This appendix comprises an analysis of the treatment and disposal options available to owners and/or operators of mineral processing facilities. The appendix presents the available technically feasible treatment and disposal options, a comparison of those options, and a determination of the lowest-cost alternative.

Under the current regulations governing the disposal of hazardous mineral processing waste, owners and/or operators of mineral processing facilities have several disposal options available, depending on the type of waste that is generated:

- Solid wastes may be:
  - Disposed of in a Subtitle C landfill; or
  - Treated and disposed of in a Subtitle C landfill; or
  - Treated and disposed of in a Subtitle D landfill.

- Liquid wastes may be:
  - Treated, with solid wastes disposed in a Subtitle C landfill; or
  - Treated, with solid wastes disposed in a Subtitle D landfill.

Upon completion of this rulemaking, owners and/or operators of mineral processing facilities that generate hazardous waste must choose between two treatment and disposal options. Both solid and liquid wastes may be:

- Treated and disposed of in a Subtitle D landfill; or
- Treated and disposed of in a Subtitle C landfill.

Depending on the quantity of waste generated, owners and/or operators of mineral processing facilities may choose to send the waste off-site for treatment and disposal, or build a treatment system on-site.

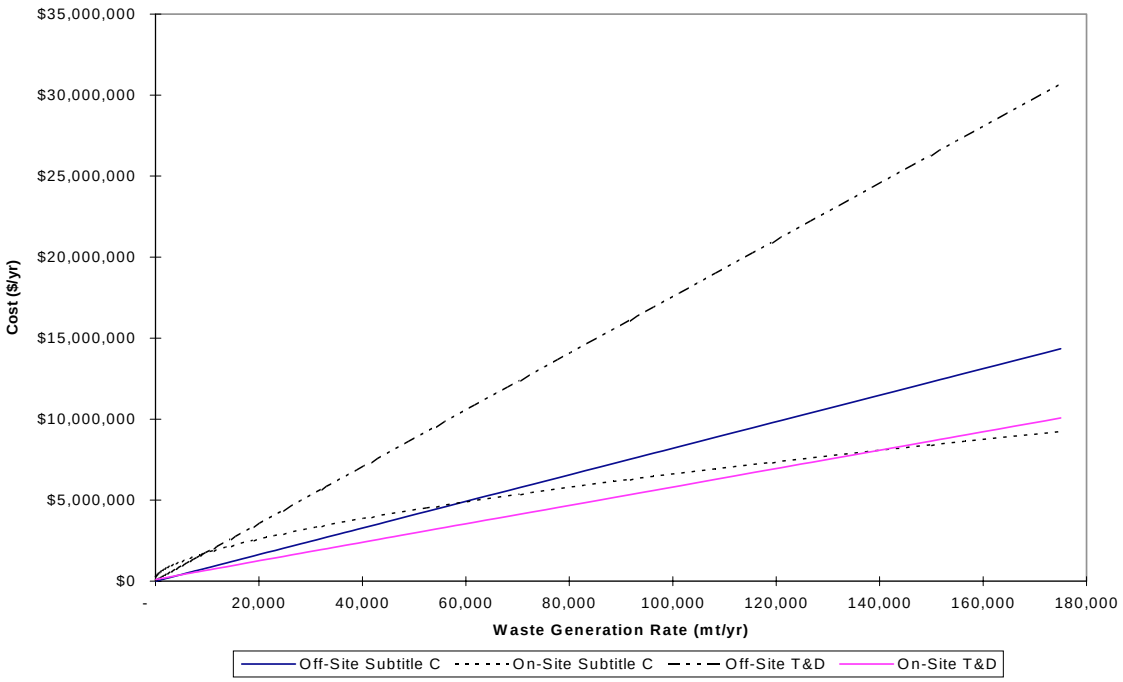
C.1 Pre-Rule Lowest Cost Option

C.1.1 Analysis of Treatment and Disposal Costs

Using on-site cost functions and off-site unit prices from Appendix D, EPA has calculated pre-rule (or baseline) treatment and disposal costs over a range of waste generation rates (100 mt/yr - 175,000 mt/yr) for on- and off-site Subtitle C landfill disposal, and on- and off-site treatment followed by Subtitle D landfill disposal. Exhibit C-1 shows the total treatment and/or disposal cost plotted against a range of waste generation rates. The total cost of disposing mineral processing wastes increases as the quantity of waste increases using all four alternatives.

Total treatment and/or disposal costs were divided by the waste generation rate to obtain unit costs. Exhibit C-2 shows the unit treatment and/or disposal cost plotted against a range of waste generation rates. Note that the unit cost of off-site treatment and disposal is constant, while the unit cost of Subtitle C landfilling and on-site treatment and disposal decreases as waste quantity increases.

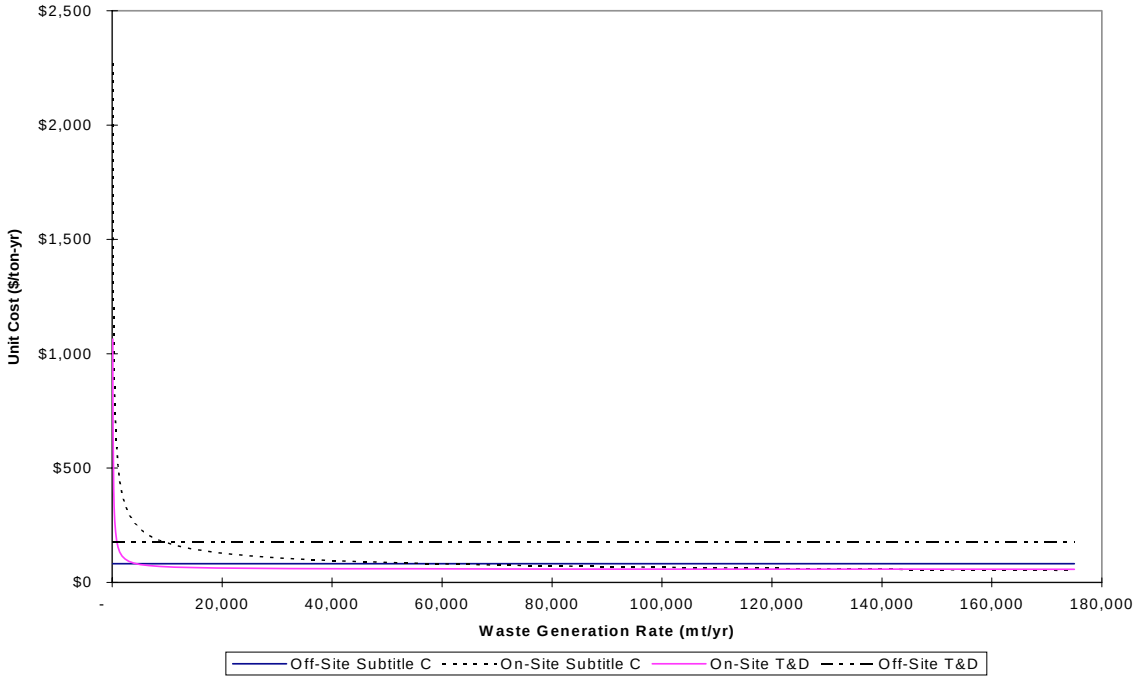
Exhibit C-1
Total Cost of Treatment and/or Disposal Alternatives



C.1.2 Subtitle C Disposal vs. Treatment and Subtitle D Disposal

Exhibits 1 and 2 show that treatment followed by disposal in a Subtitle D landfill is less costly than Subtitle C landfilling for virtually the entire range of solid waste generation rates under consideration in this rulemaking. For very small waste generation rates, however, off-site Subtitle C landfilling is actually a lower cost option than treatment and Subtitle D disposal. Likewise, for waste generated in excess of approximately 150,000 mt/yr, on-site Subtitle C landfilling is a lower cost option than treatment and Subtitle D disposal. However, liability costs (from corrective action requirements) of Subtitle C landfills are not accounted for in the on-site Subtitle C cost functions or the off-site Subtitle C unit disposal price described in Appendix D. It is EPA's assertion that owners and/or operators of mineral processing facilities generating very small quantities of waste or facilities generating waste in excess of 150,000 mt/yr will treat and dispose the waste in a Subtitle D landfill due to the potentially high liability cost associated with Subtitle C landfilling. Therefore, EPA considers on- and off-site treatment and Subtitle D disposal to be the lowest-cost disposal options for mineral processing hazardous wastes.

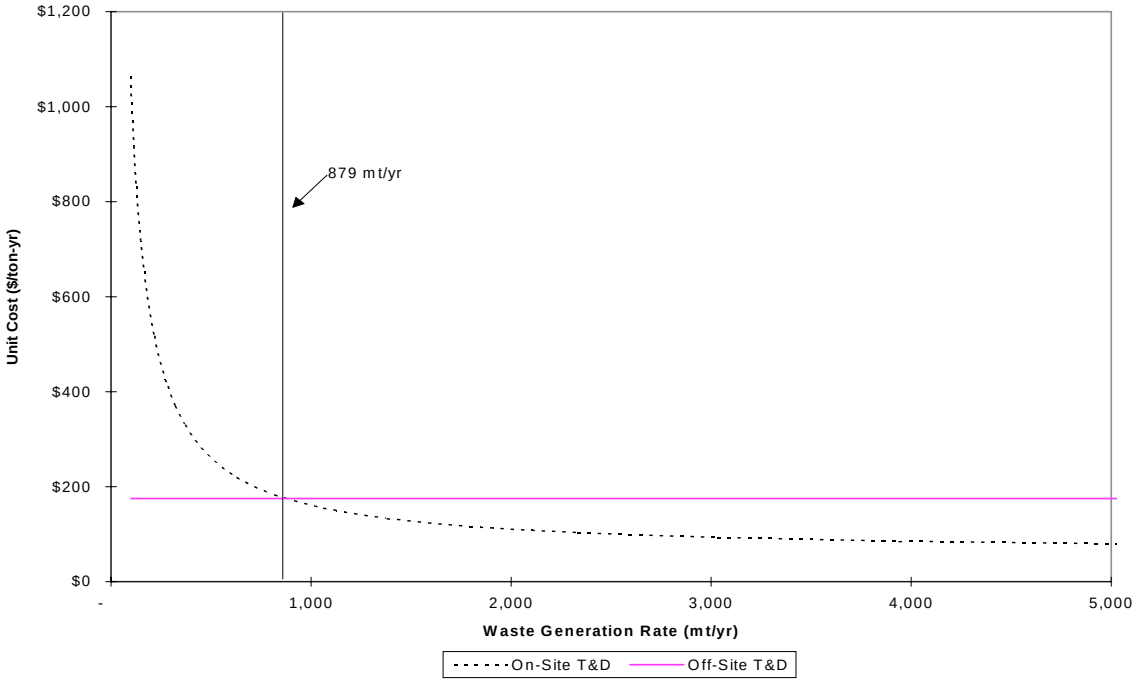
Exhibit C-2
Unit Cost of Treatment and/or Disposal Alternatives



C.1.3 On-Site vs. Off-Site Treatment and Subtitle D Disposal

In addition to determining that treatment and disposal is the lowest cost disposal option, EPA has identified a "break-even" point at which it is more economical to send waste off-site for treatment and disposal rather than treat and dispose of waste on-site. Exhibit C-3 (an enlargement of Exhibit C-2) shows the "break-even" point between off-site treatment and disposal and on-site treatment and disposal. This "break-even" point occurs at approximately 879 mt/yr, and therefore waste that is generated in small quantities (0 mt/yr - 879 mt/yr) will be sent off-site for treatment and disposal rather than be treated and disposed on-site. Waste generated in excess of 879 mt/yr, however, will be treated and disposed on-site.

Exhibit C-3
Treatment and Subtitle D Disposal Unit Costs



C.2 Post-Rule Lowest Cost Option

Based on the above analysis that shows that disposal of waste in a Subtitle C landfill alone is almost always more expensive than treatment and disposal of waste in a Subtitle D landfill, EPA asserts that treatment and disposal of waste in a Subtitle C landfill is clearly more expensive than treatment and disposal of waste in a Subtitle D landfill. Therefore, EPA assumes that the post-rule lowest-cost option is treatment followed by Subtitle D disposal.

C.3 Conclusion

EPA believes that Subtitle C disposal is generally more expensive than treatment followed by Subtitle D disposal. This assertion, coupled with potentially high Subtitle C liability costs, has led EPA to assume that owners and/or operators of mineral processing facilities will choose to treat waste to UTS levels and dispose of the treated waste in a Subtitle D landfill. Therefore, in both the pre-rule (baseline) and post-rule (option) scenarios, the mineral processing cost model assumes that for waste generated in quantities below 879 mt/yr, owners and/or operators will send the waste off-site for treatment and disposal, while owners/operators will build an on-site treatment system for waste generated in excess of 879 mt/yr.