

Modeling Vertically-Staged Earthwork Rock Undercut Volumes (Subtraction Method) (Cont.)

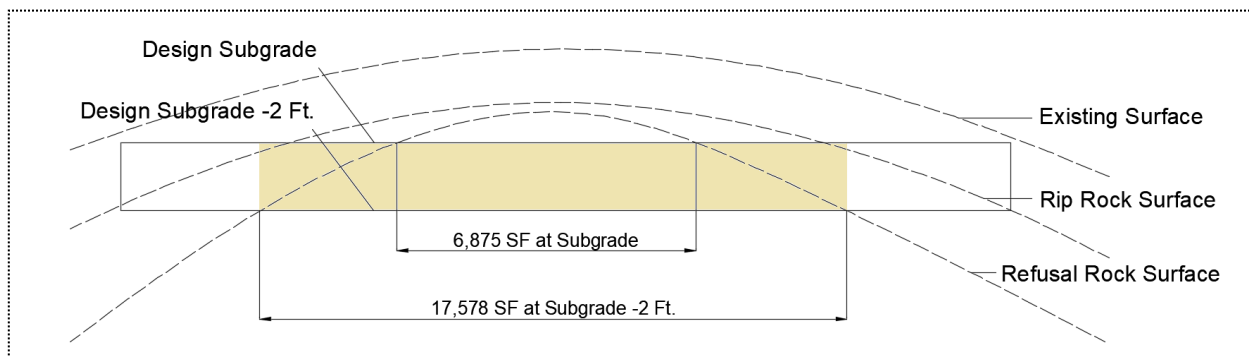
With the preceding manipulations and volume calculations completed (Steps 1-21), we can apply the subtraction method to the individual strata material cut volumes documented on our last two volume reports (pages 145 and 146) to determine the estimated undercut volumes. For each strata undercut material, we subtract the original Subgrade cut volume (on the Page 146 Volume Report) from the corresponding Subgrade -2 feet cut volume (on the Page 145 Volume Report). The resulting net undercut volumes are presented in the right-most column of the recap table below.

In this example, a total undercut of 1,285 BCY is required so that no Refusal Rock remains within two feet of Subgrade (the shaded end area in the profile below). The 1,285 BCY of undercut consists of 796 BCY Refusal Rock, 377 BCY Rip Rock, 112 BCY Soil, and 0 BCY Stripped Material. Although identical Refusal undercut volumes result here and in Step 6 (796 BCY), Steps 7-21 were required to avoid overestimating the volumes of overlying Rip Rock and Soil undercut. Recall that applying the subtraction method to the Rip Rock volumes initially reported on pages 142 and 143 resulted in 1,221 BCY of Rip Rock undercut (1,582 BCY on the page 143 report, less 361 BCY on the page 142 report) when the actual expected volume is only 377 BCY. Limiting the volume calculations to the actual undercut area is critically important when quantifying the incidental undercut materials (Rip Rock and Soil in this example) overlying the Refusal rock.

Finally, remember: (1) the 1,285 BCY total undercut is work in addition to this site's cut/fill volumes as reported on page 142, (2) the undercut material must be replaced with 1,285 CCY of suitable backfill to return the undercut area to plan Subgrade, and (3) the accuracy of strata surface models and strata cut volumes are only as good as the referenced geotechnical data.

Strata Material*	Cut Volume to Subgrade -2 Feet (Page 145 Report)	-	Cut Volume to Plan Subgrade (Page 146 Report)	=	Net Undercut Volume (BCY)
Stripped Material	241	-	241	=	0
Soil	916	-	804	=	112
Rip Rock	733	-	356	=	377
Refusal Rock	1,381	-	585	=	796
Total					1,285

* Note: The above recap was compiled in Excel—it is not an AGTEK-generated report



Tips: Because it is somewhat labor-intensive (21 steps in the above example), using the subtraction method for estimating a rock undercut (when the undercut is resulting simply from the inability to remove rock neatly to Subgrade) may not be the best use of your time. If the much easier “cut area” method (described on pages 38 and 204) is good enough for your quantity estimating purposes, save yourself some time and use the cut area method. Also, AGTEK offers other tools and methods that could be applied to the above undercut example (see the *Variable-Depth Removal of Expansive Clay* example beginning on page 148—it requires a lot of steps, too, but does offer the advantage of retaining all data in one AGTEK job file). Finally, AGTEK’s rock removal model video at www.agtek.com/video.html?id=210 documents yet another approach to modeling and quantifying a rock undercut (it’s a bit more complicated but all data is kept in a single job file--AGTEK Support ID/Password is required to watch the video).