Flow in Channel Sections: Subsectioning

SPEAKER Charles Berenbrock: In this section, we're going to be discussing on how you subsection a cross-section. But recall from the previous lecture why we wanted to subsection. The main reason is to correctly adjust for the non-uniform distribution of roughness along a cross-section. And the reason is so that we don't overestimate or underestimate what the true value, say, for discharge or for other calculations--variables that we needed later on.

When should we subsection? Well, there are some values that are given and subsectioning should be used if the total depth in the main section divided by the depth in the overflow channel is greater than two or if the width in the overflow channel divided by the depth in the overflow channel is greater than or equal to five. That is when--in either of those cases is when we subsection. Now, there are some assumptions when you do subsectioning. Remember that the subsections, we assume that they are parallel to one another, they are separated by a vertical boundary with no sheer. The roughness value in each of the subsections is constant. So in the previous example that we discussed, the Manning's n value in the main channel was 0.030, that would stay for that entire main channel. And the roughness value was 0.050 in the floodplains section. Well, that would stay true for the floodplain section again in the subsectioning. Also the depth is constant in each subsection. Also the water surface elevation in the entire cross-section is constant. When we compute discharge when subsectioning, we can go through certain steps and I've kind of outlined them here. What you need to do is you need to know what the--let's say the width and the depths for each cross-section. And then from that, you need to determine what the area, the perimeter, the hydraulic radius, and we call that R, and the conveyance for each subsection. And we usually denote that when we determine the conveyance for each subsection as a little "k." After that, we sum the area and we sum the total conveyance and then we use that in Manning's n equation to determine what the total discharge in that cross-section is. There might be some other needed information, too, that is required like determining the energy coefficient alpha--that was discussed in previous lectures. Also, we might want to determine what the average velocity in the entire cross-section is. And also maybe friction slope, we call that S sub-f (S_f). Remember what the alpha is? It's really a velocity distribution coefficient--I won't go into discussion here about that. Also that it is an energy coefficient and we use that mainly in the

energy equation. There is also a beta coefficient, it’s also called the momentum coefficient or Boussinesq coefficient. You use that when you talk of--when we use the moment equation, we won't be discussing that any further probably in this course. But remember that the energy coefficient, alpha, and then, I think, previous lectures called it the Coriolis coefficient. Because of the non-uniform distribution of velocities in a cross-section, we need to use the energy coefficient. It gives us a truer velocity head for that cross-section especially when we’re using the energy equation. That is the end of this session.