

# 316(b) Entrainment and Impingement Studies Edge Moor Power Plant

Conectiv, Inc., Delaware River Estuary, Delaware



## Situation

An impact assessment was submitted as part of the NPDES renewal for Conectiv's Edge Moor Power Plant, which withdraws water from the Delaware River. ENTRIX Inc. developed a study plan cooperatively with the state regulatory agency to assess the population of indigenous fish and shellfish through trawl and ichthyoplankton studies. The Surfacewater Modeling Group provided models to assess the potential environmental impact on populations in the Delaware River as described in Section 316(b) of the Clean Water Act.

## Approach

Four models were used to assess the potential environmental impact and associated economic losses: the Empirical Transport Model (ETM), the Equivalent Adult Model (EAM), the Equivalent Yield Model (EYM), and the Forgone Production Model (FPM). Model inputs were available through ichthyoplankton and trawl sampling conducted over a two year period providing information regarding the presence, abundance, diversity, and distribution of fish and blue crab populations within the study area. In addition, impingement and entrainment sampling was conducted collecting data to estimate the types and numbers of fish and blue crab affected by the Cooling Water Intake Structure (CWIS).

ERM used GEMSS® (Generalized Environmental Modeling System for Surfacewaters) to compute entrainment parameters for the ETM and the EAM, programmed in EXCEL and provided to the client.

The defined study area upstream and downstream of the

power plant was characterized by a 3-D grid. A higher resolution grid was used near the intake region. The Delaware River was divided into regions corresponding to the biological far-field and near-field sampling regions.

To evaluate the percentage of standing crop that could be entrained from a specified region, a numerical dye study was performed. Each region was dyed separately, with dye a surrogate for the entrainable organisms, to estimate the likelihood of withdrawal into the plant. The simulation was run for sufficient time to establish the currents within the water body and to withdraw sufficient dye to evaluate each region's total percent entrained entrainment rate. The dye concentration, a surrogate for fish density, was attenuated using the species-specific natural mortality rate. The model predicted entrainment parameters were compared with field sampling data.

The results of the modeling and analysis of the two years of collected data were assessed in a risk assessment format associated with the operation of the CWIS. Supplemental population trend data were used to place the estimated risk in an ecological perspective relative to the Delaware River/Estuary ecosystem with an emphasis on the fish and blue crab populations.

## Results

The ERM modeling analyses were used to provide a quantification of the adverse environmental impacts in terms and format recognized by the regulating agencies. ENTRIX is currently supporting the facility in their completion of the Comprehensive Demonstration Study and associated discussions with State permitting agencies.