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Office of Water Quality Water-Quality Information Note 2005.06

Subject: Software— Release of LOAD ESTimator (LOADEST) documentation and software

The Office of Water Quality is pleased to announce that "*LOAD ESTimator (LOADEST), a FORTRAN program for estimating constituent loads in streams and rivers*", is now available as a U.S. Geological Survey Techniques and Methods report and the program is available for download and use.

The report has been released online-only and is available at: <http://pubs.water.usgs.gov/tm4A5/> . It describes the estimation theory used by the program and provides input and output specifications, sample applications, and installation instructions. The report citation is:

Runkel, R.L., Crawford, C.G., and Cohn, T.A., 2004, Load estimator (LOADEST): a FORTRAN program for estimating constituent loads in streams and rivers: U.S. Geological Survey Techniques and Methods Book 4, Chapter A5, 69 p.

The program files can be downloaded by use of file transfer protocol (ftp) at [ftpdcolka.cr.usgs.gov](ftp://ftpdcolka.cr.usgs.gov) under a directory named loadest. Alternatively, the program can be accessed by use of a web browser at the following address:

<ftp://ftpdcolka.cr.usgs.gov/loadest/> .

Please note that the files available by ftp are for installation purposes only. Detailed installation instructions are provided in Section 5 of the software documentation.

The program is compiled for use with the Solaris, Linux, or Windows operating systems.

Background

LOAD ESTimator (LOADEST) is a FORTRAN program for estimating constituent loads in streams and rivers. Given a time series of streamflow, additional data variables, and constituent concentration, LOADEST assists the user in developing a regression model for the estimation of constituent load (calibration). Explanatory variables within the regression model include various functions of streamflow, decimal time, and additional user-specified data variables. The formulated regression model then is used to estimate loads over a user-specified time interval (estimation). Mean load estimates,

standard errors, and 95 percent confidence intervals are developed on a monthly and (or) seasonal basis.

The calibration and estimation procedures within LOADEST are based on three statistical estimation methods. The first two methods, Adjusted Maximum Likelihood Estimation (AMLE) and Maximum Likelihood Estimation (MLE), are appropriate when the calibration model errors (residuals) are normally distributed. Of the two, AMLE is the method of choice when the calibration data set (time series of streamflow, additional data variables, and concentration) contains censored data. The third method, Least Absolute Deviation (LAD), is an alternative to maximum likelihood estimation when the residuals are not normally distributed. LOADEST output includes diagnostic tests and warnings to assist the user in determining the appropriate estimation method and in interpreting the estimated loads.

Comparison To Other Regression-Based Load-Estimation Programs

LOADEST is in part the result of a recent effort to combine two previously undocumented software packages, LOADEST2 and ESTIMATOR. Previous users of LOADEST2 and ESTIMATOR may wish to consult the attached summary that compares the new software with these other packages.

Questions should be directed to:

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