

APPENDIX C –

Provisional Inflow Data Development for the

Roanoke River Basin

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The current methodology for developing model inflow data does not lend itself well to frequent updates that will be necessary for real-time position analysis. The current methodology requires a large amount of input gage data (using 29 active gages in the basins); impairments from reservoir operations, water supply, wastewater returns, and agricultural withdrawals; correction to negative inflows that could otherwise cause model infeasibility; and scaling of gains to ensure that filled-in data for gages with missing data preserves the known volume of flow at downstream gages. Obtaining impairment data alone (which are necessary to unimpair the gage flows) is the most time-intensive part of the updating process.

HydroLogics has developed a simplified, *provisional* procedure that will enable weekly or monthly updates to be made, later overridden by periodic annual updates using the current methodology. It is meant to provide a representative inflow to key points in the basin, most notably Kerr Lake, which is central to real-time management of the basin. The downloading of data and calculations for the provisional update are handled automatically within the GUI from the Update Record tab.

To simplify the update as much as possible, the procedure eliminates the need for most impairments and the concern over negative inflows that could lead to model infeasibility. The assumption is that most of the net impairments (withdrawals – discharges) in the basin are small and occur within a reach and therefore are not likely to have much effect on the natural inflow.

As an example, the Dan River at Paces gage is significantly affected by the operation of Philpott Lake upstream. However, by computing the gains between Philpott and Eden, and Eden/Wentworth and Paces, the effect of the Philpott Lake operation is removed. Only the net impairments within those reaches affects the natural inflow, and as long as the net impairments are small, it can be assumed that the difference in gaged flows in these reaches is the natural inflow.

Inflows to Philpott and Kerr Lakes are back-calculated from historic releases and change in storage and are occasionally negative because lake evaporation is factored in (i.e., they are calculated as net inflows) and/or wind effects on the reservoir which impact the stage measurement. Negative inflows at other locations can also occur when the downstream gage flow is less than the upstream gage flow (which is usually due to time of travel issues). In either case, these only pose a modeling problem if there is not enough water in the river or reservoir to handle them, which is rare. As a precaution, when gains are negative, the model's OCL is used to filter them to maintain model feasibility.

Smith Mountain/Leesville inflows are updated in the manner described in Appendix B. Note that the Roanoke at Roanoke gage, on which much of the estimated inflow to the reservoirs is based, is first unimpaired for withdrawals upstream before being adjusted upward for the downstream drainage area.

The simplified procedure is detailed in the *update_record.Iv* file contained in the basedata directory of the model application. As noted, all data acquisition and calculations are automatically done within the model from the Update Record tab. The user should do a manual QA/QC check on the downloaded data before updating the record.

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