Index-velocity Quick Sheet

Index-velocity Rating Tips

- Index velocity ratings relate the velocity measured by an acoustic Doppler velocity meter (ADVM) or index velocity (Vi) to the mean-channel velocity (V).

- Discharge measurements are made while the index velocity meter (ADVM) measures velocity. Using the mean velocity from the ADVM during the period when the discharge measurement was made, an index-velocity rating can be developed. When doing so, compute V by dividing the measured discharge (Q) by the area (A) from the **stage-area rating**. **DO NOT** compute V using the area from the discharge measurement because discharge measurements may be made in different locations depending on flow conditions.

- Create a table summarizing your measurement data, including measurement number, date, mean gage height, discharge, the rated area (A) from your stage-area rating, V and Vi for each measurement, and any remarks. Use a spreadsheet for plotting and analyzing the data..

- Plot the data! Create plots of mean channel velocity (V) and the index velocity (Vi) to for evaluating the index velocity relation for linearity, for example. Plot V on y-axis and Vi on x-axis.

- If the relation is approximately linear, a linear regression may be used to develop the index-velocity rating:

    V = X*Vi + C where **X** is the velocity coefficient and **C** is the intercept
- Assess the linear regression using the following:
    - Correlation coefficient (R-square). The R-square should be about 0.95 or greater. If R-square is approximately 0.90 or less, determine whether a multi-parameter index-velocity rating with Vi and stage (S) improves the index velocity rating.
    - Standard error (SE). The SE is an overall indicator of the error of the index velocity rating. The lower the SE, the more accurate the rating.
    - Residual plots. Plots of the regression residuals should be approximately random, indicating no patterns or trends. Outliers on these plots should be checked carefully for measurement errors or irregularities in index-velocity data.
    - Site hydraulics. Consider the hydraulics of the site. The parameters X and C in the equation above are indicative of site characteristics

- Multiple-linear regressions may be attempted if velocity (Vi) and stage (S) are statistically significant in the regression and the resulting equations represent site hydraulics.

    V = Xvi + YSVi + C where X is Vi coefficient and Y is SVi coefficient

- Assess the multiple-linear regression using the approach for a single parameter equation

- You could use just S instead of SVi, but generally SVi yields slightly better results, and the ADAPS velocity processor is set up for the SVi coefficient

- At the stage (water surface elevation) where flow goes over bank, the rating will likely change. In this case a compound rating, may be necessary (i.e. one equation for flows within the channel and a separate equation for over bank flow). For use in the USGS NWIS software, it will be necessary to represent such a situation using a table rating.