



Overview of Metal Mining EEM Program and Activities at National EEM Office

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Environmental Effects Monitoring (EEM) Program

- Regulatory-based program through MMER
- Objective:
 - Determine effects in receiving aquatic ecosystems at each mine
 - Help determine the effectiveness of environmental protection measures in place at mines
- Collaborative program
 - EPS, ECS, Regions, DFO, Industry, ENGOs, environmental consultants

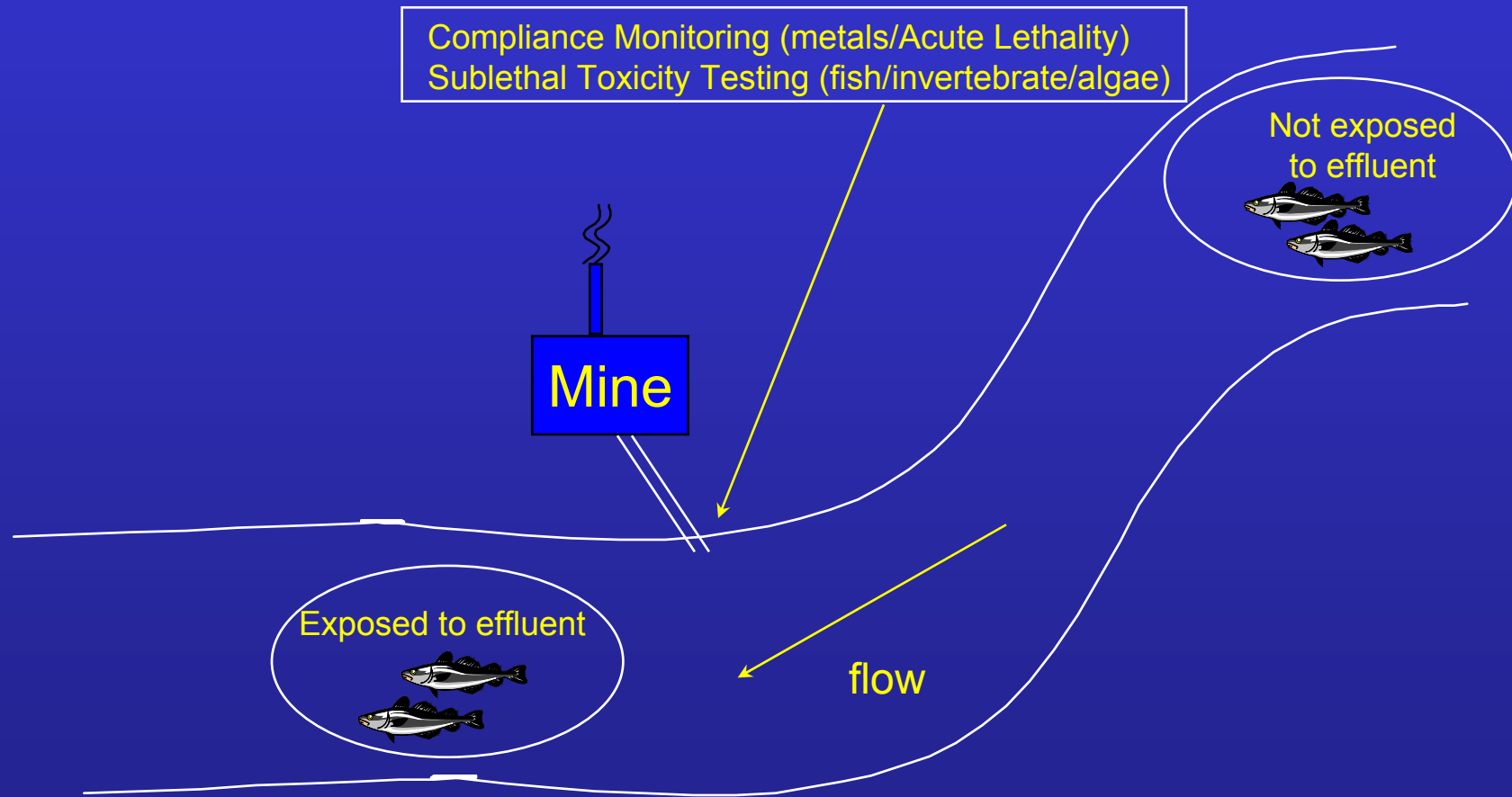


What is EEM?

- Iterative, scientific-based monitoring program
- 2-6 year sequence
 - monitoring - interpretation - reporting phases
- Tiered approach
 - frequency and type of monitoring dependent upon results from previous studies
- Flexible Tool
 - study designs can be adjusted to account for site-specific conditions
- Program requirements based on consensus agreement by the EEM Working Group



Measuring Effects in the Receiving Environment versus End-of-Pipe





EEM Answers:

- Are fish growing, reproducing and surviving normally?
- Is fish habitat being impacted – as determined through a benthic invertebrate survey?
- Are Canadian's ability to use fish being impacted (mercury in fish tissue)?



Part 1 - Effluent and Water Quality Monitoring

- Objectives:

- Monitor changes and trends
- Develop supporting data to help interpret biological monitoring results

- Consists of:

- Effluent characterization
- Sublethal toxicity testing
- Water Quality Monitoring



Part 1 - Effluent and Water Quality Monitoring

- **Effluent Characterization:**
 - conduct 4 times per calendar year
 - deleterious substances and pH
 - Al, Cd, Fe, Hg, Mo, NH₃, NO₃⁺, hardness, alkalinity
- **Sublethal Toxicity Testing:**
 - conduct twice per year for first 3 years
 - once per year thereafter
 - fish, invertebrate, algae and plant



Part 1 - Effluent and Water Quality Monitoring

• Water Quality Monitoring

- conduct 4 times per calendar year and during biological monitoring
- sample reference and exposure area
- parameters measured are same as effluent characterization, plus temperature, dissolved oxygen

• Submission of annual report



Part 2 - Biological Monitoring

- Objective:

- determine if there are effects
 - fish, fish habitat and fish usability
- when mine-related effects are found, determine magnitude, geographic extent and cause of effects



EEM Program Components: Biological Monitoring

- Fish Population Survey
 - Measures changes in survival, energy use (growth and reproduction), and energy storage (condition)
- Benthic Invertebrate Community Survey
 - Measures effects on fish habitat
 - Abundance, taxon richness, Simpson's index, Bray-Curtis index
 - Sediment monitoring for supporting information
- Fish Tissue Analysis
 - Mercury analysis required if mercury detected in effluent



Status

- **June 2003**
 - Effluent Characterization, Water Quality Monitoring, Sublethal Toxicity Testing commenced
- **December 2003**
 - First study designs and historical reports submitted
- **March 2004**
 - Effluent and Water Annual reports received
- **December 2004**
 - Mines that submitted historical reports will submit 1st EEM study design
- **June 2005/June 2006**
 - First EEM Interpretative reports will be submitted

Workshop on Possible Amendments to the

Metal Mining Effluent Regulations

Nov 3 & 4, 2004



EEM Program Partners

- **Regional EEM Co-ordinators**

- review study designs and interpretive reports, form Technical Advisory Panels, visit sites as necessary, conduct regional analysis, participate in National EEM Team to discuss study design and national consistency issues

- **National EEM Office**

- chairs National EEM Team, develops guidance documents, provides liaison between Regional EEM Coordinators, NWRI scientists and Science Committee, maintains national database, leads development of electronic reporting systems, conduct national analysis

- **EEM Science Committee**

- Ensures scientific evolution of the program, advises regional EEM coordinators on site specific issues

- **Technical Advisory Panels**

- EC, Provinces, NGO's, DFO, mining associations
- Review study designs, interpretive reports



Electronic Reporting

- National EEM Office leading development of an electronic reporting system that will be user-friendly
- Linking it with statistical analysis software that calculates all effect endpoints
- Development and status will be discussed in following presentation



Evolutionary...

- EEM program will evolve as more information becomes available
- Technical Guidance Document will be updated as necessary (likely after the review of the program)
- EEM allows flexibility to adapt to site specific issues
- To date, EEM requirements within MMER appear to be clear and effective (only minor suggested amendments)



Evolutionary....

- Environment Canada committed to reviewing all aspects of the EEM program after the first 3 years (2006)
- Adjustments will be considered based on experience gained and recommendations following this review