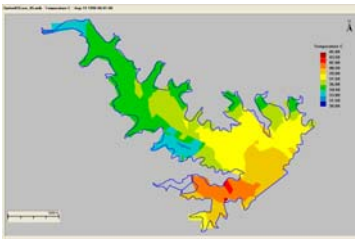
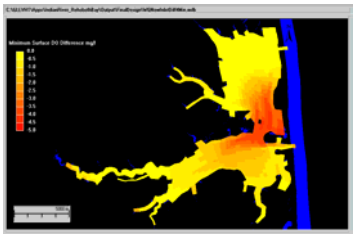
Dewatering Discharge to the Maggie Creek-Humboldt River System

Newmont Gold Company, Carlin, Nevada





Situation

Release of mine dewatering flows from Newmont Gold Company's Eastern Nevada operations to the Maggie Creek presented an environmental and engineering challenge. The dewatering flows are large and constant and have a year-round temperature of 25 C, compared to the varying flows and temperature of the nearly-intermittent Maggie Creek. The situation was further complicated by the proximity of the discharge to the confluence of the Maggie Creek and the Humboldt River. ERM's Surfacewater Modeling Group was retained by Newmont to model the temperature regime in Maggie Creek, to assess the effectiveness of a proposed cooling reservoir, and to compute the size of the Maggie Creek mixing zone as it enters the Humboldt River.

Approach

Because of the seasonal variation in the hydrologic, thermal and meteorological processes that drive temperatures in the Maggie Creek-Humboldt River system, the model was set up for an 11-year historical period to capture naturally occurring combinations of these driving processes. Temperatures at various key locations computed by the model were then analyzed as time series to which extreme event analysis was applied. This hindcast approach provides a more realistic description of the system than one that arbitrarily combines extreme values of the driving processes, the so-called "worst case" approach.

The hydrodynamic and transport model of the system divided the Maggie Creek-Humboldt River system into half-mile segments and computed flows and temperatures in each of those segments. The model incorporated features important to the analysis including surface heat exchange, other streams tributary to the system, and the thermal performance of a proposed reservoir used to hold and cool the discharge prior to its release to Maggie Creek. The model used for the simulations was the 1-D module of GEMSS® (the Generalized Environmental Modeling System for Surfacewaters).

The 1-D model also allowed the dimensions of the proposed Maggie Creek Reservoir to be modified to assess the costs and benefits of improved performance.

The size of the mixing zone at the confluence of the Maggie and Humboldt was computed using the 3-D module of GEMSS®.

Results

Use of the Maggie Creek Reservoir to cool the dewatering flows prior to discharge to Maggie Creek resulted in a decrease in temperature rises by 3-4°C at the outfall on Maggie Creek and by 1-2°C at its confluence with the Humboldt River. Expressed as a probability, Nevada's 2°C limit would be exceeded at the confluence with the Maggie for at least one day about one year in two and at the confluence with the Humboldt about one year in five. The exceedences in both cases occur in the late fall and early winter months.

The results of the analysis were presented to and accepted by the Nevada Division of Environmental Protection and the U. S. Bureau of Land Management. The size of the mixing zone at the confluence of the Maggie and Humboldt was found to meet regulatory requirements.