APPENDIX C –

Provisional Inflow Data Development for the Yadkin-Pee Dee and Lumber River Basins

The current methodology for developing model inflow data does not lend itself well to frequent updates that will be necessary for real-time forecasting using OASIS in position analysis mode. 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; filling-in of missing gage data; 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.

Hazen 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, including mainstem and tributary reservoirs, The downloading of data and calculations for the provisional update are handled automatically within the GUI from the History 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 Yadkin College gage can be affected by the operation of Kerr Scott upstream. However, by computing the gains between the Yadkin River gages at Enon (downstream of Kerr Scott) and Yadkin College (downstream of Enon), the effect of the Kerr Scott 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 Kerr Scott are back-calculated from historic releases and change in storage and are occasionally negative because lake evaporation is factored in (i.e., they are as 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.

Inflows to the Cube Carolinas and Duke Energy projects are not calculated in real-time as there is no means of accessing these data on the web. Instead, we rely on drainage-area adjustments of tributary gage flows to estimate local inflows to the projects.

The simplified procedure is detailed in the processor file ***update_record.1v*** file contained in the model database. It is not included here given the amount of detail (requiring 40+ pages). As noted, all data acquisition and calculations are automatically done within the model from the History tab in the model (instructions are detailed in the available OASIS PowerPoint tutorials). The user should do a manual QA/QC check on the downloaded data before updating the record.