Part 4. Broader Considerations in AEM Planning

4-1 Discussion

Challenges to Implementing an AEM Process

The goals and objectives of the CRCIP have been formulated in the context of economic and environmental sustainability. These goals and objectives will be translated into management actions applied to a large and complex environmental system–the lower river and estuary. This combination of desired sustainability, large scales, and system complexity justifies the use of an AEM approach to management and decision-making. In fact, it is difficult to think of an alternative management approach for this large-scale river and estuary ecosystem. However, practical barriers to making the AEM Process operational have emerged in previous applications of this approach, especially active AEM (Walters 1997). Hopefully, these barriers might not arise in management and decision-making regarding channel improvement. However, plans should be developed in anticipation of these potential pitfalls to effectively executing AEM.

Walters (1997) identified the following four challenges in putting an AEM Process into practice:

- Modeling in support of AEM is often replaced by never-ending model development and modeling exercises with the presumption that detailed modeling replace field experimentation in defining best management practices. There are also technical issues (e.g., accuracy, reliability) associated with the development and use of models in AEM. The most difficult technical issue may be the cross-scale linkages between physical (hydrodynamic), chemical (water quality), and ecological models that are necessary in using the models to design and evaluate management alternatives.

- Using active AEM (i.e., system manipulations as large-scale experiments) has been often viewed as excessively expensive or ecologically risky, compared to traditional management approaches. Costly modeling studies may be needed to design the management manipulation. Follow-on monitoring programs add to the costs of active AEM. Manipulations may result in economic losses to economic interests (e.g., lost revenues from reduced navigation). The management manipulation might result in unanticipated effects on non-target populations or resources with unacceptable consequences.

- People in management bureaucracies often oppose experimental management policies (e.g., AEM) in order to protect self-interests and retain the status quo. Complex institutional settings involving multiple agencies with sometimes-overlapping responsibilities and legal mandates can lead to interference in operations and resistance to proposed changes in management policy.

- There are value conflicts within the community of ecological (e.g., preservation) and environmental (e.g., conservation) management interests. In some cases, these conflicts can run deeper than more traditional conflicts between ecological and industrial (e.g., power production, navigation) values.

In addition to the challenges identified by Walters (1997), the current planning and guidance procedures (USACOE 1990) that have directed USACOE's activities in the past may require modifications that facilitate the practice of AEM. For example, identification of a "best" management Plan (i.e., National Economic Development Plan) seems to run counter to the basic philosophy of AEM, wherein the best current Plan might well change in the future. Identifying a best Plan might have to be replaced by identifying or describing the most effective process for performing AEM. Yet in the context of AEM, even the best AEM Process defined *a priori* as the result of a feasibility study might change during the course of managing. Therefore, the potential incompatibility of current planning and guidance with directives to embrace sustainability and practice AEM might require modifications to such guidance (Martin and Stakhiv 1999).

Surmounting Barriers to AEM

It is not easy to anticipate the extent to which the previously described barriers will influence the implementation of AEM in the context of the Channel Improvement Project. Several important steps have been undertaken that might surmount these barriers and facilitate the effective use of AEM in managing the lower river and estuary:

A comprehensive conceptual environmental model relevant to managing salmonids in the lower river and estuary has been developed. The model has been reviewed and shared with the community of stakeholders. The model has been used to guide the identification and selection of management goals and objectives consistent with the adaptive management directives that continue to shape the Channel Improvement Project.

A long-standing and continuing relationship between the USACOE and key partners provides a mechanism for sharing information, exchanging ideas, identifying concerns, and creating solutions in the context of AEM and sustainability for the Project.

Extensive peer review can be established to evaluate the technical aspects of sustainability goals and objectives, as well as the available models, data, and other tools needed to practice AEM in the context of the lower river and estuary.

Experience can accumulate in the use of complex hydrodynamic and ecological models in assessing ecological risks posed by channel deepening. The important cross-linkages among these models have been worked through in other applications (e.g., UMRNFS) and the models appear amenable for applications in AEM, as well as for continued evaluation of risks posed by physical, chemical, and biological alterations to complex lotic systems, including the LCR.

4-2 A Comprehensive, Integrated AEM Plan

The proposed AEM Plan to support the Channel Improvement Project was designed to focus initially on potential physical-chemical impacts of channel deepening. At the same time, it is recognized that these attributes, while of fundamental environmental importance, represent a subset of the components of a more comprehensive conceptual model of the lower river and estuary (Appendix A). This conceptual model conveys a direct sense of the ecological and environmental complexity in describing, understanding, and managing salmonid survival, growth and ocean entry. It appears unlikely that any single AEM Process undertaken by an individual resource agency or stakeholder could meaningfully progress towards realization of these challenging objectives. It seems more realistic that cooperation among ongoing (and future) AEM Projects (e.g., LCREP) will be required to achieve the desired goals concerning recovery and sustainability of the valued salmonid resources in the LCR and estuary.

The proposed Channel Improvement AEM Plan can contribute valuably to the future development and integration of a comprehensive adaptive management plan for the LCR and estuary. Data and information generated by the EEA, as well as research results developed during the course of Project management, can be shared among other agencies and stakeholder groups involved in other AEM Projects. The Channel Improvement Project AEM monitoring results, when integrated with other adaptive management programs, can help construct a more comprehensive picture concerning the structure and dynamics of the river and estuary ecosystem.

Data developed as a result of the Channel Improvement AEM Process may prove useful in facilitating the implementation of programs directed at recovery of listed salmonids in the estuary. For example, the research, monitoring, and evaluation Plan for the Columbia River estuary and plume (EP-RME Plan), currently under development, also emphasizes an adaptive management framework in relation to salmon habitat restoration (Johnson et al. 2004). Overlap in performance measures (e.g., accretion rates, water velocity, water elevation, water quality) between the EP-RME Plan and the Channel Improvement AEM Plan indicate an opportunity for useful collaboration towards achieving goals and objectives consistent with a comprehensive management Plan for the estuary.

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LIST OF ACRONYMS & ABBREVIATIONS

AEL	adult equivalent losses
AEM	Adaptive Environmental Management
AFEP	Anadromous Fish Evaluation Program
AMT	Adaptive Management Team
BA	biological assessment
BO	biological opinion
CRCIP	Columbia River Channel Improvement Project
CRITFC	Columbia River Inter-tribal Fish Commission
CRM	Columbia River mile
CWA	Clean Water Act
cy	cubic yards
DLCD	Department of Land Conservation and Development
EEA	ecosystem evaluation actions
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	evolutionary significant units
ETM	estuary turbidity maximum
FR	Federal Register
FSIFR	Final Supplemental Integrated Feasibility Report
LCR	Lower Columbia River
LCREP	Lower Columbia River Estuary Partnership
MA	monitoring actions
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
ODEQ	Oregon Department of Environmental Quality
psu	practical salinity units
ROD	record of decision
SEF	Sediment Evaluation Framework
USACOE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WDOE	Washington Department of Ecology