>
<tr>
<td>10. Monitoring Well Installation (MW-01)</td>
<td>$ -</td>
</tr>
<tr>
<td>11. Transportation (TR-01)</td>
<td>$ -</td>
</tr>
<tr>
<td>12. Treatment and Disposal (TD-01)</td>
<td>$ -</td>
</tr>
<tr>
<td>13. User Defined Cost (UD-01)</td>
<td>$ -</td>
</tr>
<tr>
<td>14. <strong>Subtotal of Closure Costs</strong></td>
<td>$ -</td>
</tr>
</tbody>
</table>
Review of Closure and Post-Closure Plans and Cost Estimates

<table>
<thead>
<tr>
<th>15</th>
<th>Percentage of Engineering Expenses</th>
<th>$0.10</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Engineering Expenses</td>
<td>$-</td>
</tr>
<tr>
<td>17</td>
<td>Certification of Closure (TS-09)</td>
<td>$-</td>
</tr>
<tr>
<td>18</td>
<td><strong>Subtotal</strong></td>
<td>$-</td>
</tr>
<tr>
<td>19</td>
<td>Percentage of Contingency Allowance</td>
<td>$0.20</td>
</tr>
<tr>
<td>20</td>
<td>Contingency Allowance</td>
<td>$-</td>
</tr>
<tr>
<td>21</td>
<td>Landfill Closure (Cover Installation) (CI-02)</td>
<td>$-</td>
</tr>
</tbody>
</table>

**Total Cost of Closure**

<table>
<thead>
<tr>
<th><strong>TS-3 Removal of Waste Worksheet</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This worksheet estimates the cost of pumping the waste out of the tank system and ancillary piping by a vacuum truck. The topics below provide additional help in completing each of the entries on the worksheet.</td>
</tr>
</tbody>
</table>

1. **Maximum Volume of Waste to be Removed:** This information is transferred from the Tank Systems Inventory Worksheet and does not require manual entry. The user can replace this value with one that is more appropriate by selecting Enter. |

2. **Labor and Equipment Cost per Work Hour:**¹ When the appropriate level of PPE is selected, the labor and equipment cost per work hour is chosen automatically. The default PPE level is Protection Level D. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults. |

3. **Work Rate Required to Remove Waste:**² This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults. |

4. **Number of Hours Required to Remove Waste:** This value is calculated automatically by multiplying the maximum volume of waste by the work rate. |

**Total Cost of Removal of Waste:** This value is calculated automatically by multiplying the number of hours required to remove the waste by the labor and equipment cost per work hour. |

<table>
<thead>
<tr>
<th><strong>TS-4 Purging Worksheet</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This worksheet is needed only for tanks containing wastes that are characterized as ignitable waste. The estimate of the cost is based on the introduction of carbon dioxide (dry ice) into the tank to purge the volatile vapors.</td>
</tr>
</tbody>
</table>

1. **Maximum Capacity of the Tank System:** This information is transferred automatically from the Tank Systems Inventory Worksheet and does not require manual entry. The user can replace this value with one... |
Review of Closure and Post-Closure Plans and Cost Estimates

that is more appropriate by selecting Enter.

2. **Amount of Solid Carbon Dioxide (Dry Ice) Needed per Hundred Gallon Capacity:**³ This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

3. **Amount of Dry Ice Needed to Purge the System:** This value is calculated automatically by multiplying the maximum capacity of the tank by the default value for the amount of dry ice needed per hundred gallons of capacity.

4. **Cost of Dry Ice:**³ This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults

5. **Cost of Dry Ice Needed to Purge Tank System:** This value is calculated automatically by multiplying the cost of dry ice by the amount of dry ice needed to purge the tank system.

6. **Labor Cost per Work Hour:**⁴ When the appropriate level of PPE is selected, the labor cost per work hour is chosen automatically. The default PPE level is Protection Level D. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

7. **Work Rate Required to Purge Tank:**⁵ This information is obtained from the cost reference database. This value can be replaced with one specific to the facility, if appropriate.

8. **Number of Hours Required to Purge Tank:** This value is calculated automatically by multiplying the capacity of the tank by the work rate.

9. **Labor Cost to Purge Tank System:** This value is calculated automatically by multiplying the labor cost per work hour by the number of hours required to purge the tank system.

**Total Cost to Purge Tank System:** This value is calculated automatically by adding the labor cost and the cost of dry ice needed to purge the tank system.

**Total Cost of Tank System Purging**

**Notes:**

---

**TS-5 Flushing the Tank and Piping Worksheet**

The cost of this activity includes the cost of flushing the tank system and ancillary piping with water, solvent, or a mixture of soap and water to remove residues of hazardous waste. This activity might be done before or as a substitute for decontamination of the tank system. Note: A significant amount of water is generated if flushing is used to remove hazardous waste residues. Both manual and automatic systems have been used for tank decontamination, resulting in the generation of a much smaller volume of water to be treated and discharged.
However, higher labor costs (most likely for personnel using self-contained breathing apparatus (SCBA)) and equipment costs are required for manual and automatic systems, respectively. CostPro can be used to estimate multiple ways of tank decontamination, so that the user can justify lower costs.

1. **Maximum Capacity of the Tank and Ancillary Piping:** This information is transferred automatically from the Tank Systems Inventory Worksheet and does not require manual entry. The user can replace this value with one that is more appropriate by selecting Enter.

2. **Number of Times Tank and Ancillary Piping Are Flushed:** If this information is unspecified, assume one volume.

3. **Total Volume of Flushing Solution:** This value is calculated automatically by multiplying the maximum capacity of the tank system by the number of times the tank system is flushed.

4. **Labor and Equipment Cost per Work Hour:** When the appropriate level of PPE is selected, the labor and equipment cost per work hour is chosen automatically. The default PPE level is Protection Level D. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

5. **Work Rate Required to Flush Tank and Ancillary Piping:** This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

6. **Number of Hours Required to Flush Tank and Ancillary Piping:** This value is calculated automatically by multiplying the maximum capacity of the tank system by the work rate.

7. **Subtotal of Labor and Equipment Cost to Flush Tank and Ancillary Piping:** This value is calculated automatically by multiplying the labor and equipment cost per work hour by the number of hours required to flush the tank system.

8. **Number of Drums Required to Contain Flushing Solution:** Select either “drums” or “bulk” for management of the flushing solution. (Large volumes of flushing solution will be contained in bulk.) If the flushing solution is to be placed in drums, the cost of the drums is calculated here. This value is calculated automatically by dividing the total volume of flushing solution by 55 gallons per drum and rounding up to the nearest whole number. Use support worksheets TR-1 and TD-2 to calculate the costs of transportation, treatment, and disposal of the waste, whether in drums or bulk.

9. **Cost of One Drum:** This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

10. **Cost of Drums Needed to Contain Flushing Solution:** This value is calculated automatically by...
Review of Closure and Post-Closure Plans and Cost Estimates

multiplying the cost of one drum by the number of drums required to contain the flushing solution.

Total Cost to Flush Tank and Ancillary Piping: This value is calculated automatically by adding the labor and equipment cost and the cost of drums needed to contain the flushing solution.

### Total Cost to Flush Tank and Ancillary Piping

**Notes:**

#### TS-6 Excavation, Disassembly, and Loading Worksheet

This worksheet can be used to determine the costs of excavation, disassembly, and loading of tank systems. Section 1 is to be completed for all tanks that have ancillary piping that will require disassembly. Section 2 should be completed for the excavation and loading of in-ground and underground storage tanks (USTs). The default labor and equipment costs and work rates presented in this section are applicable for tanks up to 50,000 gallons in capacity; different work ranges are applicable for different tank sizes. On-ground and aboveground storage tanks (ASTs) typically do not require excavation; for these tanks, complete Section 3 to determine loading costs. The default labor and equipment costs and work rates presented in this section are applicable for ASTs up to 300,000 gallons in capacity. For USTs over 50,000 gallons and ASTs above 300,000 gallons, the work rates for the largest tank range in that category will be applied.

1. **Disassembly of Ancillary Piping**

   1.A **Length of Ancillary Piping to be Disassembled**: This information is transferred automatically from the Tank Systems Inventory Worksheet and does not require manual entry. The user can replace this value with one that is more appropriate by selecting Enter.

   1.B **Labor and Equipment Cost per Work Hour**: When the appropriate level of PPE is selected, the labor and equipment cost per work hour is chosen automatically. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

   1.C **Work Rate Required to Disassemble One Foot of Pipe**: This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

   1.D **Number of Hours Required to Disassemble Ancillary Piping**: This value is calculated automatically by multiplying the length of ancillary piping by the work rate.

   1.E **Cost of Disassembly of Ancillary Piping**: This value is calculated automatically by multiplying the labor and equipment cost per work hour by the number of hours required to disassemble the ancillary piping.

2. **Excavation and Loading (for In-Ground Tanks and USTs Only)**

   2.A **Capacity of Tank**: This information is transferred automatically from the Tank Systems Inventory
Worksheet if the tank selected on that sheet is in-ground or underground. It does not require manual entry. The user can replace this value with one that is more appropriate by selecting Enter.

2.B Labor and Equipment Cost per Work Hour: When the appropriate level of PPE, the labor and equipment cost per work hour is chosen automatically. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

2.C Work Rate Required to Remove and Load Tank per Gallon Capacity: This information is obtained from the cost reference database. The default values presented are based on the gallon capacity of the tank. The user can replace this value with one that is more appropriate by selecting Override Defaults.

2.D Number of Hours Required to Excavate and Load Tank: This value is calculated automatically by multiplying the capacity of the tank by the work rate.

2.E Cost to Excavate and Load Tank: This value is calculated automatically by multiplying the labor and equipment cost per work hour by the number of hours required to excavate and load the tank.

3. Loading (for On-Ground and Aboveground Tanks Only)

3.A Capacity of Tank: This information is transferred automatically from the Tank Systems Inventory Worksheet if the tank is on-ground or aboveground. It does not require manual entry. The user can replace this value with one that is more appropriate by selecting Enter.

3.B Labor and Equipment Cost per Work Hour: When the appropriate level of PPE is selected, the labor and equipment cost per work hour is chosen automatically. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

3.C Work Rate Required to Load Tank per Gallon Capacity: This information is obtained from the cost reference database. The default values presented are based on the gallon capacity of the tank. The user can replace this value with one that is more appropriate by selecting Override Defaults.

3.D Number of Hours Required to Load Tank: This value is calculated automatically by multiplying the capacity of the tank by the work rate.

3.E Cost to Load Tank: This value is calculated automatically by multiplying the labor and equipment cost per work hour by the number of hours required to remove and load the tank.

Total Cost of Excavation, Disassembly, and Loading: This value is calculated automatically by adding the appropriate subtotals for excavation, disassembly of ancillary piping, and loading of the tank system.
Total Cost of Excavation, Disassembly, and Loading: $\ldots$ 

**Notes:**

**TS-7 Demolition and Removal of Containment System Worksheet**

1. **Demolition of Containment System**

If the unit includes a concrete base or foundation as part of its containment system, the cost of demolishing and removing the tank’s containment system, if contamination exists, must be included. The charges for this activity include the labor and equipment cost for demolishing and loading the structures, and the cost of debris boxes to contain the demolished structures.

1.A **Area of Containment System:** This information is transferred automatically from the inventory worksheet and does not require manual entry. The user can replace this value with one that is more appropriate by selecting Enter.

1.B **Labor and Equipment Cost per Work Hour:** When the appropriate level of PPE is selected, the labor and equipment cost per work hour is chosen automatically. The default PPE level is Protection Level D. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

1.C **Work Rate Required to Demolish One Square Foot of the Containment System:** This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

1.D **Number of Hours Required to Demolish the Containment System:** This value is calculated automatically by multiplying the area of the containment system by the work rate.

1.E **Cost to Demolish the Containment System:** This value is calculated automatically by multiplying the labor and equipment cost per work hour by the number of hours required to demolish the containment system.

2. **Removal and Loading of Containment System**

2.A **Volume of Containment System:** This information is transferred automatically from the inventory worksheet and does not require manual entry. The user can replace this value with one that is more appropriate by selecting Enter.

2.B **Labor and Equipment Cost per Work Hour:** When the appropriate level of PPE is selected, the labor and equipment cost per work hour is chosen automatically. The default PPE level is Protection Level D. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.
Review of Closure and Post-Closure Plans and Cost Estimates

2.C Work Rate Required to Remove and Load One Cubic Yard of Containment System: This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

2.D Number of Hours Required to Remove and Load the Containment System: This value is calculated automatically by multiplying the volume of the containment system by the work rate.

2.E Subtotal of Labor and Equipment Cost to Remove and Load the Containment System: This value is calculated automatically by multiplying the labor and equipment cost per work hour by the number of hours required to remove and load the containment system.

2.F Number of Debris Box Containers Needed: The number of debris boxes needed to contain the demolished containment system is calculated automatically by dividing the volume of the containment system by 20 cubic yards and rounding up to the nearest whole number.

2.G Cost of One Debris Box Container: This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

2.H Cost of Containers: This value is calculated automatically by multiplying the total number of debris boxes required by the cost of one debris box.

2.I Cost of Mobilization and Demobilization: This cost is incurred for activities that require the use of heavy equipment. This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

2.J Cost to Remove and Load the Containment System: This value is calculated automatically by adding the labor and equipment cost, the cost of containers, and the cost of mobilization and demobilization.

Total Cost of Demolition and Removal of Containment System: This value is calculated automatically by adding the cost of demolishing the containment system and the cost of removing and loading the containment system.

Total Cost of Demolition and Removal of Containment System: $ 

Notes:

TS-8 Removal of Soil Worksheet
If a release from the unit to surrounding soils is anticipated or has occurred, excavation of the contaminated soils will be required. The cost of this activity includes charges for labor and equipment to excavate soils and charges for debris boxes used to contain the contaminated soil.

1. Volume of Contaminated Soil to be Removed: This information is transferred automatically from the inventory worksheet and does not require manual entry. The user can replace this value with one that is $/container

work-hrs/cy

work-hrs

containers

$/container

$
Review of Closure and Post-Closure Plans and Cost Estimates

more appropriate by selecting Enter.

2. Labor and Equipment Cost per Work Hour: When the appropriate level of PPE is selected, the labor and equipment cost per work hour is chosen automatically. The default PPE level is Protection Level D. Labor and equipment cost information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

3. Work Rate Required to Remove One Cubic Yard of Soil: This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

4. Number of Hours Required to Remove Soil: This value is calculated automatically by multiplying the volume of contaminated soil by the work rate.

5. Cost to Remove Soil: This value is calculated automatically by multiplying the labor and equipment cost per work hour by the number of hours required to remove the contaminated soil.

6. Number of Debris Box Containers Needed: The number of debris boxes needed to contain the contaminated soil is calculated automatically by dividing the volume of contaminated soil by 20 cubic yards and rounding up to the nearest whole number.

7. Cost of One Debris Box Container: This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

8. Cost of Debris Box Containers: This value is calculated automatically by multiplying the total number of debris boxes required by the cost of one debris box.

9. Cost of Mobilization and Demobilization: This cost is incurred for activities requiring the use of heavy equipment. This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

Total Cost of Removal of Soil: This value is calculated automatically by adding the cost of removal of the contaminated soil, the cost of containers, and the cost of mobilization and demobilization.

Notes:

TS-9 Certification of Closure Worksheet

The cost of certification of closure includes professional and administrative fees for performing closure inspections and preparing the certification of closure report. If a number of units of the same type are being closed in the same manner at the same time, the user may choose to charge the cost of certification of closure only once for all similar units.
Review of Closure and Post-Closure Plans and Cost Estimates

1. Number of Units Requiring Certification of Closure: Enter the number of units being closed.

2. Cost of Certification of Closure per Unit: This information is obtained from the cost reference database. The user can replace this value with one that is more appropriate by selecting Override Defaults.

Total Cost of Certification of Closure: This value is calculated automatically by multiplying the number of units to be closed by the cost per unit for certification.

Notes:

Foot Notes:

1 Cost derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 665, crew A-13. Crew A-13 consists of one light equipment operator; one truck-mounted 1,500-gallon vacuum loader; and one 20,000 GVW flatbed truck. Refer to Appendix B of the manual for details of the PPE calculation. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.


3 Material requirements derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 30, item no. 02 65 1030 0401, assuming 1.5 pounds of dry ice per 100-gallon capacity. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.

4 Cost derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 663, crew A-1 (labor only). Total cost for one common laborer is $49.00 per hour. Refer to Appendix B of the manual for details of the PPE calculation. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.

5 Rate derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 30, item no. 02 65 1030 0401. In estimating the work rate, it was assumed that the work hours required per pound of dry ice are as follows: 0.016 work hr/lb of dry ice x 1.5 lb of dry ice/100-gal capacity = 0.00024 work hr/gal capacity.

6 Rate derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 30, item no. 02 65 1030 0310, assuming two hours for a 1-person crew is required for waste removal rate from a 7,000-gallon tank, as follows: 2 hr/7,000-gallon tank x 2 (the tank must be filled and emptied) = 0.0006 work hr/gal capacity.

7 Azimuth Group, Ltd., ECHOS (Environmental Cost Handling Options and Solutions) Environmental Remediation Cost Data – Unit Price, 2006, item number 33190430, 55-gallon reconditioned steel 17-H drum. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.


Azimuth Group, Ltd., ECHOS (Environmental Cost Handling Options and Solutions) Environmental Remediation Cost Data – Unit Price, 2006, item numbers 33109502, 33109505 to 33109508. Labor and equipment cost for the excavation and loading a UST. Labor and equipment costs were derived from crew CODEV. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.

Azimuth Group, Ltd., ECHOS (Environmental Cost Handling Options and Solutions) Environmental Remediation Cost Data – Unit Price, 2006, item numbers 33109502, 33109505 to 33109508. Labor and equipment cost for removing a tank. Labor and equipment costs vary depending on the size of the tank and the crew type. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.

Azimuth Group, Ltd., ECHOS (Environmental Cost Handling Options and Solutions) Environmental Remediation Cost Data – Unit Price, 2006, item numbers 16019030 to 16019036. Labor and equipment cost for removing a tank. Labor and equipment costs vary depending on the size of the tank and the crew type. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books. The work rate changes with the tank capacity.

Cost derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 675, crew B-39. Crew B-39 consists of one labor foreman, four building laborers, one light equipment operator, one air compressor (250 cubic feet per minute), two 60-pound pavement breakers, and two 50-foot air hoses (1.5-inch diameter). Refer to Appendix B of the users manual for details of the PPE calculation. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.


Cost derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 671, crew B-17. Crew B-17 consists of two labor foremen, one light equipment operator, one truck driver, one 12-ton dump truck, and one 48-
Review of Closure and Post-Closure Plans and Cost Estimates

horsepower backhoe loader. Refer to Appendix B of the user manual for details of the PPE calculation. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.


18 R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 29, item no 02 41 1923 0725. Cost is the weekly rental rate for a 20-cubic yard-capacity (8-ton) dumpster. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.

19 Cost derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, items no. 01 54 3650 0020, 01 54 3650 0300, and 01 54 3650 0900. Cost is based on average mobilization and demobilization costs for a 70-150 horsepower dozer, loader, backhoe, excavator, paver or roller; a 6-cubic yard scraper towed by a tractor, and a 3/4 –cubic yard shovel or dragline from a location within a 25-mile radius of the site, plus delivery charge. The cost is added to all activities that require the use of heavy equipment. If equipment already has been mobilized for another activity, it may not be necessary to include this cost. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.

20 Cost derived from R.S. Means Company, Inc., Means Building Construction Cost Data, 2009, page 667, crew B-10L. Crew B-10L consists of one medium equipment operator, one-half building laborer, and one 80-horsepower dozer. Refer to Appendix B of the manual for details of the PPE calculation. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.


22 Assumes performance of the following tasks by an independent registered professional engineer at a labor, overhead, and profit rate of $86.46 per hour: 1) 8 hours for initial review of closure plan, 2) 16 hours for final closure inspections, and 3) 16 hours for preparation of a certification of closure report [(8 hrs + 16 hrs + 16 hrs) x $86.46/hr = $3,458.00]. The estimate also includes 20 clerical hours at a total rate of $33.00 per hour (20 hrs x $33.00/hr = $660.00). The total cost is: $3,458.00 + $660.00 = $4,118.00. If State Cost Factor was chosen in the Facility Information Window, this cost has been adjusted using the index guide found in the Means Cost Data Books.
## Tables

### Table 1
**Typical Vertical Tank Dimensions**

<table>
<thead>
<tr>
<th>Capacity (gal)</th>
<th>Approximate Diameter (ft)</th>
<th>Approximate Height or Length (ft)</th>
<th>Interior Surface Area (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,000</td>
<td>9</td>
<td>10.5</td>
<td>424</td>
</tr>
<tr>
<td>10,000</td>
<td>11.5</td>
<td>13</td>
<td>677</td>
</tr>
<tr>
<td>15,000</td>
<td>13</td>
<td>13</td>
<td>878</td>
</tr>
<tr>
<td>20,000</td>
<td>15</td>
<td>15</td>
<td>1,060</td>
</tr>
<tr>
<td>25,000</td>
<td>15</td>
<td>17</td>
<td>1,257</td>
</tr>
<tr>
<td>30,000</td>
<td>17</td>
<td>18</td>
<td>1,415</td>
</tr>
</tbody>
</table>

### Table 2
**Typical Horizontal Tank Dimensions**

<table>
<thead>
<tr>
<th>Capacity (gal)</th>
<th>Approximate Diameter (ft)</th>
<th>Approximate Height or Length (ft)</th>
<th>Interior Surface Area (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,000</td>
<td>6</td>
<td>23</td>
<td>490</td>
</tr>
<tr>
<td>10,000</td>
<td>8</td>
<td>26</td>
<td>754</td>
</tr>
<tr>
<td>15,000</td>
<td>9.5</td>
<td>29</td>
<td>1,007</td>
</tr>
<tr>
<td>20,000</td>
<td>10</td>
<td>34</td>
<td>1,225</td>
</tr>
<tr>
<td>25,000</td>
<td>10.5</td>
<td>38</td>
<td>1,427</td>
</tr>
<tr>
<td>30,000</td>
<td>11</td>
<td>42</td>
<td>1,641</td>
</tr>
</tbody>
</table>

### BF-01 Backfill and Grading

**Interior Volume of Storage or Process Pit if applicable**

1. A. Interior Volume: cy

1. B. Top Surface Area: sf
# Review of Closure and Post-Closure Plans and Cost Estimates

## DC-01 Decontamination

### Decontamination of Heavy Equipment
1. Number of hours needed to decontaminate all heavy equipment

## SA-02 Sampling and Analysis

### Sampling and Analysis Inventory
1. Number of Drilling and Subsurface Soil Samples (2.5-inch borings)
2. Number of Drilling and Subsurface Soil Samples (4-inch borings)
3. Number of Concrete Core Samples
4. Number of Whip Sample Locations
5. Number of Surface Water and Liquid Sample Locations
6. Number of Soil, Sludge, and Sediment Soil Samples
7. Number of Groundwater Sample Locations
8. Number of Lysimeteres to be Sampled

### Drilling and Subsurface Soil Samples
Drilling and Subsurface Soil Samples - 2.5 inch Diameter Holes
1. B Enter depth of boreholes (sum of all)

### Concrete Core Samples

### Wipe Samples

### Surface Water and Liquid Samples

---

55
### Review of Closure and Post-Closure Plans and Cost Estimates

#### Soil, Sludge, and Sediment Samples
3. Number of sampling events

#### Groundwater Samples
Sampling Events
3. Number of Sampling events

#### Soil-Pore Liquid Samples
Sampling Events
3. Number of sampling events

#### Analysis of Subsurface Soil Samples
1. Enter the number of sampling events

### MW-01 Monitoring Well Installation

#### Project Engineering
1.A Number of Wells:

#### Well Installation 2 inch diameter
3.A Total number of boreholes to be drilled

#### Well Installation 4 inch diameter
4.A Total number of boreholes to be drilled
4.B. Total Depth of Boreholes

### TR-01 Transportation of Waste
3.A Number of waste debris boxes

### TD-01 Treatment and Disposal of Waste

#### Soil Treatment and Disposal
1. Solid Waste Type
1.A. Volume in cy of solid waste to be treated and disposed of

#### Liquid Waste Treatment and Disposal
2. Liquid waste Type
2.A. Volume in gallons of liquid waste to be treated and disposed of

Drummed Waste Treatment and Disposal
1. Drummed Waste Type (optional)
Review of Closure and Post-Closure Plans and Cost Estimates

End of Work Plan