Side Slope Credits in CROSS SECTIONS AND VOLUMES

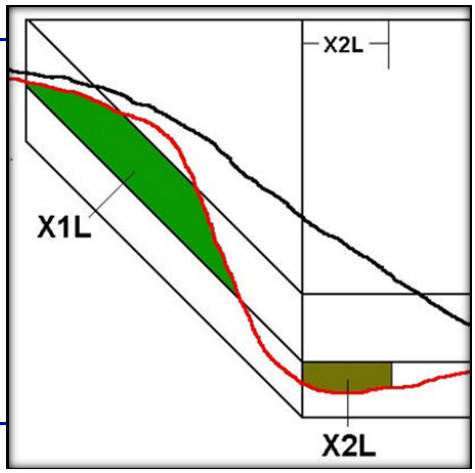
By Pat Sanders (a.k.a. 'Volume Boy')

It is difficult to dredge exact side slopes. Many dredge operators prefer to dig extra material at the channel toe points and be credited for material on the side slope falling into the hole over time. In the HYPACK® CROSS SECTIONS AND VOLUMES program, there are two methods that compute the credit for this process. The original method was the AEA3. Later on, the Jacksonville Post-dredge method was added. The two methods vary slightly and will give different results.

AEA3 METHOD

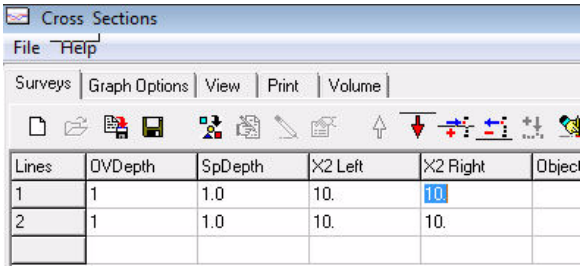
The AEA3 (Average End Area) method computes the volume of material that has been removed between Pre-dredge and Post-dredge surveys. It also can compute a side slope credit. The side slope credit is based only on the Post-dredge survey.

FIGURE 1. *Average End Area 3 Diagram*



For both the left and right side slopes, the AEA3 method will compute the amount of material found in the Overdepth Allowance area. This is labeled X1L (left) and X1R (right). One of the differences between the AEA3 method and the Jacksonville Post-dredge method is that AEA3 does not provide for any credit of material located above the channel design depth.

FIGURE 2. *Defining the Distance for the Void*



AEA3 then computes the void beneath the overdepth template, working inward from the toe point a user-defined distance. The material is computed and displayed as X2L (left) and X2R (right). You can control the distances by entering them under the X2 Left and X2 Right columns of the Surveys tab.

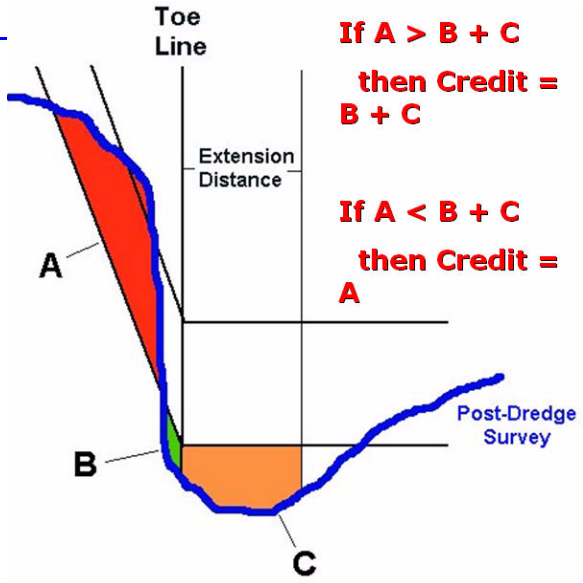
AEA3 will not compute any X2L or X2R void if the profile of the Post-dredge survey is shoaler than the Overdepth Allowance depth at the toe point.

In the volume report, AEA3 does not make any decisions regarding the amount of available material and the amount of the available void. It just lists the areas and volumes generated for each section (X1L, X1R, X2L, X2R).

JACKSONVILLE POST-DREDGE METHOD

The Jacksonville Post-dredge (JPostD) method was developed for the Jacksonville Corps of Engineers. It also requires Pre-dredge and Post-dredge surveys.

FIGURE 3. Jacksonville Post-dredge Diagram



This method reports three separate quantities for both the left and right side slopes.

A = All material that remains above the Allowable Overdepth side slope.

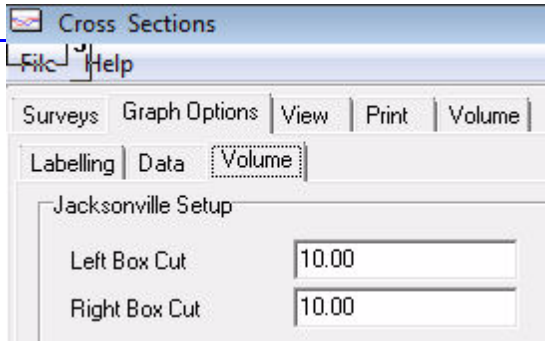
Note: This is a major difference between AEA3 and JPostD! JPostD includes the material above the design template. AEA3 does not. Therefore, my eligible credit is going to be larger in the JPostD method than in the AEA3 method.

B = The void beneath the Allowable Overdepth template working outwards from the toe point.

Note 1: If the depth profile is above the Allowable Overdepth at the toe point, no credit is generated.

Note 2: Since there is no credit in AEA3 for voids outward from the toe points, the JPostD method will result in a larger credit than AEA3.

FIGURE 4. Specifying the Extension Distance



C = The void beneath the Allowable Overdepth template, working inward from the toe point. You can specify the distance to search in the Graph Options – Volume tab.

There are a couple of options available at the bottom of the Graph Options – Volume tab that can affect your results.

FIGURE 5. Jacksonville Post-dredge Volume Options

The '**Post Dredge Below Overdepth / First Void Only**' stops the computation of the B void where the depth profile passes through the Allowable Overdepth Template. If you are in a

situation where the bottom goes above and below and above and below the Overdepth Template, this option would only include the first void outward from the toe. Subsequent voids going up the side slope would not be included.

The '**Any Void Within Box Cut Distance**' will include any void it finds on the side slope, outward to a distance equal to the Left Box Cut and Right Box Cut distances entered in the Graph Options – Volume tab.

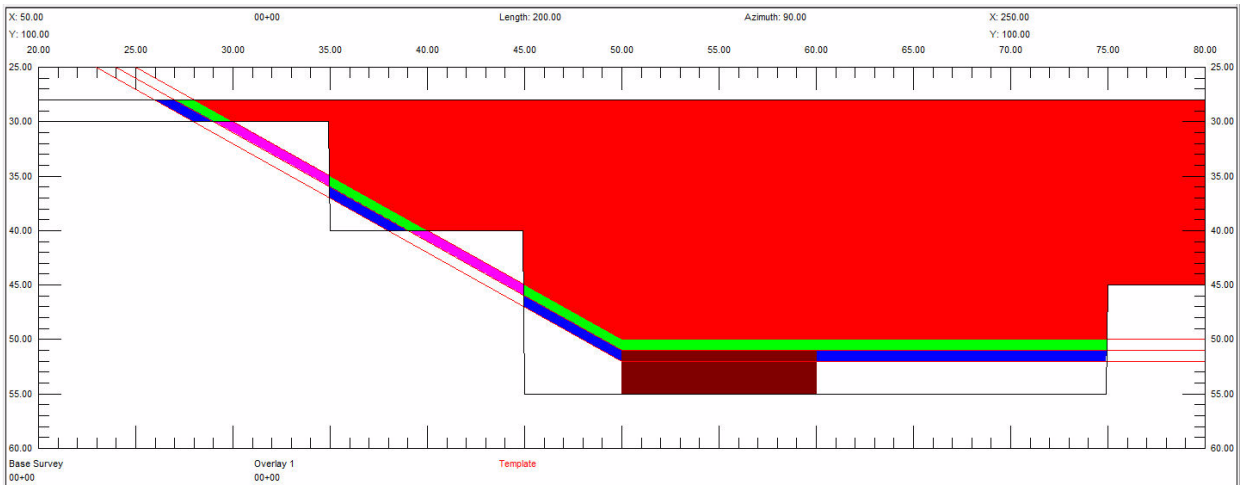
The **Credit Calculation** can either include the credit for the C material (Credit = MIN(A, B+C)) or ignore the C material (Credit = MIN (A,B)). The first option will result in larger credits.

TEST CASE

In order to test the calculations, I created a rather sharp profile and ran it through CROSS SECTIONS AND VOLUMES in both methods.

AEA3

FIGURE 6. *Average End Area 3 Diagram*

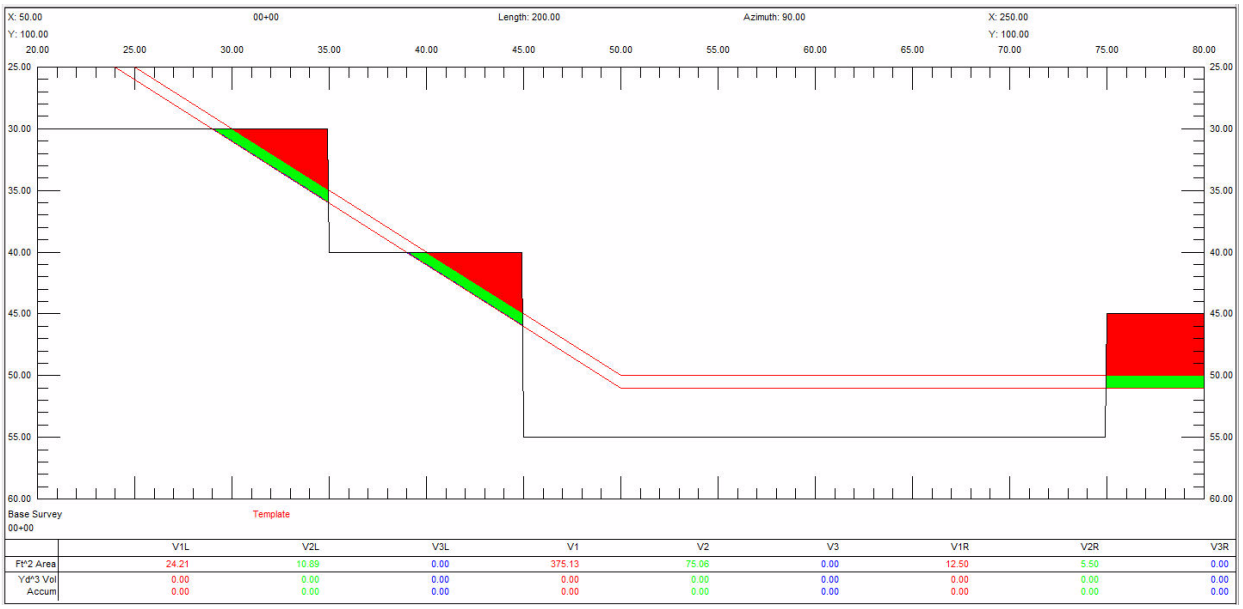


The screen capture from the AEA3 method is shown above. Remembering that only the After-dredge profile is used in the computation of side slope credits, I have colored the X1L material in pink. The X2L material is colored in Brown, however there is an error in our display (but not in the computed quantities). The X2L void should only compute the void beneath the Allowable Overdepth template. The void between the Design template and the Allowable Overdepth template should not be included. Checking the computed areas, I found that our computation was correct. Only the display of the X2L was in error and we are going about fixing that.

The results for AEA3 were: 1L = 40.34cy
2L = -148.15cy (voids are reported as negatives in AEA3)
Net Credit = 40.34 cy

JACKSONVILLE POST-DREDGE

FIGURE 7. *Jacksonville Post-dredge Diagram*



For the first test, I ran the Jacksonville Post-dredge with the 'First Void Only' option. In order to check the areas, I also ran the same data in the AEA1 version to verify the quantities that remained. Note that when computing the 'Available Material' (A), all of the red and green material on the side slope will be included. However, I elected to only include the last void.

Selecting the MIN = (A, B+C) I get:	A =130.01cy
	B=120.37cy
	C = 148.15cy
	Credit = 130.01cy
Selecting the MIN = (A,B), I get:	A =130.01cy
	B =120.37cy
	C = 0.00cy
	Credit = 120.37cy

I manually computed the areas and verified the areas and volumes to within 0.05cy.

SUMMARY:

So, two different methods result in a difference of 90cy (on one slope). Not a big deal, unless you have 100+ sections……

It's important to understand how the side slope credit is being applied in each method in order to eliminate confusion regarding your side slope credit results.