

Draft Guidelines for Aquatic Effects Monitoring Program

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DEFINITIONS AND ACRONYMS

TERM	DEFINITION
Action level	A magnitude of environmental change which, if measured in an aquatic effects monitoring program, triggers a management action.
Adaptive management	A systematic, rigorous approach for deliberately learning from management actions with the intent to improve management policy or practice.
AEMP	Aquatic Effects Monitoring Program.
Benchmark	Contaminant concentration levels above which biological or physiological effects could potentially be manifested in sensitive organisms.
Boards	Land and Water Boards of the Mackenzie Valley, as mandated by the MVRMA.
CCME	Canadian Council of Ministers of the Environment.
Effluent Quality Criteria (EQC)	Numerical or narrative limits on the quality or quantity of waste that is authorized for disposal to the receiving environment.
Engagement	The communication and outreach activities a proponent is required, by the Boards, to undertake with affected communities and Indigenous organizations/governments prior to and during the operation of a project, including closure and reclamation phases.
GLWB	Gwich'in Land and Water Board.
INAC	Indigenous and Northern Affairs Canada.
Mackenzie Valley	The part of the Northwest Territories bounded on the south by the 60 th parallel of latitude, on the west by the Yukon Territory, on the north by the Inuvialuit Settlement Region as defined in the Agreement given effect by the <i>Western Arctic (Inuvialuit) Claims Settlement Act</i> , and on the east by the Nunavut Settlement Area as defined in the <i>Nunavut Land Claims Agreement Act</i> , but does not include Wood Buffalo National Park.
MVEIRB	Mackenzie Valley Environmental Impact Review Board.
MVLWB	Mackenzie Valley Land and Water Board.
MVRMA	<i>Mackenzie Valley Resource Management Act</i> .

NWT	Northwest Territories.
Project	Any development that requires a water licence or land use permit.
Proponent	Applicants for, or holder of, water licences and land use permits.
Receiving environment	The natural environment that, directly or indirectly, receives any deposit of waste (as defined in the <i>Waters Act</i> and the MVRMA) from a project.
Regulatory process	The process that begins with the submission of a water licence application and can include an environmental assessment or impact review (conducted by MVEIRB) as well as licensing (conducted by a Land and Water Board).
Response framework	A systematic approach to responding to the results of an aquatic effects monitoring program through adaptive management actions.
Response plan	Document describing the actions that will be taken by a proponent in response to an Action Level exceedance.
Significance threshold	A limit of environmental change which, if reached, would likely result in significant adverse effects.
Surveillance Network Program (SNP)	Monitoring at key locations on the project site, often to ensure compliance with specific water licence conditions (e.g., end-of-pipe discharge).
Traditional Knowledge (TK)	A cumulative, collective body of knowledge, experience, and values built up by a group of people through generations of living in close contact with nature. Builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual, and political change.
Waste	As defined ¹ by Section 2 of the <i>Waters Act</i> and section 51 of the MVRMA.

¹ “Waste” is defined (in the *Waters Act* and the MVRMA) as:

- (a) a substance that, if added to water, would degrade, or alter, or form part of a process of degradation or alteration of the quality of the water to an extent that is detrimental to its use by people or by any animal, fish, or plant, or
- (b) water that contains a substance in such a quantity or concentration, or that has been so treated, processed, or changed, by heat or other means, that it would, if added to any other water, degrade, or alter or form part of a process of degradation or alteration of the quality of that water to the extent described in paragraph (a), and, without limiting the generality of the foregoing, includes:
 - (c) a substance or water that, for the purposes of the Canada Water Act, is deemed to be Waste;
 - (d) a substance or class of substances prescribed by regulations made under subparagraph 63(1)(b)(i);

Introduction to the Guidelines

In the Mackenzie Valley, the use of water and the direct or indirect deposit of waste into water is regulated through the issuance of water licences. Responsibilities associated with the issuance, administration, and enforcement of water licences are shared by the Land and Water Boards of the Mackenzie Valley (the Boards) and the Government of the Northwest Territories (GNWT). In recognition of their collective responsibility for water licensing, the Boards and the GNWT have collaborated in the development of these *Guidelines for Aquatic Effects Monitoring Programs* (the Guidelines).

As described in the Boards' *Water and Effluent Quality Management Policy*² (2011, the Policy), the Boards set water licence conditions with the dual objectives of protecting water uses and minimizing the amount of waste deposited by a project. Water licence conditions are set based on the information in the proponent's project description including predictions of waste quantity, quality, source, and pathway to the receiving environment; predictions of potential environmental effects of the project; and, any measures or limits of acceptable environmental change defined during the regulatory process. In recognition of the uncertainty inherent in any predictions, the Boards require proponents to perform aquatic effects monitoring in the project's receiving environment to directly measure the type and extent of project-related effects during construction, operation, and closure.

Aquatic Effects Monitoring Programs (AEMPs) are required to include a Response Framework that define levels of environmental change (i.e., Action Levels) that, if exceeded, will trigger management responses by the proponent or the Boards to ensure that project-related effects on the environment remain within acceptable limits.

Purpose

The overall purpose of these Guidelines is to clarify the role of AEMPs in water licensing and to describe the expectations of the Boards and the GNWT for AEMP design, implementation, and adaptive management. Specifically, these Guidelines:

- Describe the purpose of aquatic effects monitoring in regulating development projects;
- Describe the key regulatory requirements related to AEMPs;
- Describe the expected process for how an AEMP, including a Response Framework, is developed, and refined or updated;
- Provide guidance on the optimal timing of AEMP development within the regulatory process;
- Provide recommended approaches for effective engagement during the development and implementation of AEMPs; and

(e) water that contains any substance or class of substances in a quantity or concentration that is equal to or greater than a quantity or concentration prescribed in respect of that substance or class of substances by regulations made under subparagraph 63(1)(b)(ii), and;

(f) water that has been subjected to a treatment, process or change prescribed by regulations made under subparagraph 63(1)(b)(iii).

² See MVLWB (www.mvlwb.com) 'Policies and Guidelines' webpage for the [Water and Effluent Quality Management Policy](#) (2011).

- Provide a template for an AEMP Design Plan.

Note that these Guidelines supersede the Indigenous and Northern Affairs Canada's Guidelines for the Design and Implementation of Aquatic Effects Monitoring Programs for Development Projects in the Northwest Territories³ (the INAC Guidelines) that were published in 2009. Nonetheless, the INAC Guidelines provide valuable technical advice and information for proponents on the development of AEMPs and relevant sections of the INAC Guidelines are referenced in this document.

Authority

The Boards have the authority to develop and implement guidelines under sections 65, 102, and 106 of the Mackenzie Valley Resources Management Act (MVRMA). The Boards' authority to require AEMPs in water licences comes from subsection 27(1) of the Waters Act⁴.

How These Guidelines Were Developed

The content of these Guidelines is based on the best practices developed by the Boards and the GNWT, as well as several guideline and policy documents published over the past several years including:

- The NWT Water Stewardship Strategy⁵ (2010) and Action Plan⁶ (2016);
- Indigenous and Northern Affairs Canada's *Guidelines for the Design and Implementation of Aquatic Effects Monitoring Programs for Development Projects in the Northwest Territories*⁷ (2009);
- The Wek'èèzhii Land and Water Board's *Draft Guidelines for Adaptive Management - A Response Framework for Aquatic Effects Monitoring*⁷ (2010);
- The MVLWB's *Water and Effluent Quality Management Policy*⁷ (2011), *Engagement and Consultation Policy* (2013), and *Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits*⁷ (2013);
- The MVLWB/GNWT's *Guidelines for Effluent Mixing Zones*⁷ (2017).

Application

This document will be applied by the GNWT and Boards in accordance with their respective mandates and responsibilities. The Guidelines will be applied by the following Boards operating under the MVRMA:

- Mackenzie Valley Land and Water Board
- Gwich'in Land and Water Board
- Sahtu Land and Water Board

³ See MVLWB (www.mvlwb.com) 'Policies and Guidelines' webpage.

⁴ Subsection 27(1) of the *Waters Act* (for projects on territorial lands) and subsection 72.04(1) of the *Mackenzie Valley Resources Management Act* (for projects on federal lands) states that a Board may include in a licence any conditions "that it considers appropriate, including, but not limited to... (d) conditions relating to studies to be undertaken, works to be constructed, plans to be submitted, and monitoring programs to be undertaken..."

⁵ GNWT (2010) [Northern Voices, Northern Waters. NWT Water Stewardship Strategy](#).

⁶ GNWT (2016) [NWT Water Stewardship Strategy: A Plan for Action 2016-2020](#).

⁷ See MVLWB (www.mvlwb.com) 'Policies and Guidelines' webpage for the listed documents.

- Wek'èezhii Land and Water Board

AEMPs will be required for mining/milling and oil/gas production undertakings that require a Type “A” water licence as defined in the *Waters Regulations*⁸. AEMPs may also be required for other undertakings based on the specific project activities. The Guidelines apply to all new applications and submissions made to a Board after the effective date. It may also apply to existing licences, depending on submissions made in relation to those licences. In all cases, AEMP requirements will be set by the Boards based on the specific project description and the evidence presented during a regulatory process.

Monitoring and Performance Measurement for these Guidelines

Mechanisms will be required to monitor and measure performance and to evaluate the effectiveness of the Guidelines. In accordance with the principles of a management systems approach (e.g., plan-do-check-act), the Boards and the GNWT will develop a performance measurement framework. The Guidelines will be reviewed and amended as necessary within that framework. The performance measurement framework will also describe how affected parties, industry, and government will be involved in the review process.

Structure of Document

There are three parts to these Guidelines and one Appendix:

1: AEMP Requirements in the Mackenzie Valley

This Part of the Guidelines describes the role of AEMPs in the regulation of development projects. Part 1 also provides details of the documents proponents will need to submit both with their water licence application and during the term of a water licence.

2: Recommended Approaches to AEMP Design and Implementation

This Part of the Guidelines describes approaches to AEMP design and implementation that, based on the collective experience of the Boards and the GNWT, will greatly aid proponents in meeting the Boards’ and affected parties’ expectations. Specific recommendations for engagement during AEMP design and implementation are also provided in Part 2.

3: Development of a Response Framework for Aquatic Effects Monitoring

This Part of the Guidelines provides a detailed description of how to design and implement a Response Framework. The Response Framework will be documented within the AEMP Design Plan.

Appendix 1: Template for AEMP Design Plan

This appendix provides an annotated template that describes the minimum requirements for an AEMP Design Plan. The Boards are willing to consider different formats for each AEMP Design Plan if the proponent provides a clear rationale for the change or deviation. The Design Plan must also meet AEMP objectives and best professional standards for monitoring.

⁸ See Schedules D and E of the [Waters Regulations](#) R-019-2014 (for projects on territorial lands) and Schedules IV and V of the [Mackenzie Valley Federal Areas Waters Regulations](#), SOR/93-303 (for projects on federal lands).

1. AEMP Requirements for Water Licences in the Mackenzie Valley

Aquatic Effect Monitoring Programs (AEMPs) are more than just a plan for monitoring. In a regulatory context, AEMPs encompass monitoring, analysis, reporting, and responding to the results of monitoring. Water licences for projects that require an AEMP will contain a series of conditions that, collectively, allow the Board to adaptively manage a project in a formal, structured, and systematic manner based on monitoring results.

This part of the Guidelines describes the role of AEMPs in the regulation of development projects and provides details on the documents that proponents will be required to submit, both as part of their water licence application and during the term of the licence. Section 1 provides a brief introduction to AEMPs and what type of projects may require them. Section 2 outlines how AEMPs should be developed and implemented, and Section 3 provides detail on each of the required regulatory submissions related to AEMPs.

1.1 Introduction to AEMPs

Water licences monitoring requirements reflect the scale of a project. For small projects, only water use measurements may be necessary, while larger, more complex projects may require extensive monitoring on both the project site and within the receiving environment. As described in the MVLWB's Policy, there are three basic ways that monitoring is incorporated into a water licence:

- Management Plans – monitoring required under specific management plans (e.g., for facilities or processes that use water or generate waste).
- Surveillance Network Program (SNP) – monitoring at key locations on the project site, often to ensure compliance with specific water licence conditions (e.g., end-of-pipe discharge).
- Aquatic Effects Monitoring Programs (AEMPs) – monitoring for project-related effects in the aquatic environment.

The first two types of monitoring usually occur on or very near the project site; these programs generally provide information on the quantity and quality of water used or waste generated, and discharged to the environment. In contrast, monitoring conducted under an AEMP occurs in the wider environment that has the potential to receive waste from a project either directly or indirectly. AEMPs are meant to monitor project-related effects on the aquatic ecosystem including, for example, effects to water quality and/or quantity, aquatic habitats, and aquatic life in the receiving environment.

1.1.1 *What kind of Projects need an AEMP?*

An AEMP may be required for any project or undertaking where a change or effect to the aquatic environment is reasonably expected. AEMPs are often required of projects which directly deposit waste to the receiving environment through, for example, an effluent discharge. However, AEMPs may also be considered for projects with indirect deposits of waste such as the transport of project-related contaminants to receiving waters through seepage, run-off, groundwater, or air.

AEMPs are required for mining/milling and oil/gas production undertakings that require a Type "A" water

licence as defined in the *Waters Regulations*. AEMPs may also be required for other undertakings based on the specific project activities. For example, an AEMP may be required for projects with Type “B” water licences, such as advanced mineral or oil/gas exploration projects. In all cases, the requirement for an AEMP for any specific project is at the discretion of the Boards and will be based on the evidence presented in individual water licence proceedings.

Note that an AEMP may be required even for projects that have mandatory monitoring requirements required by other regulators (e.g., under the *Metal Mining Effluent Regulations*). In these cases, it may be possible to integrate monitoring requirements to minimize duplication of effort. See Section 1.3.4 for more information on this topic.

1.1.2 How are AEMP Results Used to Regulate a Project?

The collection and evaluation of monitoring data plays a critical role in the adaptive management of a project by proponents and by the Boards. Section 7.4 of the Policy states:

“While selecting the best possible approach to water and effluent quality management is very important, the use of adaptive management acknowledges that it can be difficult to predict all the effects of projects and developments on water resources. As a result, adaptive management involves monitoring the effects of actions and, where necessary, adjusting actions based on the monitoring results.”

Prior to the construction of a project, water licence conditions are based on predictions of what waste will be generated and released, how mitigation measures will perform, and how the receiving environment may be affected by the project. Although proponents are required to make all reasonable efforts to ensure the accuracy of their predictions (e.g., through baseline data collection, modelling, research etc.), uncertainty always remains; monitoring requirements are, therefore, set in water licences so that changes to the aquatic environment can be detected and assessed against impact predictions as the project goes ahead as well as following closure.

Evaluations of monitoring data collected from an approved AEMP are used by parties and the Boards to answer the following types of questions:

- How do measured environmental effects compare to initial predictions?
- Are project-related environmental effects currently within acceptable limits as defined by the regulatory process?
- Are there trends in measured environmental effects that indicate that significant adverse impacts are possible in the future?
- In general, are the water licence conditions working as intended to meet the Boards’ Policy objectives of protecting water uses and minimizing waste?

Depending on the answers to these questions, in conjunction with other data from on-site monitoring (e.g., from SNPs), additional studies, implementation of additional mitigations, or other adaptive management actions from the proponent or the Board may be deemed necessary.

1.1.3 What specific objectives does an AEMP need to meet?

AEMPs must be designed and implemented to meet the following objectives, as well as any additional objectives included in a water licence:

- 1) Determine the short and long-term effects of a project on the aquatic receiving environment.

AEMPs are meant to determine project-related effects on the entire aquatic ecosystem of the receiving environment. Depending on the size and scale of the predicted project effects, this may require AEMPs to include monitoring of water quality/quantity/flow, sediment quality, plankton, benthic invertebrates, and/or fish. In this way, AEMPs can assess change and potential impacts in an integrated way. For example, even though predictions may show that concentrations of individual contaminants may not exceed guideline values, there is currently no way to model the additive effect of several concurrent contaminants on aquatic life. By monitoring effects to water quality as well as fish food (i.e., plankton, benthic) and fish health, assumptions about the cumulative impact of the simultaneous increase in contaminant concentrations can be better understood. In addition to being able to detect short-term or temporary effects to the receiving environment, an AEMP must also be designed so that it can detect trends that might lead to adverse environmental effects in the future. The AEMP should also be designed to determine the spatial extent of effects.

- 2) Test predictions from the regulatory process regarding the impacts of a project on the receiving environment

Proposed projects can proceed to licensing if there is sufficient evidence that the project is unlikely to cause significant adverse impacts to the environment with or without mitigations to minimize such effects. The potential for a project to cause adverse impacts is first assessed through a preliminary screening and the project may be subject to an environmental assessment or impact review conducted by the Mackenzie Valley Environmental Impact Review Board (MVEIRB). The final decisions about whether to allow a project to proceed, and under what conditions it can proceed, are largely based on the predictions of project-related effects developed by the proponent and reviewed by all parties. An AEMP, therefore, must be designed so that it may test the accuracy of those predictions during each phase of the project including construction, operation, and closure.

- 3) Provide data that can be used to assess cumulative impact predictions

An important consideration⁹ in the regulatory process is the impact of cumulative effects of a project in combination with other developments. The AEMP should be designed to collect the data necessary to test any predictions of cumulative effects that were made during the environmental assessment. The Boards may require proponents to utilize testing methods or testing parameters that are optimal for use in regional cumulative effects studies and that allow for meaningful comparisons of AEMP results from different projects.

⁹ E.g., see Section 117(2)(a) of the MVRMA

- 4) Assess the effectiveness of mitigation measures and, if necessary, identify the need for additional mitigation measures to reduce or eliminate project-related effects

During a regulatory process, mitigation measures may be imposed on a project with the goal of minimizing or avoiding the potential for significant adverse impacts. Environmental assessment measures and/or water licence conditions may be based on predictions of mitigation effectiveness for a given project; these predictions must be verified through monitoring. If the mitigations are not working as intended and unacceptable environmental effects are measured in an AEMP, then additional mitigation measures will need to be identified and implemented by the proponent during the term of the water licence. Additional mitigations may also be imposed in the water licence if AEMP results indicate that the Boards' Policy objectives of minimizing waste deposits and meeting water quality objectives are not being met.

- 5) Provide an early warning system to prevent or avoid adverse environmental impacts

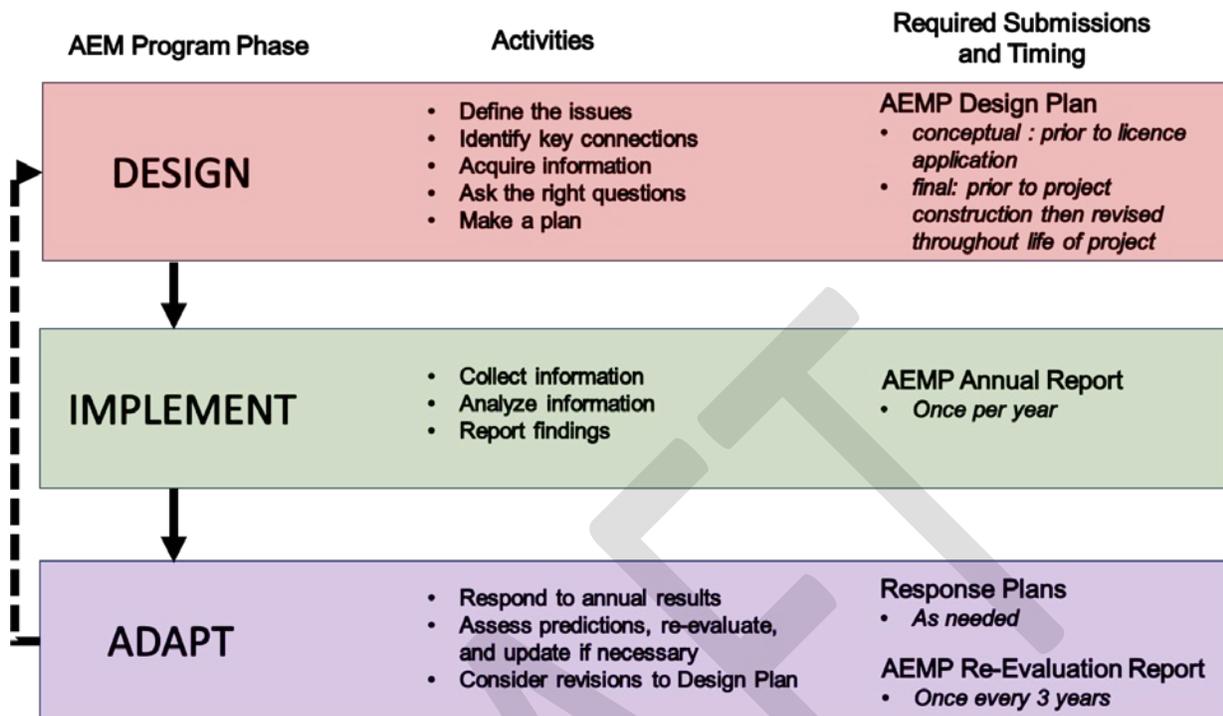
The Response Framework, described in Part 3 of the Guidelines, provides a way of formally linking aquatic monitoring results to adaptive management actions. Tiered Action Levels are set in the AEMP to define levels of measured environmental change which, if exceeded, warrants a response as outlined in a Response Plan. The Response to an exceedance is based on the degree of effect and is appropriately scaled to address the level of exceedance. Action Levels must be set conservatively enough to act as an early warning system and to ensure that project-related effects remain within acceptable limits.

1.2 Regulatory AEMP Submissions and Timing

An AEMP is developed and implemented in three phases: design, implement, and adapt. Figure 1 outlines the activities that proponents will carry out during each phase of the AEMP and lists the documents proponents will need to prepare and submit to the Boards either with the water licence application or during the term of the water licence. Specific requirements for each AEMP-related submission will be provided in a project's water licence.

Note that while this Section and Section 1.3 of the Guidelines focus on the "what" and "when" of AEMP development and implementation, recommended approaches for how to carry out the activities for each phase are provided in Part 2 of the Guidelines.

Figure 1: Summary of Activities and Required Submissions for Phases of AEMP



1.2.1 Design Phase

As noted in Figure 1, the activities undertaken during the AEMP design phase culminate in the preparation of an AEMP Design Plan that meets the objectives described in Section 1.1.3. The AEMP Design Plan documents the sampling and analysis plan that will be used to monitor project-related aquatic effects in the receiving environment.

Table 1 provides a summary of requirements for the AEMP Design Plan including information about the timing of submission and the review/approval process for the Plan after submission. An AEMP Design Plan Template is provided in Appendix A.

Purpose	To describe the sampling and analysis plan that will be used to monitor project-related aquatic effects in the receiving environment
Content	<ul style="list-style-type: none"> • This Plan must describe a monitoring program that meets the objectives stated in Section 1.1.3; a water licence may include additional objectives to be met by the AEMP depending on the specifics of each project. Evidence to support the AEMP design, such as baseline data, statistical analyses, statistical power, research, engagement results, etc., must also be provided in the Design Plan. • An important component of the AEMP Design Plan is the Response Framework which is described in detail in Part 3 of the Guidelines. As part of the Response Framework, proponents must set Action Levels (i.e., pre-defined levels of environmental change or

	<p>effect) for chemical, biological and/or physical parameters that are monitored in the AEMP.</p> <ul style="list-style-type: none"> Proponents should develop their Design Plan using the approach described in Section 2.1 of these Guidelines and document the Plan using the template provided in Appendix A and any other specific conditions listed in the project’s water licence.
Timing	<p><i>Pre-licensing:</i> Proponents should begin the development of a conceptual AEMP Design Plan well in advance of applying for a water licence; ideally, the AEMP design phase begins as soon as a proponent deems that their project is viable. A conceptual AEMP Design Plan must be submitted with a water licence application and refined into a final AEMP Design Plan during the regulatory process prior to construction. As discussed in Section 1.3.1, the conceptual AEMP Design Plan may be revised by the proponent several times prior to water licensing as information is gathered through baseline studies and engagement.</p> <p><i>During licence term:</i> The due date for submission of a final AEMP Design Plan will be specified in the water licence. Although typically the Design Plan is due within a few months of licence issuance, the exact date may vary depending on the construction/operation schedule of individual projects. In general, the Boards base the submission date on the project’s construction/operation schedule, allowing enough time for review and approval of the document prior to any deposit of waste by the project into the receiving environment. Note that if it is determined that there is insufficient baseline data to support the AEMP Design, approval may be delayed.</p> <p>After, or as part of, the approval of the AEMP Re-evaluation Report, proponents may propose changes to the AEMP Design Plan. This typically occurs every 3 years.</p>
Review and Approval	<p>AEMP Design Plans are subject to review by all affected parties and final approval by the Boards. Depending on the amount of pre-engagement proponents have done on their AEMP Design in advance of submission, the review process may include technical workshops in addition to requests for written comments/recommendations from parties. The Boards will consider all the evidence provided to either approve the Plan (with or without changes) or require the proponent to do further work and re-submit a revised plan for approval. Note the re-submission of the plan may lead to project delays so engaging early is extremely important for projects wishing to expedite production or deposit waste.</p>

1.2.2 Implementation Phase

Once approved, an AEMP Design Plan is implemented during the term of the water licence. The main activities in this phase are to collect and analyze monitoring data according to the approved plan and to report results annually. Details about the regulatory requirements of the AEMP Annual Report can be found in Table 2.

Table 2: Regulatory Requirements for an AEMP Annual Report	
Purpose	To document the results and analysis of monitoring data collected under the approved AEMP in the preceding calendar year.
Content	The types of data summaries and analyses that must be provided annually will be specified in the water licence and described in the approved AEMP Design Plan. Generally, the Annual Report will contain:

	<ul style="list-style-type: none"> • a plain language summary and interpretation of the major results obtained in the preceding calendar year; • a summary of activities conducted under the AEMP; • summaries of all the data and information generated under the AEMP; • an interpretation of the results, including an evaluation of any identified environmental effects that occurred as a result of the project and the significance of those effects; and, • a comparison of monitoring results to Action Levels (i.e., pre-defined levels of environmental change or effects) as set in the AEMP Design Plan. <p>Note that proponents will be required to submit raw monitoring data in electronic format so that data analyses can be independently verified.</p>
Timing	AEMP Annual Reports are typically due in April or May each year to report on monitoring data obtained in the previous calendar year. The exact timing of the submission may vary based on the sampling schedule approved in the AEMP Design Plan which should include all potential requirements.
Review and Approval	AEMP Annual Reports are subject to review by all affected parties and final approval by the Boards. Any proposed changes to the AEMP Design Plan will not be approved as part of the AEMP Annual Report review process. Instead, proposed changes to the AEMP Design Plan need to be requested in a separate approval process. Note that results from the AEMP Annual Report may be used to support proposed changes to the design in that separate process.

1.2.3 Adapt Phase

AEMP results may be used to support adaptive management of the project, the project's water licence and/or the AEMP design itself. The textbox below provides some example scenarios of how AEMP results may be used to support adaptive management.

Examples of how AEMP results may be used to support adaptive management

Example 1: Change in regulated effluent criteria

Although parameter X was initially identified as a contaminant of concern for a project, several years of monitoring show that parameter X concentrations in the receiving environment are not increasing. Conversely, parameter Y concentrations are unexpectedly increasing above background levels. Based on this evidence, the effluent quality criteria may be reviewed and amendments considered for parameters X and Y.

Example 2: Change in monitoring frequency requirements

After three consecutive years of monitoring sediment quality, the results show that there is little variability and no trends in contaminant concentrations. The proponent may propose changing the AEMP Design Plan to require sediment quality sampling to only once every three years.

Example 3: Change in monitoring sample types and follow-up requirements

Measured levels of parameter X in a small-bodied fish species (e.g., Slimy Sculpin) are showing an increasing trend through time that is greater than what was predicted. The proponent may propose, and/or the Board may direct, the proponent to add monitoring of large-bodied fish (e.g., Lake Trout) to the AEMP Design to see if those fish remain safe to eat. The proponent may also be required to follow-up on the monitoring results by investigating all the potential sources of parameter X on site. Depending on the results of the investigations, additional mitigation measures may be required to reduce the quantity of parameter X being released into the environment.

To ensure that adaptive management is carried out in a structured and formal way, two types of regulatory submissions are required: the AEMP Re-Evaluation Report and the AEMP Response Plans. While the Re-Evaluation Report is generally only required every three years, Response Plans are due any time a pre-defined level of environmental change or effect, called an Action Level, has been exceeded as measured during the AEMP annual monitoring. A description of the requirements for each of these reports can be found in Tables 3 and 4, respectively.

Table 3: Regulatory Requirements for an AEMP Re-Evaluation Report

Purpose	To provide the information necessary to check whether the project-related environmental effects are and will remain within an acceptable range or if changes to the project or water licence are required. This Report may also be used to provide supporting evidence, if necessary, for revisions to the AEMP Design Plan.
Content	This Report is typically due every three years. Generally, the AEMP Re-Evaluation Report will contain: <ul style="list-style-type: none">• a review and summary of AEMP data collected to date including a description of overall trends in the data and other key findings of the monitoring program;• an analysis that integrates the results of individual monitoring components (e.g., water quality, sediment, fish health, etc.) to date and describes the overall ecological significance of the results;

	<ul style="list-style-type: none"> • a comparison of measured project-related aquatic effects to predictions made during the regulatory process and an evaluation of any differences and lessons learned; • an assessment and, if necessary, an update of predictions of project-related aquatic effects or impacts from current time to the end of Project life based on AEMP results to date and any other relevant information; • a plain language summary of the major results of the above analyses and a plain language interpretation of the significance of those results; and, • recommendations, with rationale, for changes to any aspect of the AEMP Design Plan including the Action Levels.
Timing	This Report is meant to include an analysis of at least three years of monitoring data; therefore, the submission due date is usually set for three years after implementation of the AEMP and every three years thereafter.
Review and Approval	The AEMP Re-Evaluation Report is subject to review by all affected parties and final approval by the Boards.

Table 4: Regulatory Requirements for an AEMP Response Plan

Purpose	To document the proponent's proposed response to an exceedance of any Action Level that was defined in the Response Framework approved as part of the AEMP Design Plan. This plan may provide the basis for the Boards' directions to do additional studies, implement additional mitigations, and/or to make changes to the water licence.
Content	<p>Generally, an AEMP Response Plan is required to contain the following information for each parameter to have exceeded an Action Level:</p> <ul style="list-style-type: none"> • a description of the parameter and the ecological implication of the Action Level exceedances; • a summary of how the Action Level exceedance was determined and confirmed; • a description of likely causes of the Action Level exceedances and potential mitigation options if appropriate; • a description of actions to be taken by the Licensee in response to the Action Level exceedances including: <ul style="list-style-type: none"> ○ a justification of the selected action; ○ a description of timelines to implement the proposed actions; ○ a projection of the environmental response to the planned actions, if appropriate; ○ a monitoring plan for tracking the response to the actions, if appropriate; and ○ a schedule to report on the effectiveness of actions and to update the AEMP Response Plan as required; • recommended values for subsequent Action Levels (e.g., if a Low Action Level was exceeded, then the proponent must propose a Moderate Action Level); and, • any other information necessary to assess the response to an Action Level exceedance or that has been requested by the Boards.
Timing	If any Action Level as defined in the approved AEMP Design Plan is exceeded during any AEMP-related sampling or analysis event, proponents are required to report the exceedance to the Boards within a timeframe specified in the water licence (e.g., 30 days). The proponent is then required to submit an AEMP Response Plan a few months after detection of the exceedance, in the timeframe specified in the water licence.

Review and Approval	The AEMP Response Plan is subject to review by all affected parties and final approval by the Boards. The information presented in a Response Plan will form part of the adaptive management of the project by the Boards; for example, the Boards may require the proponent to do additional studies, change aspects of project management, or implement additional mitigations through Boards' directives or through changes to the water licence conditions.
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1.3 Expectations for AEMP Development and Implementation

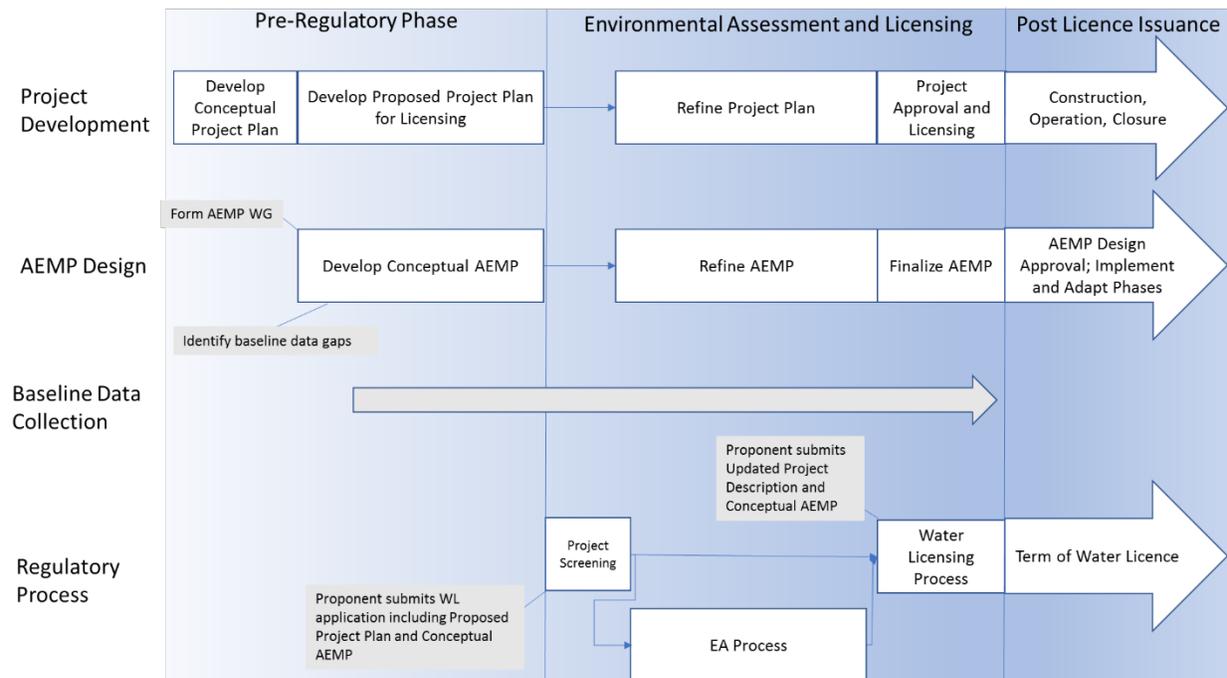
1.3.1 Start Early

Proponents should begin the design of an AEMP and the collection of environmental baseline (i.e., pre-development) data prior to submitting a water licence application, preferably as early as possible in the project planning phase which may include the Advanced Exploration phase. For example, Figure 2 illustrates how the development of an AEMP can run in parallel to the development of a project plan. For projects requiring regulatory permits and licences, the planning phase leading up to licencing may take many years, starting from an initial concept through to pre-feasibility and feasibility studies, financing, detailed engineering/design, and environmental assessment. The design of a robust AEMP will likely also take several years, as it will continue to change as the project plan is progressively refined; running these two processes in parallel rather than sequentially will inevitably save time, reduce delays in permitting, and reduce the risk of construction delays after licence issuance.

Depending on the site-specific nature of the project area, as well as the potential magnitude of the environmental effects, proponents may need to collect several years of environmental baseline data to use both in the design and implementation of the AEMP. Baseline studies must include both the collection of scientific and Traditional Knowledge (TK). Baseline studies intended to capture TK will require many months to prepare, initiate and complete; therefore, these studies should begin at the same time as scientific studies. As discussed in more detail in Part 2 of the Guidelines, some initial meetings with affected parties to scope out all the potential environmental issues or concerns will help proponents to appropriately determine the kind of baseline data required. Frequent “check-ins” with parties and regulators in the pre-regulatory phase can also help proponents ensure that they are on track with respect to baseline data collection and AEMP design.

To prepare a conceptual AEMP, project proponents should have completed minimum baseline assessments. If a Project requires an environmental assessment, project proponents may use that period to collect additional baseline data if required to fill gaps or shortcomings of existing baseline reports. The Environmental Assessment (EA) process can also be used to collect additional information from affected parties and regulators that will help proponents to refine the conceptual AEMP Design into a final AEMP Design.

Figure 2: AEMP development during regulatory and pre-regulatory phases



1.3.2 Engage Affected Parties

The Boards and the GNWT strongly recommend that the proponent bring together an AEMP Working Group made up of invited representatives of all potentially affected parties, including Board staff, all levels of government (federal, territorial, indigenous), and any other organization that may be affected by the project. An AEMP Working Group, if formed early in the process of AEMP development, can greatly aid proponents by providing a consistent review process. If this is not possible, the proponent should consider use of one-on-one meetings with all relevant parties.

Part 2 of these Guidelines provides specific engagement recommendations for the design and implementation of AEMPs. Proponents should also consult the Boards' Engagement and Consultation Policy (2013) and the Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits (2013) for a full understanding of the Boards' requirements for engagement in general.

1.3.3 Use Best Practices

Monitoring is an evolving practice, continuously benefiting from enhancements, lessons learned, modern technologies, precedents, and discoveries. Proponents are expected to make use of current best monitoring practices to maximize monitoring effectiveness. One way of doing this is by involving knowledgeable experts including traditional knowledge holders, consultants, scientists, etc. Board staff and the GNWT can assist proponents in identifying current best practices. Specific recommendations for best practices regarding engagement can be found in Part 2 of these Guidelines; some specific technical references can be found in the AEMP Design Template in Appendix A.

1.3.4 Harmonization with Other Regulators

Project proponents may have authorizations from other regulators that also require environmental monitoring. For example, metal mines are currently required to carry out Environmental Effects Monitoring as prescribed under the Metal Mining Effluent Regulations and administered by Environment and Climate Change Canada. Monitoring may also be required for oil and gas projects by the National Energy Board or the Office of the Regulator for Oil and Gas Operations in the NWT. In these cases, the possibility of overlap and duplication of monitoring efforts with the AEMP may exist. Proponents must ensure they meet the conditions of all necessary authorizations. The Boards and the GNWT agree that ensuring all requirements are met and that harmonizing monitoring requirements to the extent practical (i.e., design, plans, and reports) is the preferred approach to addressing any overlap.

In their applications to the Boards, proponents may propose to integrate monitoring requirements from other authorizations into an AEMP; these requests will be considered on a case-by-case basis and will need to demonstrate that all the objectives of the AEMP as well as water licence and environmental assessment requirements will be met. The Boards will still need to review and consider, independently from other regulators, AEMP Design Plans and monitoring reports.

2. Recommended Approaches to AEMP Design & Implementation

Throughout the life of a project, the AEMP is a key tool for communicating with parties about project-related effects on the receiving environment and, importantly, whether effects are remaining within acceptable limits. Therefore, the successful design and implementation of an AEMP provides value to a proponent throughout the life of its project. This section of the Guidelines describes approaches to AEMP design and implementation that, based on the collective experience of the Boards and the GNWT, will greatly aid proponents in meeting the expectations¹⁰ of the Boards and affected parties.

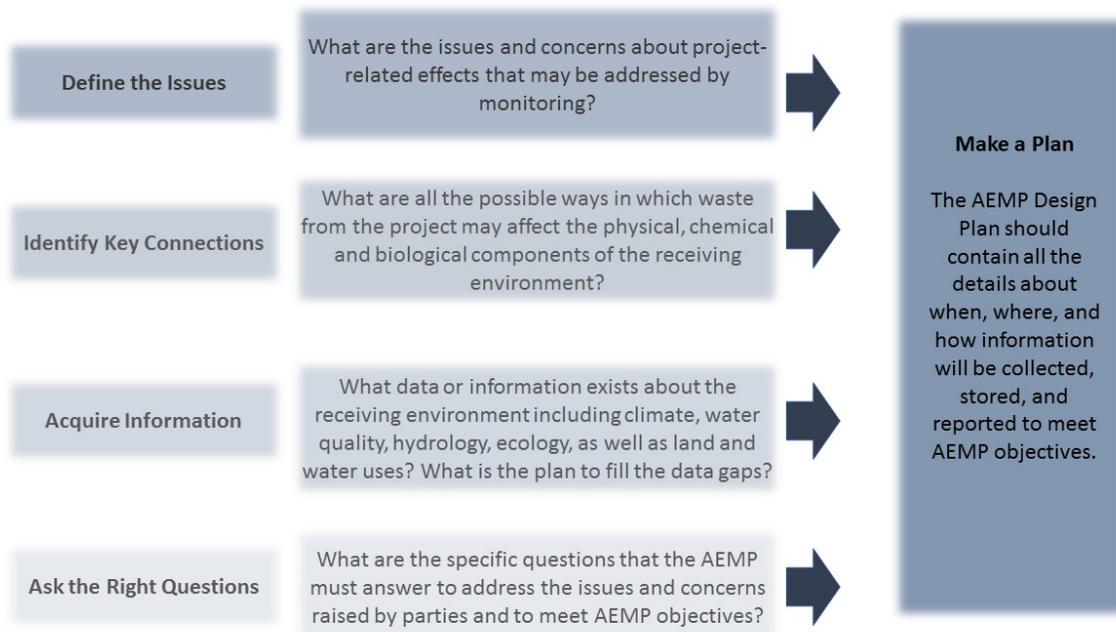
The three sections below cover recommendations for the design, implement, and adapt phases of AEMP development and implementation.

2.1 Monitoring Program Design

This section of the Guidelines outlines recommended activities for proponents to follow when designing an AEMP. The recommended AEMP design process involves the five key activities, outlined in Figure 3. A description of each of the key activities is provided in the subsections below along with specific recommendations for engagement.

¹⁰ Note that the approaches described in this part of the Guidelines are recommendations, not strict regulatory requirements.

Figure 3: Summary of Activities during AEMP Design



Note that the design process activities are not necessarily meant to be carried out in a linear fashion. Each of the activities may need to be carried out more than once during the development of a conceptual and then the final AEMP. For example, issues may be defined initially based on a preliminary project design; the subsequent activities are then undertaken with the goal of preparing a conceptual AEMP as envisioned in Figure 2 (see Part 1, Section 1.2.1). During an environmental assessment process, the project design may change, and proponents will need to redefine the issues and concerns of affected parties. The other AEMP design activities will likely need to be revisited as the proponent develops a final AEMP Design Plan. Overall, whether designing a conceptual or a final AEMP Design Plan, the activities to be undertaken by the proponent are the same but the level of detail or content addressed in each step will vary.

As discussed in more detail in Section 1.3 of these Guidelines, proponents are encouraged to begin the AEMP design process long before the submission of the water licence application as a conceptual AEMP Design Plan will be required at that time. It is important to note that water licences often require the AEMP Design Plan to be approved prior to project construction; therefore, to avoid unnecessary delays after water licence issuance, the GNWT and the Boards recommend that proponents carry out as much of the recommended design process as possible prior to submitting their water licence application. Doing so will require pre-engagement with the affected parties and reviewers to avoid delays, duplication of effort and numerous plan submissions.

2.1.1 Define the Issues

The first activity in AEMP design is to define the issues and concerns that are to be addressed by monitoring during the term of the water licence. The issues and concerns may be broad: “Will the fish

remain safe to eat if the project goes ahead?"; or, they may be more narrowly defined: "Are cadmium concentrations in the receiving environment going to increase over time?". Although proponents will likely have their own ideas on what an AEMP should address, it is critical to understand the issues and concerns of all affected parties and regulators very early in this process. Casting a wide net on possible issues and concerns may result in potential problems, but subsequent steps in the process will provide opportunities to refine this list as appropriate.

The result of this activity should provide the proponent with a comprehensive list of issues and concerns representative of all affected parties that may be addressed through an AEMP. Ensuring that the viewpoints of all parties are considered in the design process will make it more likely that the final AEMP design will be acceptable to all parties.

Engagement Recommendations:

- Form an AEMP Working Group consisting of affected or knowledgeable parties to aid in the AEMP design. Consult the MVLWB's Engagement Guidelines¹¹ for Applicants and Holders of Water Licences and Land Use Permits (2013) (the Engagement Guidelines) for information on how to identify affected parties for inclusion in an AEMP Working Group.
- Prepare a project description that will enable parties to the regulatory process to understand the nature and scope of the proposed development and to identify potential interactions between the project and the environment. When developing a conceptual AEMP, this project description need only be a preliminary project description; as project planning and the regulatory process proceeds, the proponent will need to update the project description and check back in with the AEMP Working Group to see if the list of issues/concerns has changed.
- Send the project description to parties in advance of meetings and present it during the meeting in a way that promotes understanding. For example, using maps and plain language can be helpful. Both technical and non-technical feedback from participants should be encouraged at the meeting but some parties may prefer to follow up with written comments.
- Document meeting discussions and any follow-up comments received from parties after the meeting.
- Holding a workshop with the AEMP Working Group may be an efficient engagement tool but one-on-one meetings may also be necessary. The proponent may also want to consider using site visits as a way of engaging parties in a discussion of potential project-related effects.
- Fully clarify what the raised issues and concerns really mean to the party that voiced them. For example, be sure to clarify what the issue is if there are statements like "no changes to the water". This is necessary to determine if the statement is intended to mean that uses of the water for things like fishing, drinking, or recreation should not change or that water quality will not change (i.e., they want it to stay within the range of background). Depending on the above, proponents may need to collect baseline data differently and/or design the AEMP differently, so it is essential to have clarity right from the beginning.

¹¹ Note that the engagement principles cited in the Engagement Guidelines have also been adopted by the Mackenzie Valley Environmental Impact Review Board for the environmental assessment process.

- Document a comprehensive list of issues and concerns raised by parties and verify it with the AEMP Working Group in writing.

The reader can obtain more detailed information on this step from INAC's 2009 AEMP Technical Guidance Document - Volume 1.

2.1.2 Identify Key Connections

Another activity in AEMP design is to determine how components in the environment connect and what will need to be monitored. This step involves examining how the project will influence the environment; specifically, the stressors and effects on the physical, chemical, and biological components of the environment. Development of exposure pathways and site models may be important tools to document this step. Each of the issues and concerns listed in Section 2.1.1 should be considered when attempting to establish key connections between the project and the receiving environment.

Although the proponent will likely have employed or retained experts in the field of aquatic monitoring, it is important to recognize that members of the AEMP Working Group or other local and traditional knowledge holders will have unique and useful perspectives and information on how the project may affect the receiving environment. Therefore, proponents are encouraged to bring their experts together with other parties to discuss key connections between different parts of the environment which will help identify indicators and stressors to include in the AEMP. These discussions will also help the proponent to identify if additional baseline studies may be necessary.

The outcome of this activity is documentation of a preliminary conceptual model of how the different waste streams from the project may enter the receiving environment to potentially affect water quality/quantity and aquatic life. A preliminary list of assessment endpoints (i.e., those things that will be sampled and analyzed in the AEMP) may also be generated. Any model developed should account for each of the issues and concerns identified in Section 2.1.1; it may be possible to refine the list of issues and concerns at this stage, but proponents should document such refinements to help ensure transparency in the process.

Engagement Recommendations:

- Use the list of issues and concerns from Section 2.1.1 (Define the Issues) to draft materials describing likely key pathways for environmental effects. For example, if parties raised a concern about fish health in a lake downstream of the proposed project, the proponent should describe all the possible ways the large and small bodied fish could be affected by the project.
- Share the preliminary model of key project-environment connections with the AEMP Working Group and seek additional feedback. It may be helpful to use maps or pictures of the area to generate discussion on connections.
- Ask Working Group members if there are other experts in traditional, local, and/or scientific knowledge that should be consulted to ensure all key connections have been identified.
- Key connections between the project and the receiving environment should be documented for each issue or concern identified by parties or the proponent.

The reader can obtain more detailed information on this step from the AEMP Technical Guidance Document - Volume 2¹².

2.1.3 Gather Existing Information

The next activity in AEMP design is acquiring information. This activity provides context to the monitoring exercise so that all aspects of the receiving environment may be understood. The first part of this activity is to gather and review existing baseline or background information. The proponent needs to identify what is known about the area, the surrounding influences, and traditional and local knowledge. The proponent should also gather information on past projects, state of knowledge reports, and industry reviews, and use this information to conduct a literature review. The proponent must include information about the receiving environment (climate, water, hydrology, ecology), as well as information on regional land and water uses.

The identified background information should be compared to the results from Sections 2.1.1 and 2.1.2 steps with the goal of identifying data or information gaps. The proponent will need to plan to acquire the additional information either through baseline studies (e.g., scientific and/or TK studies) or other research. As shown in Figure 2, this would ideally be done concurrently with the development of a conceptual AEMP, about one to three years in advance of the regulatory process, to ensure that there is sufficient time¹³ to collect all the data necessary to implement the AEMP after licence issuance. Timing of baseline data collection is important: project construction may be delayed if the Boards deem additional baseline data needs to be collected after water licence issuance. Note that projects that require an environmental assessment may be able to collect additional baseline data, if needed, during the assessment process to further refine the AEMP.

Engagement Recommendations:

- Proponents should consider engaging community members, experts with long-term ‘corporate memory’, and technical experts to determine what information sources may be available.
- Proponents are encouraged to prepare a plan for baseline data collection, using both scientific and traditional knowledge, and share it with the AEMP Working Group prior to implementation. Comments and edits from the parties may greatly aid the proponent in making sure the baseline studies are properly scoped.

The reader can obtain more detailed information on this step from the AEMP Technical Guidance Document - Volume 1, Section 4.0.

¹² Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the Northwest Territories. Recommended Procedures for Developing Detailed Designs for Aquatic Effects Monitoring Programs - Volume 2.

¹³ Note that the amount and type of baseline data needed will depend on the nature of the project and the scope of the AEMP.

2.1.4 Ask the Right Questions

Specific and testable questions are vital to confirming the linkages established during the activities entitled **Define the Issues, Key Connections, and Collect Existing Information**. The following example illustrates this point: during the AEMP design process, an issue was identified that waste water discharge associated with the project development might negatively impact fish in the surrounding environment. The process also identified a connection with water discharge constituents and survivability of a small insect that fish feed upon. A series of specific and testable questions or hypotheses could then be generated. For example:

- Does water discharge constituent A affect survivability of insect species A?
- Does water discharge constituent A affect reproduction or growth of insect species A?
- Does water discharge constituent A affect relative abundance of fish species B which feeds on insect species A?

Though questions are generally meant to track changes and identify cause and effect relationships used for regulatory decision-making, proponents should coordinate or balance these questions with those that help address community concerns. This will help build trust with community members and keep the AEMP relevant to those communities as well as to regulators. For example:

- Does water discharge affect the fish tissue or flavour of fish species B in lake C?

The process of asking the right questions should include identifying all the perceived relevant questions, documenting what the questions are, and engaging communities and decision-makers to make sure the right questions have been asked. Ultimately, only a subset of the original potential questions will be selected to guide the AEMP design; these will be proposed by the proponent and approved by the Boards. In making such selections, it is important to explain to all parties how the proponent has balanced regulatory requirements with that of the community-specific questions as well as to balance costs with resultant benefits.

When developing the questions that need to be answered, it is also important to discuss effect size, sample size, location, and frequency of information (data) sampling. These items will help ensure the data collected provides ‘certainty’ in its answers - certainty in the form of how much change must occur before the AEMP detects the change, and the confidence associated with a detected change.

Engagement Recommendations:

- Identify all the relevant questions, analyze them, and document which questions will be used going forward. If questions were left out, the reason should be documented.
- Go back to the AEMP Working Group with the list of questions identified and link them to the issues and concerns originally raised. Note that some “concerns” are too broad and can’t be tested directly. The point should be made that questions will be addressed in the AEMP, but concerns will not. A process to check-in to ensure that this is done correctly should be sought.

The reader can obtain more detailed information on this step from the AEMP Technical Guidance Document - Volume 3.

2.1.5 Make a Plan

The final part of the design process involves the proponent developing a plan which details when, where, and how information will be collected, stored, and reported to answer the specific and agreed upon questions raised in the previous sections. The proponent must produce a written document which includes the AEMP sampling design, the analysis and sampling plan, the quality assurance plan, data quality objectives, and the field health and safety plan. In addition, information on all the previous steps should be provided. Proponents should consult the AEMP Design Plan template provided in Appendix A for detailed recommendations on what to include and how to present the plan.

As discussed previously, proponents need to prepare both a conceptual and a final AEMP Design Plan. The main difference between the two versions of the plan is the level of certainty and detail in the final project design and, therefore, in the final monitoring program design. Prior to water licensing, a conceptual AEMP Design Plan can be shared and discussed with affected parties, including regulators, allowing proponents to validate their approaches and identify any additional gaps. If well reviewed and refined prior to licensing, the review and approval process for the final AEMP Design Plan after water licence issuance will go more smoothly and help proponents avoid delays in project construction and operations.

Engagement Recommendations:

- When developing the monitoring plan, consider input from local knowledge holders who often know when or where fish are spawning or the best locations to sample. Local and traditional knowledge can help maximize field time and field data, resulting in more cost-effective sampling.
- Prepare a conceptual AEMP Design Plan prior to applying for a water licence and share it with the AEMP Working Group. Comments on the plan should be used by the proponent to identify any potential gaps in baseline data/information and to refine the AEMP design over time. It may be possible to continuously refine the AEMP design during the environmental assessment of a project or during the water licensing process.
- A final AEMP Design Plan will be required after water licence issuance on a date prescribed in the water licence. The Boards will run a review process involving all parties at that time, but proponents are encouraged to offer workshops or meetings to ensure parties understand the design and how their concerns have been addressed.

2.2 Monitoring Program Implementation

This section of the Guidelines outlines the process for AEMP implementation with some specific recommendations for activities proponents can follow when implementing an AEMP.

AEMPs are implemented only after approval of the water licence and subsequent approval of a final AEMP Design Plan by the Boards. The process for AEMP implementation involves three key activities: collecting information, analyzing information, and reporting the results. The specific details of how these activities will be carried out are provided within the approved AEMP Design Plan; this section of the Guidelines provides a brief description of the activities including some recommendations for engagement.

2.2.1 Collect Information

For this activity, the proponent will gather observations and data in the manner defined in the approved AEMP Design Plan. The proponent is responsible for ensuring accurate, precise, representative, and complete data are collected to support management decisions needed to protect the environment.

Engagement Recommendations:

- Seek local expertise to assist in collecting information. Local experts and TK holders can help in planning, can facilitate logistics, as well as improve safety of travel and field work. Community members can also help proponents behave respectfully while on the land, and may assist in decreasing field costs for long-term projects. Community participation in the AEMP may even provide an opportunity for the proponent to get to know the community better and for two-way knowledge sharing.

2.2.2 Analyze Information

In this activity, the proponent will be expected to translate the information acquired in the previous step into knowledge that can be used for decision-making, including adaptive management.

The process for analyzing data flows directly from the AEMP Design Plan (i.e., Make a Plan). Specifically, this activity involves presenting the information in a format that allows for review (i.e., database, spreadsheet, etc.), evaluating the information collected to ensure it meets acceptable standards, analyzing the data according to approved methods in the AEMP Plan, and interpreting the analytical results to form a knowledge base.

Engagement Recommendations:

- The process of analysis is the responsibility of the proponent; however, the analysis need not be completed by the proponent in isolation. Local experts, land-users, elders, TK holders, community members, and government experts can provide insight and context for the analysis. These experts have knowledge of water and landscape patterns, seasonal changes, animal behavior and movements. Soliciting input from these other experts will inform a more valid and relevant analysis.

2.2.3 Report Findings

Findings from the AEMP are reported in the Annual AEMP Report as required by the water licence. The report content and format will be laid out in the water licence and/or the approved AEMP Design Plan, respectively. Typically, Annual AEMP Reports require a plain language summary of the main results as well as a detailed technical analysis; in this way, both laypeople and technical experts can understand the results.

Engagement Recommendations:

- Present results to the AEMP Working Group or to individual communities during an in-person meeting. Make best efforts to communicate in plain language and use visual tools including pictures, maps, and diagrams.
- When communicating results to communities, focus on the larger findings of the AEMP rather than the technical or scientific components of the program.
- Relate the findings back to the original list of issues, concerns, or questions voiced by the communities during the design process of the AEMP.

2.3 Adapt Based on Monitoring Results

In this phase of the AEMP process, AEMP results are used to see if any adaptive management actions are warranted. Adaptive management may involve changes to the AEMP itself, to project operations, or to the project's water licence. In all cases, the goal of any adaptive management actions is to ensure that project-related effects remain within acceptable limits. The three main activities of this AEMP phase are briefly described below.

2.3.1 Respond to Annual Results

The Response Framework, described in detail in Part 3, provides a systematic way of responding to the annual AEMP results. Proponents are expected to compare results to pre-defined levels of environmental changes or effects, called Action Levels which have been set in the approved AEMP Design Plan. If any Action Level is exceeded, proponents are required to notify the Boards and then submit a Response Plan (see Table 4, Section 1.2.3) for each exceedance, in a timeframe specified by the Boards.

In the Response Plan, proponents will describe the nature of the Action Level exceedance, the potential environmental implications, and propose actions that are commensurate with the results. Depending on the type of exceedance, appropriate actions may range from further studies to the identification or implementation of additional mitigations to reduce the amount waste that needs to be discharged from site. The final actions taken will be decided by the Boards.

One of the benefits of the Response Framework is that it makes it easier to understand and contextualize the results presented in individual AEMP Annual Reports. For example, affected parties who do not have the capacity to read highly technical Annual Reports can at least check to see if any Action Levels were exceeded that year; this helps parties have a better sense of whether they want to allocate more of their resources to reviewing the report. To realize this benefit, affected parties must have confidence in the Action Levels that are set at the beginning; therefore, proponents are encouraged to make best efforts at engagement on the Action Levels during the AEMP design phase.

Engagement Recommendations:

- Proponents should ensure that all affected parties are fully engaged in the development of Action Levels during the AEMP design phase.
- For projects that undergo an environmental assessment, it would be helpful to clarify what the limits of acceptable change for the project's receiving environment are. As these limits are

usually based on social values, proponents should work with affected parties to define these limits. Clear limits for acceptable change make it easier to set Action Levels in the Response Framework that all parties can agree with.

- Once submitted, Response Plans will undergo a review and approval process; however, proponents are encouraged to ask parties if they require additional meetings to understand the monitoring results.

2.3.2 Revise Predictions

Approximately every three years, proponents are required to submit an AEMP Re-Evaluation Report. This report is meant to pull together AEMP results from the beginning of the project and compare the collective results to the predictions of project-related effects that were made prior to the issuance of a water licence. In this way, the initial effect predictions can be verified based on actual monitoring data during the life of a project.

If the re-evaluation process results in changes to the predictions of project-related effects going forward, it may be necessary to revise the AEMP Design, change operational methods for the project, and/or amend the water licence. Actions taken because of the re-evaluation will be considered by the Boards based on the evidence.

Engagement Recommendations:

- Although the Boards will send the AEMP Re-Evaluation report out for general review, proponents are encouraged to host a meeting with the AEMP Working Group to discuss the results of the AEMP re-evaluation directly.

2.3.3 Consider Revisions to the AEMP Design Plan

Water licences generally require proponents to consider revisions of the AEMP Design Plan every three years, but revisions may also be considered at other times if reasonable. Decisions to make changes to the approved AEMP Design will require supporting evidence, which is most often provided by the AEMP Re-Evaluation Report but also from AEMP Response Plans. Revisions which may be considered include changes to the program design, the addition or removal of special studies, and/or changes to the Action Levels.

Changes to the AEMP Design Plan will be carefully considered by the Board. The Board must consider if frequent changes could result in a lack of long term monitoring data at some stations or if avoiding changes may mean the AEMP is not as effective as it could be. In general, changes to the AEMP Design Plan will not be considered based on data from a single year as presented in an AEMP Annual Report. The AEMP Re-Evaluation Report may include proposed revisions to the AEMP Design Plan based on the analysis of three years of data.

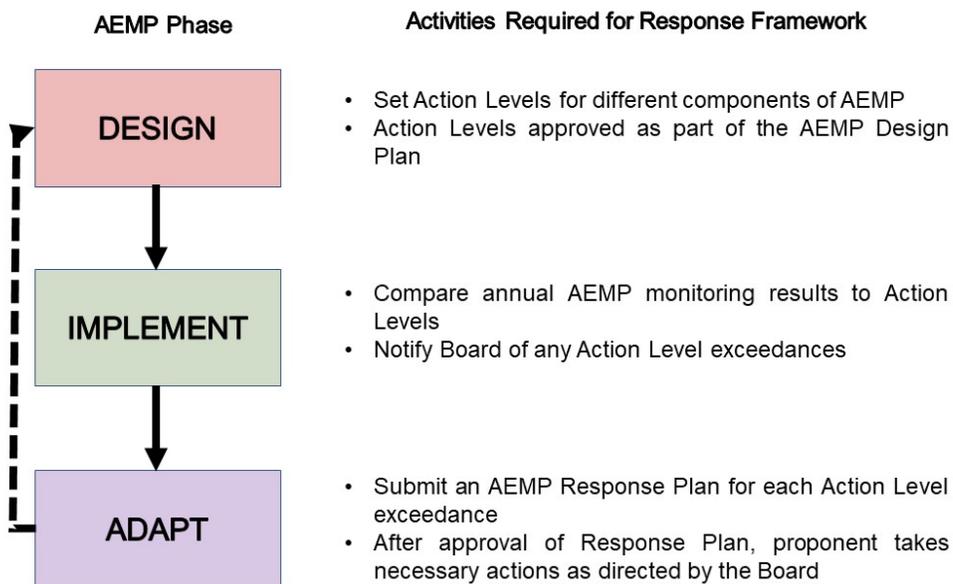
3. Development of a Response Framework for Aquatic Effects Monitoring

The Response Framework was developed by the Boards to provide a transparent, inclusive, and consistent method for integrating adaptive management into water licence requirements. The Boards released a draft guidance document in 2010 that described the Response Framework and how it was to be implemented. Since that time, the Boards have required all proponents to incorporate a Response Framework into their existing or new AEMP Design Plans. The concepts and requirements of Response Frameworks have evolved over the last several years; therefore, this part of the Guidelines provides details of the current practices that should be followed by proponents in the design and implementation of a Response Framework. Note that the Framework, once developed, is meant to be described in the AEMP Design Plan and will be approved as part of that process (see template in Appendix A).

3.1 Summary of Response Framework

The overall goal of a Response Framework is to provide a systematic approach to responding to the annual results of an AEMP. This is to ensure that project-related effects always remain within acceptable limits. Response Framework requirements are integrated within the overall phases of AEMP development and implementation, and reflected in Response Plans as summarized in Figure 4, below.

Figure 4: Activities for the Response Framework during Different AEMP Phases.



The key activity in designing the Response Framework is the setting of pre-defined levels of environmental change or effect, called Action Levels, for chemical, biological, and/or physical parameters that are monitored in the AEMP. Action Levels are defined in the AEMP Design Plan and will be subject to review and approval at the same time as the Design Plan. As annual monitoring results become available, proponents must compare the results to the Action Levels and determine if any have been exceeded. Proponents must prepare, and submit for Board approval, a Response Plan for each type of exceedance

which documents proposed follow-up actions, commensurate with the nature and extent of an exceedance.

3.2 Development of Action Levels

The Response Framework calls for defining a set of tiered Action Levels that reflect increasing levels of environmental changes or effects as measured in the AEMP. These levels must be set such that adaptive management actions can be taken in a timely way to ensure that significant adverse impacts to the receiving environment never occur. A critical requirement, therefore, of the Response Framework, is defining, quantitatively or qualitatively, what is meant by “significant adverse impacts” for each project. The term “significance threshold” is used to describe the threshold where an environmental change or effect would be considered to be significantly adverse and therefore unacceptable. The definition of significance threshold is meant to relate predictions and determinations made during the screening or environmental assessment of a project to the administration of the resulting water licence.

A detailed discussion about the determination of significance thresholds and Action Levels is presented in the sections below.

3.2.1 Significance Thresholds

For the purposes of developing a Response Framework, the term significance threshold is defined as “a limit of environmental change which, if reached, would result in significant adverse effects.” The definition of what constitutes a significant adverse effect may vary from project to project. The variance is often due to differences in regional land and water uses and values that need to be protected in each project location. For example, some projects may exist in areas that are seldom used by local people whereas other areas may have very high cultural or spiritual significance. In the former case, environmental changes may be acceptable up to the point where a local fishery might be affected; in the latter case, changes to water quality outside the range of natural variability may be considered a significantly adverse impact.

The environmental assessment or impact review process contributes importantly to the development of a Response Framework by documenting the predictions of environmental change and the degrees of change that are considered significant. Predicted impacts and significance determinations are assessed against criteria such as magnitude of effect, duration, geographic extent, reversibility, and timing. Based on the evidence provided by all parties to the environmental assessment, the MVEIRB makes the determination of whether the project will have significant adverse impacts and proposes measures to mitigate any such effects. With a clear definition from the environmental assessment or impact review of changes that must be avoided, the Response Framework can set Action Levels and mitigation responses designed to ensure that such changes do not occur.

Significance thresholds can be defined¹⁴ within a broad range of possible ecosystem change – somewhere between a departure from baseline and that level of environmental effects that is considered unacceptable by parties. They are defined in clear statements of potential environmental effects that the project must avoid. Ideally, they are quantitative statements, but in practice they may take narrative form. They typically refer to biological features of the environment that must not be degraded beyond defined limits of degree, spatial extent, or reversibility. Often the threshold is driven predominantly by social or cultural values. Overall, the significance threshold can also be described as a “no-go zone” for environmental effects.

Relationship of Effect Predictions to Significance Thresholds

During the environmental assessment or impact review, proponents are required to provide predictions of potential project-related effects to the receiving environment. It is important to note that predicted impacts may fall anywhere between baseline conditions and the significance threshold. Therefore, while environmental assessment predictions always inform the setting of Action Levels and the significance threshold itself, exceedance of predictions will not necessarily result in a significant adverse effect. Instead it may indicate an incomplete understanding of the ecosystem. Conversely, environmental measurements that reach the significance threshold would constitute a significant adverse effect, while measurements below the threshold would not, even if they were not predicted in the environmental assessment or impact review. In all cases, the Response Framework is designed to ensure that environmental changes and/or effects are minimized.

3.2.2 Action Levels and Responses

Action Levels form the critical link between monitoring and response, and establish the nature and scope of the response. Action Levels should be defined for any monitored parameter of potential environmental concern or a parameter that has clearly departed from the baseline condition and is trending toward further change. At a minimum, Action Levels should be set for:

- all measured ecological indicators of a Valued Ecosystem Component identified in the environmental assessment process;
- all contaminants of concern that were identified through the licensing process, i.e., any contaminant or effluent regulated in the water licence;
- any environmental changes that were not predicted or foreseen to change, when evidence of a trend is documented in the aquatic effects monitoring program: and,
- any other requirements such as those to be monitored and assessed under other regulatory agencies.

¹⁴ Ehrlich, A., and Ross, W. (2015), “The Significance Spectrum and EIA Significance Determinations”, *Impact Assessment and Project Appraisal*, Vol. 33 (2), p. 87-97.

Action Levels will have an element of both degree (severity) and spatial extent. For example, an Action Level may be reached if an increase in a contaminant occurs by some degree (e.g., 10%) over a certain spatial extent (e.g., the entire area of a small lake, or part of a large lake). Also, an Action Level could be set relative to a contaminant concentration above or at which biological effects could potentially be manifested in sensitive organisms (i.e., a benchmark concentration). The purpose of Action Levels, and the associated management actions, is to respond to such changes in degree or spatial extent, over time (trends) that are identified by an AEMP. In this way, the Response Framework is designed to arrest environmental trends that are likely to result in negative environmental change and to reverse imminent or actual trends.

The Response Framework foresees at least three Action Levels (Low, Moderate and High) that correspond to increasing magnitude of change. It is not necessary to set numeric values for all three action levels in the initial AEMP Design Plan. At a minimum, the Response Framework does require a numeric Low Action Level for each indicator, and a conceptual approach to setting Moderate and High Action Levels. If a specific Low Action Level is met, the Response Plan is triggered as a response. However, the triggering of a Response Plan means that the proponent must develop numerical values for Moderate and High Action Levels.

Some considerations for setting Low, Moderate and High Action Levels are summarized in Figure 5 and described in further detail in the subsections below.

Figure 5: Summary of How Low, Moderate and High Action Levels Link Monitoring Results and Potential Actions

Monitoring Result	Action Level Exceeded	Potential Action
Trend away from background but below benchmark concentration. No biological effect measured. Spatial extent limited.	Low	<ul style="list-style-type: none"> Investigate trend and implications. Identify potential mitigation options. Set Moderate and High Action Levels.
Benchmark exceedances or biological effect is imminent or has been measured in the area where effects were predicted in the EA. Trend is towards exceeding spatial extent of effects as predicted in the EA.	Moderate	<ul style="list-style-type: none"> Implement mitigations to stop or slow trend.
Benchmark exceedances or biological effects are measured that are above EA predictions but below significance threshold. Spatial extent beyond EA predictions.	High	<ul style="list-style-type: none"> Implement mitigations to reverse trend. Environmental remediation may be necessary.

Low Action Level and Response

A Low Action Level is meant to be preemptive in nature and is well below the level at which a biological effect is measured. At this point, monitoring data indicate a move away from background or existing conditions, and forecasting (e.g., trend analysis) suggests continuing change.

Adaptive management responses on exceeding the Low Action Level should include investigations to identify likely sources of the change measured (or predicted) and to identify mitigation/abatement options. The Low Action Level response should also include an evaluation of the ecological implications if change occurs and this trend is predicted to continue. Finally, if not already included in the Response Framework, the Moderate and High Action Levels should be set numerically at this stage. If research is required to set numerical values for these higher action levels, a plan to do so should be specified.

Moderate Action Level and Response

The Response Framework envisions that a Moderate Action Level is activated when a benchmark exceedance or biological effect is either imminent (e.g., within 3 years as indicated by trend analysis, see textbox below) or has been measured in the near-field area. The near-field area should be defined to encompass the area where effects were predicted in the environmental assessment and where monitoring has been done in the AEMP. In the aquatic environment, normally the near-field is an area close to the point of discharge but beyond the zone of physical mixing of effluent and receiving waters, and large enough that receptor organisms of interest may reside there. For example, in a chain of small lakes, the near-field is often the lake that receives the discharge. In a large receiving lake, the near-field may be a portion of the lake around the discharge. In a large river, it would be a zone downstream of the discharge but upstream of a major confluence.

In some cases, the approved environmental assessment may have predicted a benchmark exceedance or biological effect within the near-field area, because it was not practically avoidable. Similarly, if the benchmark at the time of the environmental assessment was higher than the present-day benchmark, exceedance of the latter may have been effectively approved. In such cases, if observed environmental conditions are within the predicted range, the changes may be considered acceptable, but should still be minimized.

Adaptive management actions on reaching the Moderate Action Level are based on the response options identified as part of the Low Action Level response. At this stage, for example, a mitigation option will be selected, detailed plans will be prepared for the specific mitigative action(s) that are selected, the plans will be reviewed by the Boards, and, if approved, will be implemented.

It is expected that the Response Plan will be updated at this stage to document a mitigation plan. The plans will be quantitative in nature. The selected mitigative action(s) will be justified, which may include a cost-benefit analysis. The mitigation plan will include current loadings of contaminants to the receiving environment, the reductions in loadings that are anticipated as a result of the mitigative action(s), a projection of environmental response, and monitoring plans to track that response. The plan will be

submitted to the Board for review and approval prior to implementation. Mitigation should be implemented at this stage to stabilize the trend.

Consideration of Trends in Setting the Moderate Action Level

The Moderate Action Level is defined in part on the basis of a trend in an environmental parameter, and the expected time to reach a High Action Level or benchmark. Regression methods are well suited to extrapolation of a trend, to estimate whether parameter values are expected to reach an Action Level or benchmark at some defined future time. Such extrapolation assumes that processes presently responsible for the trend will continue into the future without intervention. The actions defined in the Response Plan should vary depending on the trend in the environmental change - stronger adaptive management actions over a shorter time frame are required for trends that are likely to reach a significance threshold sooner. As such, the trend is as important as the absolute value of the measurement in determining responses.

High Action Level and Response

A High Action Level is activated when benchmark exceedances or biological effects are measured at or increasing outside the range of environmental assessment prediction and/or are trending toward the significance threshold. It should be noted that reaching the significance threshold is a circumstance that should not occur, and the adoption of the Response Framework is a means to ensure that this is the case. Actions are required at this stage to reverse the measured trends and improve environmental conditions.

Adaptive management responses on meeting the High Action Level will include development of new mitigative actions, with less regard to cost and the highest regard to correcting the situation. Actions at this time may include not only mitigative actions, but also some form of environmental intervention that may include remediation or restoration. The Response Plan will be updated at this stage to document the revised mitigation plan. The revised plan will include updated information on contaminant loadings and anticipated reductions, revised projections of environmental response, and monitoring plans to track that response. The plan will be submitted to the Board for review and approval prior to implementation. Directives may be issued by the Board to ensure prompt corrective action.

Benchmark Concentrations and Biological Effects

Benchmark concentrations and biological effects have been commonly referred to in setting Action Levels which are below the significance threshold. Benchmarks of contaminant concentration are levels above which biological effects could potentially be manifested in sensitive organisms. The CCME water quality guidelines are intended to represent this level in most Canadian surface waters; however, lower levels may be appropriate in sensitive environments if supported by evidence that CCME guideline levels are not protective in these environments, or if non-degradation is the intended policy for water quality management. Similarly, in some environments, higher levels may be protective based on site-specific

considerations. Some chemical parameters of interest may not have CCME guidelines. In these cases, benchmarks from other jurisdictions may be utilized, or appropriate benchmarks may be developed based on literature. The CCME protocols for guideline derivation may be followed in developing new benchmark values.

A measured biological effect will be based on measurement endpoints as defined in the AEMP. These are usually endpoints relevant to population or community success. For example, fish growth or reproductive parameters are relevant at the population level. Invertebrate community indices such as organism density and diversity are also relevant. Biological endpoints could also consider contaminant body burdens, to protect both the affected organisms as well as the food web that relies on the organism. These biological endpoints tend to vary among fish species, invertebrate community types, ecoregions and habitats, and typically do not have generic guideline values. However, benchmarks may be defined in terms of degree of change from a suitable reference area value¹⁵.

3.3 Reporting and Follow-up

As annual monitoring results become available, proponents must compare the results to the Action Levels and determine if any have been exceeded. The Board should be notified shortly after the exceedance is identified and proponents will be required to submit a Response Plan for each type of exceedance within the timeframe specified in the licence. In a Response Plan, proponents are expected to describe the nature of the exceedance and describe the potential implications to the receiving environment. Proponents are also required to propose follow-up actions commensurate with the measured exceedance. After the review and approval of the Response Plan, proponents may take specific management or monitoring actions on their own initiative or as directed by the Board. The Board may also consider changes to the water licence if warranted and supported by the evidence.

3.4 Revisions to the Response Framework

Initially, it is prudent to set Action Levels, especially the Low Action Level, conservatively so that potentially harmful effects or changes are flagged as soon as possible. However, after implementation, proponents and affected parties may discover that the Action Levels are too sensitive and are being triggered at a frequency that is not commensurate with the ecological implications of the measured changes. In those cases, changes to the Action Levels may be warranted. Revisions to approved Action Levels may be proposed as part of the AEMP Re-Evaluation process or other requests to revise the AEMP Design Plan.

¹⁵ For example, for benthic community evaluation, a benchmark equal to the reference area mean plus two standard deviations taken from a reference site has been used - see Environment Canada (2002), Metal Mining Guidance Document for Environmental Effects Monitoring, June, 2002

[Appendix 1: Template for AEMP Design Plan](#)

The annotated template provided below identifies the minimum requirements for an AEMP Design Plan. All of the information described in the template needs to be included in an AEMP Design Plan, but the Boards are willing to consider different formats for the AEMP Design Plan as long as the proponent provides a clear rationale for the change or deviation. The recommended content and order of the sections in this template are based on the experiences of the GNWT and the Boards in the review of several AEMPs for projects in the Mackenzie Valley. The template also calls for the information typically required in AEMP water licence conditions based on projects licensed in the last several years.

Proponents should use this template to guide the development of both conceptual and final AEMP Design Plans. The main difference between the two types of plans will be the level of detail provided which will, in turn, be based on the level of certainty in the project itself. As discussed in Section 1.2.1 of the Guidelines, the AEMP Design Plan is subject to review and approval by the Board. It is important to note that in addition to following the information requirements of this template, the approval of an AEMP Design Plan will be dependent on whether it meets the objectives set out in Section 1.1.3 of the Guidelines and best professional standards for monitoring.

Revised AEMP Design Documents are required throughout the term of a water licence based on the results of the AEMP Re-Evaluation process. When revising an AEMP Design Document, it may not be necessary to revise all of the sections listed in this template.

[Title Page](#)

As well as the company and project name, the title page should include the date and version of the AEMP Design Plan (the Plan).

[Plain Language Summary](#)

A plain language summary of the AEMP, including program objectives, methodology, and interpretative framework, should be provided. The summary should be non-technical and satisfy a broad audience. The summary should be able to function as a stand-alone document to brief the public. For AEMPs that are more complex, consider providing a summary for each specific component being monitored (i.e., hydrology, fish, etc). Consider the use of tables, figures, or other visual tools to summarize findings.

[Revision History](#)

A table listing the dates on which every version of the Plan was submitted to the Board, with the corresponding date of approval, must be provided. An outline of the notable revisions compared to the previous version must also be included.

[Table of Contents](#)

The Table of Contents should list the chapters, tables, figures/photos, maps, and appendices of the Plan.

[1 Introduction](#)

1.1 Purpose and Scope of the AEMP Design Plan

Describe the purpose and scope of the Plan as it relates to water licence conditions, regulatory requirements (e.g., guidelines, Board directives), previous versions of the Plan, and results of the engagement process. Provide a very brief description of the project, the proponent(s), and the overall spatial and temporal extent of the project. A map which illustrates the project location within the local watersheds and communities may be helpful.

1.2 Objectives of the AEMP

Overall, AEMPs are meant to be designed and implemented to meet the objectives listed in Section 1.1.3 of the Guidelines. Those objectives should be stated in this section of the Plan along with any additional project-specific objectives that are listed in the water licence. Proponents can add to the objectives as needed.

1.3 AEMP Team & Accountability

The AEMP should describe, list, or show an organizational chart of the important internal and external organizational relationships and specific responsibilities (e.g., accountability structure, design vs. implementation, etc.) associated with the AEMP; include any consultants working on behalf of the proponent and their reporting relationships.

1.4 Engagement

Proponents must outline their approach to engagement and how they have or will integrate the information gained through engagement into AEMP planning, development, implementation, and reporting. The level of engagement is related to the size, duration, and complexity of the project, as well as the significance of the area to residents. Part 2 of the AEMP Guidelines make specific suggestions on engagement; proponents should consider using some, or all of these suggestions. If appropriate, proponents may even expand upon these suggestions. A summary of engagement efforts specifically related to the design of the AEMP should be provided in this section. Any additional details in the proponent's Engagement Plan should be referenced here.

1.5 Regulatory Instruments for AEMP

Provide a summary of all existing and potential permits, authorizations, agreements, and regulatory authorities with jurisdiction on aquatic monitoring for the project. As an example, regulatory instruments could include the following:

- water licence(s)
- Fisheries and Oceans Canada authorizations
- Environment and Climate Change Canada requirements for Environmental Effects Monitoring
- environmental agreements
- National Energy Board authorizations

Proponents should provide a conformance table that references where the AEMP satisfies the conditions of the water licence and indicate overlaps with other applicable licences and permits.

2 Project Description

The proponent should provide a summary of the development project including a schedule of development to give reviewers a picture of activities over time. Describe the key activities for each project phase (e.g., construction, operations, closure) highlighting any differences in water or waste management over the life of the project. Sources of waste that may affect the aquatic environment either directly or indirectly should also be summarized¹⁶ along with any environmental protection or mitigation practices that are in place to minimize waste. Provide a high-level summary of predicted project-related changes/effects to the aquatic receiving environment.

3 Description of the Environment

The proponent should provide a summary of the environmental setting for the reader to understand the environmental context surrounding the development. The proponent can refer to external documents such as the Developer's Assessment Report submitted during the environmental assessment or impact review process, as required. Following the background summary, this chapter should include a description of the relevant environmental components which could be affected by the project; such components may include, but not be limited to, hydrology, water quality, sediment quality, plankton, benthic invertebrates, fish habitat, fish health, and fish tissue. This section should also include a description of the past, current and future traditional uses of the area as well as information on nearby projects.

4 Problem Formulation

This section should outline the issues that are to be addressed by monitoring during the term of the water licence. It is important, in this section, to link back to the issues/concerns that were heard from affected parties during the Define the Issues part of AEMP Design (see Section 2.1 of the Guidelines) and/or during the environmental assessment or impact review. Following identification of the relevant issues, the proponent should identify key connections between components of the environment and project stressors; namely a description of interactions and connections. Proponents can choose to represent these connections with such tools as exposure pathways, pathways of effect, or conceptual site models. Rationale should be given for including (or not including) components such as hydrology, water quality, plankton, sediment, benthics, fish health/population, and fish tissue.

This process, which brings together information identified in the Identify Key Connections and Ask the Right Questions steps of AEMP Design (Section 2.1.2 and 2.1.4), is meant to identify and describe project-related stressors, project-related effects (physical, chemical, biological), areas of concern, pathways of exposure, environmental fate, and environmental receptors. With issues and connections established, the proponent is well positioned to outline the specific questions that will guide the collection of information and analysis of data, and to demonstrate how license conditions are being met. This approach could use impact hypotheses which are a summary of predicted effects to the aquatic environment. Finally, the proponent should define assessment and measurement endpoints with rationale. If the proponent is proposing not to directly address issues and concerns that were raised by affected parties, the reasons

¹⁶ Proponents may reference a Waste Management Plan, if already developed, for details of waste sources and mitigations.

for these choices should be documented.

The reader should refer to more detailed information on this step from the AEMP Technical Guidance Document - Volume 2.

5 AEMP Design

In this step, the proponent will develop a plan which details when, where, and how information will be collected, stored, and reported to answer the specific and agreed upon questions described in Section 4.0 of the Plan. This section should start by identifying and discussing relevant monitoring design options. The proponent should provide an analysis and rationale for the choice of design type (gradient, control-impact, Before-After-Control-Impact, etc.). The proponent should also demonstrate how the available baseline data fits with and supports the proposed monitoring design and evaluation methods (e.g., is there enough data? Is there sufficient power to detect change or variability?). With these evaluations documented, the proponent should select and propose an appropriate monitoring program design.

As part of the monitoring program design, the proponent needs to propose and describe: sampling locations, effects sizes, necessary sample sizes and frequencies, data quality assurance / quality control (QA/QC) methods, and any other methods and laboratory analysis that might be used. It is critical for proponents to document the rationale for each of the above choices for program design and to make direct links between problem formulation and design. Note that this analysis, when done at the conceptual AEMP design phase, can help guide additional baseline studies in support of a final AEMP design.

The design step should also summarize how data will be analyzed and interpreted, namely how the proponent will analyze questions raised in Section 4 of the Plan and turn observations into useful knowledge. Specific monitoring details, including detailed field and analytical methodology, for each AEMP component should be described in Section 7.

The reader may refer to more detailed information on this step from the AEMP Technical Guidance Document - Volumes 3 and 4.

6 Methods & Analysis

In this section, the proponent will demonstrate how observations and information will be interpreted into useful knowledge for each component of the AEMP (e.g., hydrology, water quality, plankton, sediment, benthics, fish health/population, fish tissue). The proponent should describe the specific objectives for each monitoring component, the proposed field methods, how the data will be analyzed and interpreted, and details of quality assurance/quality control (QA/QC). Depending on the level of detail provided in Section 3 of the AEMP Design Plan, it may be helpful to provide any relevant and specific background information for each monitoring component of the AEMP.

The interpretation phase can involve comparing and integrating various lines of evidence and may include weighting evidence according to prescribed assumptions. Cause-effect relationships can be explored and

tested against data; as well, new hypotheses can also be explored and tested against the data. Analysis of AEMP findings are conducted every year, but major trend analysis and comparisons with environmental assessment predictions are conducted at minimum every three years as per the requirement for an AEMP Re-evaluation Report.

7 Special Effects Studies

While routine or long-term monitoring efforts will be described in Section 5 of the Plan, this section may be used to describe special studies that are of limited duration during the life of the project. Special effect studies may be identified as a requirement of the water licence or as part of the response to an exceedance of an Action Level in the Response Framework. For each special effect study, the proponents should provide details of the study purpose, design, and how the results will be reported.

8 Response Framework

A Response Framework for the project, developed according to the guidance provided in Part 3 of the Guidelines, should be described in this section of the AEMP. Proponents should provide a summary of their overall approach to designing the Framework and define terms such as, for example, normal range, significance threshold and Action Level.

Proposed significance thresholds, with rationale and supporting evidence should be described; supporting evidence may include, for example, information from engagement or results/measures from an environmental assessment or impact review. Action Levels should be proposed, with rationale, for key chemical, biological, and/or physical parameters that are monitored in the AEMP. Initially, proponents are required to define only Low Action Levels (see Section 3.2.2.1 of the Guidelines) for monitored parameters; Moderate or High Action Levels may be defined for those parameters that exceed the Low Action Levels within the required AEMP Response Plan. The description of each Action Level should include details of how an exceedance will be determined consistent with the AEMP data collection and analytical methodology. Suggested responses for an exceedance of Low, Moderate and High Action Levels should be described.

9 AEMP Reporting

In this section, the proponent needs to describe how they will meet reporting requirements of those water licence conditions that relate to the AEMP. Proponents should describe the purpose, timing and format/content of the following documents:

- a) the AEMP Annual Report;
- b) the AEMP Re-Evaluation Report;
- c) notification of Action Level exceedances; and,
- c) AEMP Response Plans.

The proponent should also outline its reporting and communication approach for non-technical audiences.

10 References

11 Acronyms, Glossary, and Units of Measure

The following information should be provided in this section:

- Acronyms: list and define acronyms that are commonly used within the Plan.
- Glossary: briefly define terms or words that are not used in common speech or that have a specific meaning in the context of AEMP design.
- Units of Measure: list the abbreviated units of measure used in the Plan (e.g., $\mu\text{g/g}$) and define in narrative (e.g., micrograms per gram).

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