

CLACKAMAS RIVER HYDROELECTRIC PROJECT WATER TEMPERATURE AND WATER QUALITY MODEL

The Clackamas River Hydroelectric Project is a multi-reservoir power generation facility located on the Clackamas River, a major tributary to the Willamette River, Oregon. The headwaters of the basin drain the high cascades slopes within the Mt. Hood National Forest, while the river mouth is located in the urban setting of Portland Oregon. PGE is seeking to relicense the project through a FERC alternative licensing process that is based on collaborative involvement of all stakeholders. Documentation of water quality and modeling the Project's effect on water quality is a prerequisite for Section 401 Water Quality Certification, administered through ODEQ.



EES Consulting was retained by Portland General Electric to develop and implement studies to assess project effects on water temperature and water quality within and downstream of the project area. Since ODEQ was in the process of establishing TMDLs for temperature in the Clackamas River, it was necessary to analyze the project's thermal loading contribution to downstream thermal regimes from cumulative effects of both project operation and non-project human activities. The CE-QUAL-W2 model was chosen to identify temperature, nutrient cycling, and primary production in the river in the presence and absence of the project. Modeling of project effects on nutrient cycling and algae growth are other key issues, as the Clackamas River serves as the water supply for several municipal areas. Specific tasks EES Consulting staff has performed included:

- Evaluation of water temperature/water quality models best suited to this application.
- Data collection at 45 sites for one year, model calibration, and CE-QUAL-W2 model application.
- Interpretation of model data on current project operation and alternative operational strategies.

Data were used to calibrate the two dimensional, hydrodynamic CE-QUAL-W2 models, for both reservoir and riverine sections. The water quality model was integrated with the project GIS, thereby providing a tool for integrated resource decision-making. Model scenarios included pre-project conditions, current operations and future alternative project operation scenarios. Modeling results demonstrated the project has a net cooling effect.