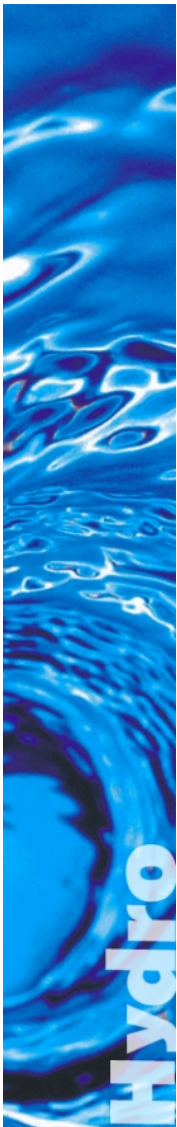




Potential and Known Environmental Concerns

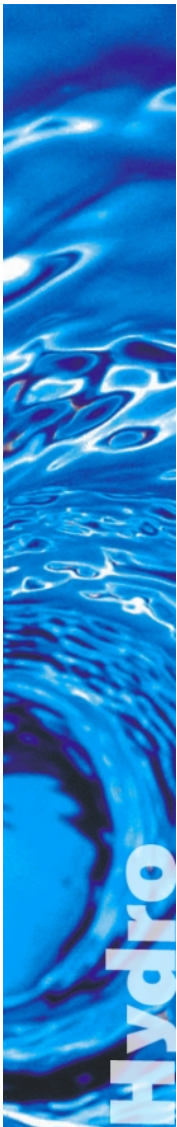
Low Impact Hydro at Existing Structures

Presentation at Hydrokinetic and Wave Energy Technologies
Technical and Environmental Issues Workshop
October 26-28, 2005



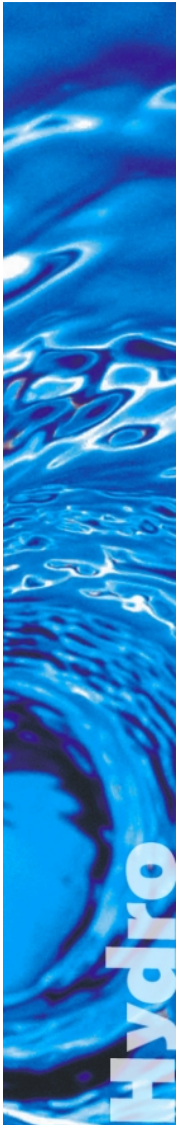
Topics

1. Natural Habitat (Fish mortality, mussels, vegetation, erosion)
2. Water Quality - Dissolved Oxygen
3. Potential for Oil Spillage
4. Hazards for Navigation and Recreational Vehicles
5. Cultural Aspects



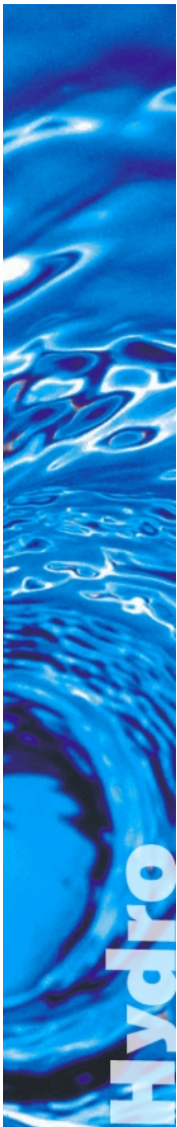
1. Natural Habitats

- **Fish Mortality & Fish Migration**
 - Site specific, dependent on existing fishery resources
 - Investigated through fish entrainment and mortality studies if required
- **Risk Mitigation Strategies**
 - Small trashrack spacing
 - Low turbine intake setting
 - Spillway and/or fishways to attract downstream fish migration
 - Behavioural deterrence and guidance systems



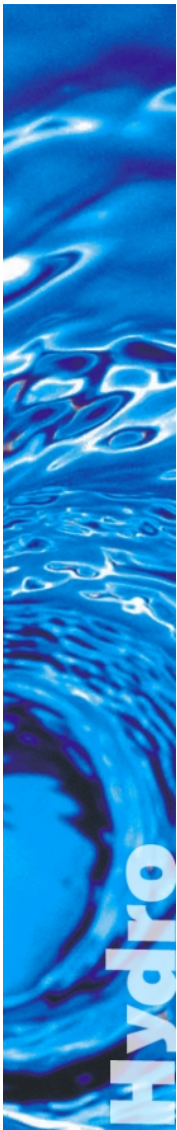
1. Natural Habitats (cont.)

- **Disturbance of vegetation, sediments**
 - If no significant change in river flows -> disturbance of sediments or erosion not an issue
 - Limited disturbance of riverbed and shoreline during construction (no major excavation works)
- **Endangered Species**
 - Site specific investigation needed
 - Usually not a major issue for hydropower at existing structures
- **Zebra Mussels**
 - Site specific phenomenon
 - Risk Mitigation: Non-metallic trash racks & monitoring



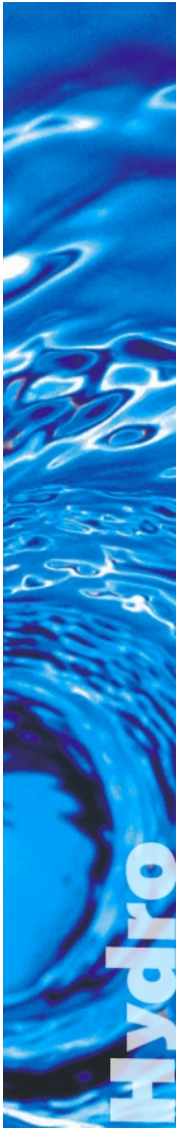
2. Water Quality - Dissolved Oxygen

- **Site specific issue**
- **Seasonal fluctuations**
 - Low DO concentrations during summer months
- **Risk Mitigation Strategies**
 - Spillway(s)
 - Air injection (Air bubbler systems)
- **Risk mitigation causes loss of power generation**



3. Potential for oil spillage

- **Main Potential Sources**
 - Bearing lubrication
 - Hydraulic power systems
 - Transformers
- **Risk Mitigation Strategies**
 - Oil containments
 - Biodegradable Oil (has application limits)
 - Oil-less designs



4. Hazards for Navigation and Recreational Vehicles

- **Main Issues**

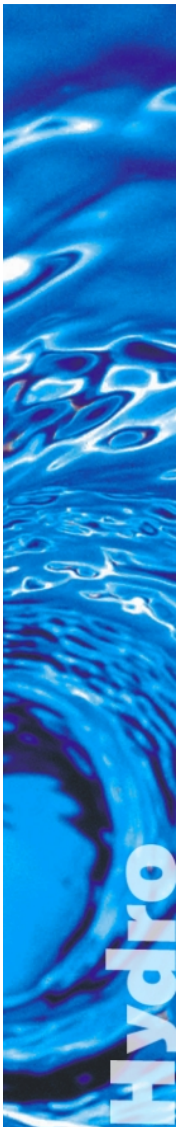
- Effects on Barge Traffic (Lock Approaches)
- Flow increase during load rejection
- Plant Intake Flow

- **Investigation Methods**

- Numerical and physical river flow models
- Site specific assessment needed

- **Risk Mitigation Strategies**

- Even flow distribution, location away from locks
- Quick shut-down of turbines during load rejection to minimize flow changes
- Security barriers



5. Cultural Aspects

- **Potential Issues**

- Building new power plants in historic areas
- Disturbance of archeological resources

- **Investigation Methods**

- Site specific historic review
- Interpretive Displays

- **Mitigation Strategies**

- Minimize number and size of overground structures (use of low-profile structures)
- Aesthetic and visually non-disruptive design

