

# Guidance for Determining Follow-up Actions when Effects Have Been Identified in Environmental Effects Monitoring (EEM)

## 1. Introduction

The federal *Fisheries Act* promotes the proper management of fisheries, the conservation and protection of fish, the protection of fish habitat, and the prevention of aquatic pollution. Two examples of Regulations pursuant to the Act are the *Pulp and Paper Effluent Regulations* (PPER) and the *Metal Mining Liquid Effluent Regulations* (MMLER). The PPER requires industry to conduct Environmental Effects Monitoring (EEM). EEM is a sequential series of monitoring and interpretation cycles conducted to identify and evaluate any effects of effluents on fish, fish habitat, and the use of fisheries resources in the receiving water. Planned revisions to the MMLER will also require EEM to be conducted at metal mines. Information provided by EEM can be used to assess the adequacy of the Regulations in protecting fish, fish habitat, and the use of fisheries resources.

Once EEM studies have identified effluent-related effects and provided information on their magnitude, geographic extent, and possible causes, follow-up actions need to be determined. There is a continuum of possible follow-up actions, ranging from continuing EEM studies to enhanced monitoring to immediate mitigation of the effect.

This document was developed by Environment Canada, in consultation with Fisheries and Oceans Canada. It provides guidance to regulatory agencies, regulated facilities, and EEM practitioners for determining follow-up actions by discussing the factors that need to be considered, and to explain the roles and responsibilities of government, industry, and stakeholders in this process.

## 2. Effects Identified through EEM

To meet the objective of the EEM program, regulated facilities are required to:

- monitor fish species as an indicator of effects on fish;
- monitor benthic invertebrate communities as an indicator of effects on fish habitat; and
- conduct fish tissue contaminant analyses and tainting evaluations as indicators of effects on the use of fisheries resources.

In the EEM program, an effect is scientifically defined as a statistical difference in measurement endpoints for the indicators of effects on fish, fish habitat, or the use of fisheries resources between sites exposed to effluent and reference sites of similar characteristics that are not exposed to effluent (Environment Canada, 2000). Once an

effect is identified and is confirmed to have been caused by the regulated effluent, the EEM program requires the regulated industry to determine the magnitude, geographic extent, and possible cause of the effluent-related effect.

There is a need to differentiate between effects that compromise the sustainability of fisheries resources and those that do not. While effects identified in EEM may indicate that the facility has the potential to compromise the sustainability of fisheries resources at a specific site, not all effects will necessarily compromise present or future use of the fisheries resource.

Effects on the use of fisheries resources clearly compromise the present use of the fisheries resource and therefore are considered unacceptable by the federal government; immediate corrective action is required. On the other hand, effects on fish or fish habitat identified in EEM may not necessarily compromise the sustainability of the fisheries resource, and corrective action is not always needed in such cases.

It is difficult to develop national criteria specifying which effects on fish or fish habitat will require corrective action, due to the variety of effects and aquatic ecosystems and the diversity of social, economic, and technological factors that exist across the country. Therefore, the need for corrective action will be determined on a site-specific basis in consideration of these factors, as discussed below.

### **3. Key Factors to Be Considered in Determining Further Action**

In all cases where EEM has identified an effect, except those where the use of the fisheries resource is compromised, the decision on what follow-up action is required will be based on a site-specific review of ecological, social, economic, and technological considerations.

#### ***3.1 Ecological Considerations***

In the EEM program, effects are considered ecologically significant if they impact on the sustainable use of the fisheries resource. A weight-of-evidence approach will be used to evaluate the ecological significance of effects measured in EEM. Aspects to consider include:

- the magnitude of the effect measured (i.e., the difference in the measurement endpoint between sites exposed to effluent and reference sites);
- the distance between the site where an effect has been measured and the point of discharge (i.e., the geographic extent of the effect);
- the identity and number of endpoints affected, the relationship between the endpoints, and whether fish and fish habitat exhibit effects;
- for effects on fish, the number, identity, and life stages of species affected — effects that appear in multiple species, in species supporting highly valued commercial,

recreational, or aboriginal fisheries, or at critical life stages may be of greater ecological significance;

- the temporal trend associated with the effect — a temporal trend indicating that the conditions are getting worse would be considered more significant than no temporal trend or a trend indicating an improvement in conditions over time;
- the duration of the effect — in some cases, an effect may have existed for a long time with no discernible change to species diversity, reproduction, growth, or population;
- the sensitivity and importance of the habitat — effects in areas that are critical to particular life stages or species may be more ecologically significant; and
- the cumulative nature of the effect — the contributions of other developments, discharges, or sources may influence the evaluation of the ecological significance of the effect.

In recognition that the determination of ecological significance is controversial (Keough and Mapstone, 1995; Mapstone, 1995; Elliott, 1996; Lowell, 1997), Environment Canada will continue to develop guidance on how to determine the ecological significance of effects as data from EEM programs and scientific research become available.

### ***3.2 Social Considerations***

Stakeholders, including users of the fisheries resource, need to be informed and consulted about the changes that are occurring in their local environment. Through consultation, the magnitude and geographical extent of the effects, changes in the effects over time, and the significance of the effects to local fisheries need to be clearly articulated. Information available regarding economic considerations, such as the cost of corrective actions and the profitability of the operation, will also be presented.

In consulting with local stakeholders, a wide range of views will likely be heard. An effect may be of concern to a majority of local stakeholders even though it may not be considered ecologically significant. A weight-of-evidence approach will be used in determining how acceptable the effect is to local stakeholders. The consultation must be balanced, and all viewpoints must be heard and considered. A number of mechanisms and guidance documents for consultation are available (e.g., Environment Canada, 1994, 2000; Institute for Research on Environment and Economy, 1994; Canadian Standards Association, 1996). The choice of mechanism to be used will be determined site specifically based on the needs and interests of the local stakeholders.

### ***3.3 Economic and Technological Considerations***

An evaluation of economic and technological considerations will include a review of technologies available to alleviate the effects as well as the costs associated with implementing those technologies. The level of detail required for this evaluation will be

determined site specifically and will be influenced by both the ecological and social considerations outlined above. In some cases, the effect may not be considered significant from an ecological or social perspective; however, in recognition that effects identified in EEM have the potential to compromise the sustainability of fisheries resources at a specific site, measures to alleviate the effect may be undertaken because they may be implemented easily and cost effectively. In other cases, engineering studies to evaluate options for mitigation of effects may be costly and not appropriate for the effect identified.

## **4. Roles and Responsibilities**

### ***4.1 Federal, Provincial, and Territorial Governments***

It is the responsibility of Environment Canada, in consultation with Fisheries and Oceans Canada, to determine what follow-up actions will be taken when effects are identified in the EEM program. This determination will be made in consideration of the information described in this document and in consideration of federal obligations under the *Fisheries Act*. The continuum of possible actions ranges from continuing to meet the EEM requirements to altered monitoring or research to immediate mitigation of the effect. Where corrective or mitigative action is required, the government will determine the level of environmental protection required, and industry will be responsible for implementing the methodologies required to achieve that level of protection.

Mechanisms for determining further actions will be open, transparent, cooperative, and iterative. The mechanisms will be consistent with Environment Canada's policy on environmental performance agreements. This policy, currently available for public comment, is a supportive policy framework to guide participation in non-legislative initiatives.

Discussions will include the facility that is causing the effect, Environment Canada, Fisheries and Oceans Canada, and representatives from other regulatory agencies, including provincial or territorial governments; they may also include local stakeholders. Through this mechanism, regulatory agencies will make coordinated decisions on the course of action.

As a first step, Environment Canada will coordinate a meeting to summarize what is known about the effect and identify further information needs. Discussion will include the identification of any additional ecological, social, economic, or technological information needed by the federal government for determining the overall approach for follow-up action. The government will provide a rationale for additional information that is needed to determine the specifics and time frame of follow-up action.

A cooperative, iterative approach is preferred to address situations where EEM has identified effects. However, this does not preclude the use of regulatory instruments by the federal government or any other regulatory agency. Regulatory instruments may be used in conjunction with this approach or when the cooperative approach does not achieve suitable progress. Environment Canada will also use site-specific and regional evaluations to conduct a national assessment of the adequacy of the Regulations for protecting fish, fish habitat, and the use of fisheries resources.

#### **4.2 Regulated Facility**

The facility will provide the information to determine what further actions will be required in response to effects identified in EEM, including information about the ecological, social, economic, and technological implications of further actions. The facility is responsible for implementing the specific abatement measures required to alleviate the effects, when remediation is identified as the further action. In this situation, the government will determine the level of environmental protection required, and industry will be responsible for implementing the methodologies required to achieve that level of protection.

### **5. Summary**

The federal EEM program requires industry to conduct studies with the objective of evaluating the effects of effluents on fish, fish habitat, and the use of fisheries resources. After the EEM program has identified the magnitude, geographic extent, and cause of effects, a range of follow-up actions may be required. This document outlines the factors to consider in determining the follow-up actions. Ecological, social, economic, and technological factors will be evaluated in a site-specific manner.

A cooperative approach is envisaged through a consultation with environmental agencies, industry, and stakeholders. Regulatory instruments may be used in conjunction with this approach. The government will determine the level of environmental protection required, and the facility will be responsible for implementing the specific abatement measures.

### **References**

Canadian Standards Association, 1996. A Guide to Public Involvement, CSA Z764-96. Etobicoke, Ontario.

Elliott, M. 1996. The derivation and value of ecological quality standards and objectives. *Marine Pollution Bulletin* 32:762-763.

Environment Canada. 1994. Working in Multistakeholder Processes. Stakeholder Relations Branch. Hull, Quebec.

Environment Canada. 2000. Guidance for Metal Mining Aquatic Environmental Effects Monitoring (in press).

Institute for Research on Environment and Economy. 1994. Community Empowerment in Ecosystem Management. University of Ottawa, Ottawa.

Keough, M.J. and B.D. Mapstone. 1995. Protocols for Designing Marine Ecological Monitoring Programs Associated with BEK Mills. Technical Report Series No. 11. National Pulp Mills Research Program, Commonwealth Scientific and Industrial Research Organization (CSIRO), Canberra. 177 pp.

Lowell, R.B. 1997. Discussion Paper on Critical Effect Size Guidelines for EEM Using Benthic Invertebrate Communities. Report to the Environmental Effects Monitoring Program. Environment Canada, Ottawa.

Mapstone, B.D. 1995. Scalable decision rules for environmental impact studies: effect size, Type I and Type II errors. *Ecological Applications* 5:401-410.