8. Monitoring and Adaptive Environmental Management

The DMNP has been developed to improve ecological function at the Don River mouth, eliminate vulnerability to flood risk, and to remediate the derelict nature of this area of the Port Lands. Based on this problem assessment, a series of design alternatives were considered (see **Chapter 5**). The preferred design was selected based on its ability to best achieve project objectives and is detailed in **Chapter 6** and assessed in **Chapter 7**. The preferred design outlines the minimum design requirements[1] necessary to provide naturalization and flood protection (see **Chapter 6** and **Table 8-1**). The monitoring and adaptive environmental management (AEM) process presented in this Chapter will ensure that minimum design requirements are maintained and work to maximize ecological function of the DMNP as identified through a set of performance indicators[2] developed during detailed design.

Given the long design and construction period, unique character of this project, the complexity of ecological interactions and the large number of adjacent planning initiatives that influence and will be influenced by this project, this EA anticipates the need for a certain degree of flexibility within the outcomes, throughout the life of the DMNP. The monitoring and AEM process presented in this Chapter coupled with the EA amendment mechanism presented in **Chapter 9** provides a framework from which designers and project managers can use the flexibility built into the EA to maximize project benefits and minimize any potential negative effects (see **Chapter 7**) after this EA has been approved. The monitoring and AEM process will be managed by TRCA with input from other DMNP stakeholders where appropriate.

Section 8.1 describes the monitoring program that informs both the detailed design process and the AEM process for the DMNP to ensure that the objectives of the DMNP are achieved. **Section 8.2** describes the AEM process as it relates to the DMNP.

As a reminder, the objectives of the DMNP are to:

1. Naturalize and rehabilitate the mouth of the Don River;
2. Provide flood protection for Spill Zones 1 and 2;
3. Maintain the provision for navigation and existing flood protection through sediment, debris and ice management;
4. Integrate existing infrastructure that could not be reasonably moved or removed (including road, rails, utilities, trails, and power);
5. Encourage additional compatible recreation, cultural heritage opportunities and public/handicap accessibility;
6. Contribute to the revitalization and sustainability of the waterfront and coordinate with and inform other planning and development efforts and associated certain and foreseeable infrastructure; and
7. Design and implement this project in a manner consistent with Waterfront Toronto's Sustainability Framework and applicable provincial legislation.

1. ***Minimum design requirements*** *represent the minimum values for the various components of the DMNP (e.g., minimum wetland patch size). Wherever possible these values will be maximized through detailed design, but the individual project components cannot be smaller than these minimum requirements.*
2. ***Performance indicators*** *will be developed for the DMNP through detailed design to measure the environmental performance of the DMNP (see* ***Section 8.1.3****). Performance indicators relate to the functional ecological attributes of the naturalized system. Performance indicators will be developed based on the monitoring of reference wetlands, baseline monitoring and ecological models.*

Table 8-1 Minimum Design Requirements for the DMNP

Design Component	Fixed Components of the Design (Minimum Design Requirements)
Naturalization	
Wetlands	• Wetland habitat area = 13 ha
Terrestrial Habitat	• Terrestrial habitat area = 8 ha
Aquatic Habitat	• Permanent aquatic habitat area= 12 ha
Flood Protection	
All Reaches	• Overall freeboard of 0.5 m for all crossings except Lake Shore Boulevard and Harbour Lead • 10 m setback from the top of the valley slope
Reach 1	• Dimensions of Reach: – Length = approximately 290 m – Width ranges from approximately 60 to 80 m within the sediment trap area, measured from the top of the banks • Existing Lake Shore Boulevard and Harbour Lead bridges will be lengthened from the two bays that currently exist to include a total of five bays, for a total length of approximately 120 m. The soffit heights for the lengthened portions of the bridges will range between approximately 77 to 78 m. • Location and elevation of east bank flood protection landform (FPL) (minimum of approx. 80 m at the upstream end, which drops by approx. 1.5 m at the downstream end) and tie-off points for FPL east of Don Roadway
Reach 2	• Dimensions of Reach: – Length = approximately 260 m – Width of the low flow channel at its widest point = approximately 52 m – Width of the valley = approximately 185 m, measured from the top of the valley slope
Reach 2a	• Dimensions of Reach: – Length = approximately 1,150 m – Width = ranges from approximately 55 m at the east end to 90 metres where it meets the lake
Reach 3	• Dimensions of Reach: – Length = approximately 680 m – Width of the low flow channel = between approximately 24 m upstream and 33 m downstream – Width of the valley = 185 metres at the upstream end to approximately 190 metres at the downstream end measured from the top of the valley slope
Reach 3a	• Dimensions of spillway: – Length = approximately 180 m between the valley and the Ship Channel – Width = approximately 165 m measured from the top of the valley slope
Reach 4 (including promontories)	• Dimensions of Reach – Length = approximately 490 m – Width of the low flow channel = approximately 220 metres at the downstream end, where the river mouth opens to the Inner Harbour , narrowing to approximately 33 metres where it connects to Reach 3. • Location of containment berms for promontories (berms extend a max of 200 m from the existing dock wall at the average lake level)
Sediment and Debris Management	
Reach 1	• Dimensions of Sediment Trap: – Depth = 70 mASL – Area = approx. 9,955 m^2 • Location of debris management area (total footprint = 45 by 90 m)

8.1 DMNP Monitoring Program

A comprehensive monitoring program is a critical element of the DMNP from pre-design through to Post-Establishment. The monitoring program serves several functions throughout the life of the DMNP:

1. Baseline conditions monitoring during pre-design and detailed design will continue to provide data that will inform detailed design elements and identify changes to the existing environment that may affect project outcomes. Any changes identified through monitoring during pre-design and detailed design can be incorporated into the detailed design and can inform the potential need for EA amendments if necessary (**Chapter 9** presents an EA amendment process for the DMNP);
2. EA compliance monitoring will ensure compliance with EA commitments and ensure that the DMNP is constructed according to the minimum design requirements and final design elements. This monitoring information will be used to inform the AEM process (see **Section 8.2**). The AEM process can only begin once the first step of the DMNP is constructed, as described in **Section 6.6**, (up to this point any project changes are design related and will be subject to the amendment process described in **Chapter 9** if applicable); and
3. Environmental performance monitoring will measure if the DMNP functions as intended during Establishment and Post- Establishment.

A standardized data collection protocol will be established for the monitoring program to ensure data consistency. The specific data that are collected will depend on the current step of the DMNP so the type of data collected will evolve as the DMNP progresses. **Figure 8-1** shows the relationship between the different monitoring phases and project implementation.

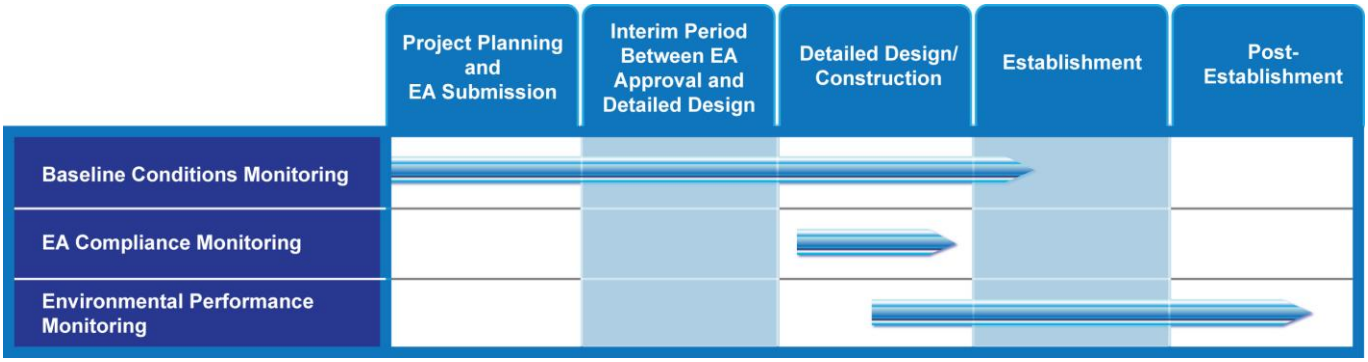

Figure 8-1 Relationship between Monitoring Phases and Project Implementation

8.1.1 Baseline Conditions Monitoring

TRCA and other agencies have been monitoring ecological conditions in the Don River and Lake Ontario for decades providing a robust baseline of existing conditions (see **Chapter 3**) which has informed the planning and design of the DMNP. Descriptions and mapping of existing vegetation and aquatic habitat in the Project Study Area and beyond has been assembled. Research has been conducted for the DMNP at reference wetland sites to obtain hydrologic and ecologic measurements for existing rivermouth systems on the north coast of Lake Ontario to develop a better understanding of how vegetation communities respond to changes in wetland bathymetry and topography.

Baseline conditions monitoring will allow TRCA to identify ecological changes that may occur between EA approval and project implementation and changes that may occur throughout the life of the DMNP as external influences exert their pressure on the enhanced conditions and newly formed channel. Continued monitoring of the baseline conditions following EA approvals will allow the TRCA to determine whether:

- Significant changes in the existing environmental conditions have occurred that would influence the form and function of the DMNP as described in **Chapter 6** prior to detailed design and/or during Construction;
- The DMNP is performing as anticipated during Establishment (i.e., it is anticipated that some areas will be completed and undergoing establishment while other reaches are still under construction); and
- The completed DMNP is sustainable and functioning under the range of future stressors that cannot be comprehensively defined at this time (i.e., due to climate change, new invasives, changes in population and land use, etc.).

The baseline monitoring and modelling work will continue through the period between EA approval and detailed design as required to ensure that the most up-to-date and relevant information is used to develop the detailed design for the DMNP.

8.1.2 EA Compliance Monitoring

EA compliance monitoring is a standard condition of approval for most projects subject to the *EA Act* in Ontario. The purpose of EA compliance monitoring is to ensure compliance with all EA and other commitments made during project planning and ensure that the DMNP is constructed and operates as described within the range of predicted effects. The MOE requires that any conditions imposed as part of the EA approval be monitored and documented for compliance.

EA compliance monitoring will take place during the detailed design, Construction and Establishment periods for the DMNP. This potentially represents a significant temporal period with respect to the implementation of the various project components. EA compliance monitoring will ensure adequate environmental protection throughout the extended construction period, document compliance with the EA, and monitor the implementation of the approved design using standard best management practices for construction. The EA compliance monitoring program will be managed by TRCA. A detailed compliance monitoring plan will be developed as part of the overall environmental management plan to guide compliance monitoring during Construction.

EA compliance monitoring will include, but may not be limited to, the following issues and potential effects:

- Ensure compliance with all commitments made in the EA including the implementation of mitigative measures as identified in the EA;
- Ensure compliance with erosion and sediment control plans;
- Ensure compliance during fish salvage and release activities;
- Ensure the implementation of fisheries mitigation measures (e.g., fisheries windows, maintenance of passage, etc.);
- Ensure the implementation of best management practices during construction (e.g., air quality mitigation measures such as dust suppression and vehicle emissions management, noise management);
- Ensure compliance with all provincial and federal permits, licenses and approvals (e.g., C of As, PTTW, etc.);
- Ensure compliance with fuel storage and handling and spill response protocols;

- Ensure compliance with waste management plans;
- Ensure provision of safe navigation during construction;
- Continue monitoring of river discharge and upstream regional weather to provide early flood warnings to construction crews (this will be undertaken as part of existing flow monitoring programs which will continue through Construction);
- Document the as-built channel features and adjacent corridor conditions immediately following construction completion;

An annual compliance report will be required for submission to the MOE, once detailed design has commenced, to report on compliance with any commitments or conditions. EA compliance monitoring will continue for each step of construction, as described in **Section 6.6**, until final grading is completed. At that time, the environmental performance monitoring program (see **Section 8.1.4**) will begin and continue through the life of the DMNP.

Table 8-2 below provides a summary of commitments resulting from the DMNP EA which will be the basis for compliance monitoring.

Table 8-2 DMNP EA Commitments

Timing	EA Commitment	EA Report Reference
Detailed Design	▶ Develop a project specific Environmental Management Plan (EMP) in accordance with Waterfront Toronto's Sustainability Guidelines and the Waterfront Toronto Environmental Management Plan for Project-Related Activities (November 2009) to describe specific mitigation and management measures, including drainage and erosion / sediment management and spill response to avoid any effects on the environment during construction	Section 6.5
	▶ Undertake a Risk Assessment / Risk Management (RA/RM) approach for the management of soil requiring treatment or disposal and groundwater (to be undertaken by Waterfront Toronto)	Section 6.5.1 and Section 7.4.2
	▶ Develop functional and final detailed design to confirm conveyance of the Regulatory Flood plus desired freeboard without affecting areas beyond the valley system, including ensuring that channel configuration in the trap area is such that any impacts to the adjacent areas are acceptable to the regulator	Section 7.4.4.3
	▶ Engage in discussions with City of Toronto Parks staff to determine responsibility for maintenance requirements	Section 7.4.8.4
	▶ Undertake a cultural heritage assessment to determine the feasibility of relocating built heritage resources (i.e., if the heritage integrity of the structure is intact) in collaboration with the City's Heritage Preservation Services Unit and other heritage stakeholders	Section 7.4.9.1
	▶ Continue to engage the Mississaugas of the New Credit First Nation, the Métis Nation of Ontario, and other interested Aboriginal communities	Section 7.4.9.3
	▶ Undertake baseline conditions monitoring and modelling work to ensure that the most up-to-date and relevant information is used to develop the detailed design for the DMNP	Section 8.1
	▶ Develop a detailed compliance monitoring plan as part of the overall specific Environmental Management Plan (EMP) to guide compliance monitoring during Construction	Section 8.1.2
	▶ Develop monitoring objectives and performance indicators and measures during detailed design for the DMNP in conjunction with Waterfront Toronto, the City of Toronto and appropriated agencies	Section 8.2.3
	▶ (In the event of amendments to the design) Prepare a technical memo to document the proposed modifications and their potential effects identified through the AEM process. The technical memo will be drafted by the TRCA in consultation with Waterfront Toronto and City of Toronto and will be circulated to appropriate stakeholders	Section 9.2
	▶ Host a public forum to review the detailed design of the DMNP and seek public input on any new information that is available to feed into the process, including similar engagement with other agencies and land owners	Section 10.4
	▶ Post regular project updates to the project webpage coordinated between TRCA and Waterfront Toronto (during both detailed design and Construction)	Section 10.4
Construction	▶ Continue dredging of the Keating Channel to maintain its current hydraulic capacity until the new river valley is connected to the lake	Section 6.5
	▶ Manage soil in accordance with a Risk Assessment / Risk Management (RA/RM) that will be undertaken by Waterfront Toronto	Section 6.5.1
	▶ Manage groundwater in accordance with the requirements of Waterfront Toronto's draft Groundwater Management Master Plan	Section 6.5.1
	▶ Ensure that all backfill material brought onto the DMNP lands from off-site sources (including the SRF as the case may be) has engineering characteristics suitable for its intended use and meets the soil quality standards, as provided in O.Reg. 153/04 and described in the Soils Management Master Plan	Section 6.5.1.4
	▶ Apply the project specific Environmental Management Plan (EMP) to avoid any effects on the environment during construction	Section 7.4.2

Table 8-2 DMNP EA Commitments

Timing	EA Commitment	EA Report Reference
	▶ Where property is privately held, is subject to longer-term leases, or is owned by the Federal government, arrangements will be made for loss of property and/or activity (i.e., negotiations for potential relocation and/or compensation)	Section 7.4.8.1
	▶ Establish clearly marked navigation aids in applicable locations regarding construction of the promontories	Section 7.4.8.3
	▶ Ensure that a professional archaeologist is on site to monitor excavation in areas of archaeological potential	Section 7.4.9.2
	▶ Undertake baseline conditions monitoring during Construction to determine whether significant changes in the existing environmental conditions have occurred that would influence the form and function of the DMNP	Section 8.1.1
	▶ Establish an advisory committee of local stakeholders who will review construction progress, particularly as it relates to soils and groundwater management issues relating to public health and risk	Section 10.4
	▶ Host a public forum to provide construction details and schedules when the information is available	Section 10.4
Establishment/ Post-Establishment	▶ Ensure regular dredging of sediment trap and trap management	Section 7.4.4.2
	▶ Ensure long-term maintenance of connecting feeder channels	Section 7.4.4.2
	▶ Conduct regular maintenance of upstream and sideflow weirs to ensure proper operation during flood events and ensure regular maintenance of slurry pipe along the Don Roadway.	Section 7.4.8.3
	▶ Monitor environmental performance to measure desired outcomes related to naturalization, flood protection (including management of the impacts of more frequent flooding events) and sediment, debris, and ice management; determine if they have been achieved; trigger adaptive measures where necessary; and inform the refinement of the as-built features	Section 8.2.3
Commitments Affecting other Projects	▶ New development areas as defined within the Provincial Policy Statement (PPS, 2005) will be required to be set back from the top of valley slope of the new river valley by 10 metres horizontally	Section 6.1.1.6
	▶ All vehicular traffic/fixed bridges and pedestrian bridges will be designed to meet the requirements for navigation	Section 6.2.1
	▶ All crossings will be designed to span the floodplain and to pass the Regulatory Flood with 0.5 metre freeboard (with the exception of the Lake Shore Boulevard and Harbour lead crossings)	Section 6.2.1
	▶ Coordinate with infrastructure construction to ensure utility conduits and bridge crossings proceed in conjunction with construction of river valley segments.	Sections 6.6.3.2 and 6.6.4

8.1.3 Environmental Performance Monitoring

The purpose of environmental performance monitoring is to measure desired outcomes related to naturalization, flood protection (including management of the impacts of more frequent flooding events) and sediment, debris, and ice management; determine if they have been achieved; trigger adaptive measures where necessary; and inform the refinement of the as-built features. Environmental performance monitoring will commence at the completion of each construction step, following final grading and as-built documentation. **Table 8-3** provides examples of general environmental performance monitoring requirements for biophysical components of the DMNP.

Table 8-3 General Environmental Performance Monitoring Requirements for Biophysical Components of the DMNP

Biophysical Component	Environmental Performance Monitoring Requirements
Aquatic Habitat and Species	• identify trends of aquatic habitat and species targets through Post-Establishment • evaluate aquatic habitat and species against intended modeled outcomes and historical conditions
Wetland Function	• evaluate wetland function against intended modeled outcomes
River Form and Function	• observe impact of major flow events on river form and the effectiveness of river management features • observe major flow events to evaluate effectiveness of flood protection measures
Terrestrial Habitat and Species	• evaluate the trajectory of newly created terrestrial habitat against intended outcomes
Surface and Groundwater Quality	• evaluate the effectiveness of on-site stormwater controls • observe the effectiveness of contaminated groundwater isolation measures
Flow and Precipitation	• document changes in flow and precipitation patterns over time to inform the need for management adjustments

TRCA monitoring frameworks (e.g., Tommy Thompson Park Cell 1 Capping and Port Union) provide examples of performance monitoring that could be adapted specifically for the DMNP. These existing monitoring frameworks will be augmented with additional performance indicators that address ecological, social and economic aspects of DMNP objectives. Monitoring results will be compared against the performance indicators developed during detailed design. The comparison of performance indicators against monitoring results is the key driver of the AEM process described in **Section 8.2**. Monitoring results are compared to performance indicators to determine if AEM measures are required to achieve desired outcomes. The performance monitoring framework will be finalized during detailed design in conjunction with Waterfront Toronto, the City of Toronto, MOE and other appropriate agencies.

8.2 Adaptive Environmental Management

To ensure that the preferred design functions as desired, based on the information presented in **Chapter 6**, an approach to ongoing management is required to continually fine tune project components and ensure long term project success. AEM provides a clear process for ongoing management of the DMNP to ensure project objectives continue to be achieved through positive feedback mechanisms.

8.2.1 What is Adaptive Environmental Management?

The CEA Agency defines AEM as a systematic process for continually improving environmental management practices by learning about their outcomes and applying that knowledge to improve the outcome. AEM allows for flexibility in project management so modifications and refinements can be incorporated throughout the project life cycle (CEA Agency, 2009). AEM is fundamentally a way of incorporating learning through monitoring into a feedback loop that enhances project outcomes. Undesirable environmental effects are identified early so that

management interventions can be implemented promptly to avoid major problems before they occur and to maximize fulfillment of the project objectives.

8.2.2 AEM Strategy for the DMNP

The outcome of naturalization projects depends on the interaction between the biological components with the underlying physical components that are created: terrain, soils and hydrology which can all be modified by changes in climate; and how people use the DMNP area and the surrounding areas.

An AEM strategy is desired for the DMNP for a number of reasons including:

1. The need for a flexible strategy to address ecosystem response to changing environmental conditions and human use stressors during sequential construction of the new river reaches and adjacent wetland and terrestrial habitat;
2. The need to create the opportunity to maximize project benefits and minimize negative effects throughout the life of the DMNP;
3. The need to adjust sediment trap management in response to unexpected downstream ecological responses, unusual weather conditions, sudden wide-spread changes in watershed land use conditions, and long-term climate change; and to adjust debris and ice management as appropriate;
4. The need to respond to changes in local weather patterns and long-term climate change that may alter lake water levels and the frequency and duration of inundation of the naturalized features; and/or the severity and frequency of extreme flood events; and
5. The need to respond to changes or benefits related to future projects and planning initiatives in the general project area and elsewhere in the Don River watershed and to take advantage of enhancements that those projects may provide to this system.

Figure 8-2 outlines the AEM cycle. The AEM cycle will be applied once construction of each reach of the DMNP is implemented and will inform ongoing management activities, future construction activities and future projects through a feedback mechanism from lessons learned. AEM is the ongoing cycle of monitoring, evaluation, adaptation and learning.

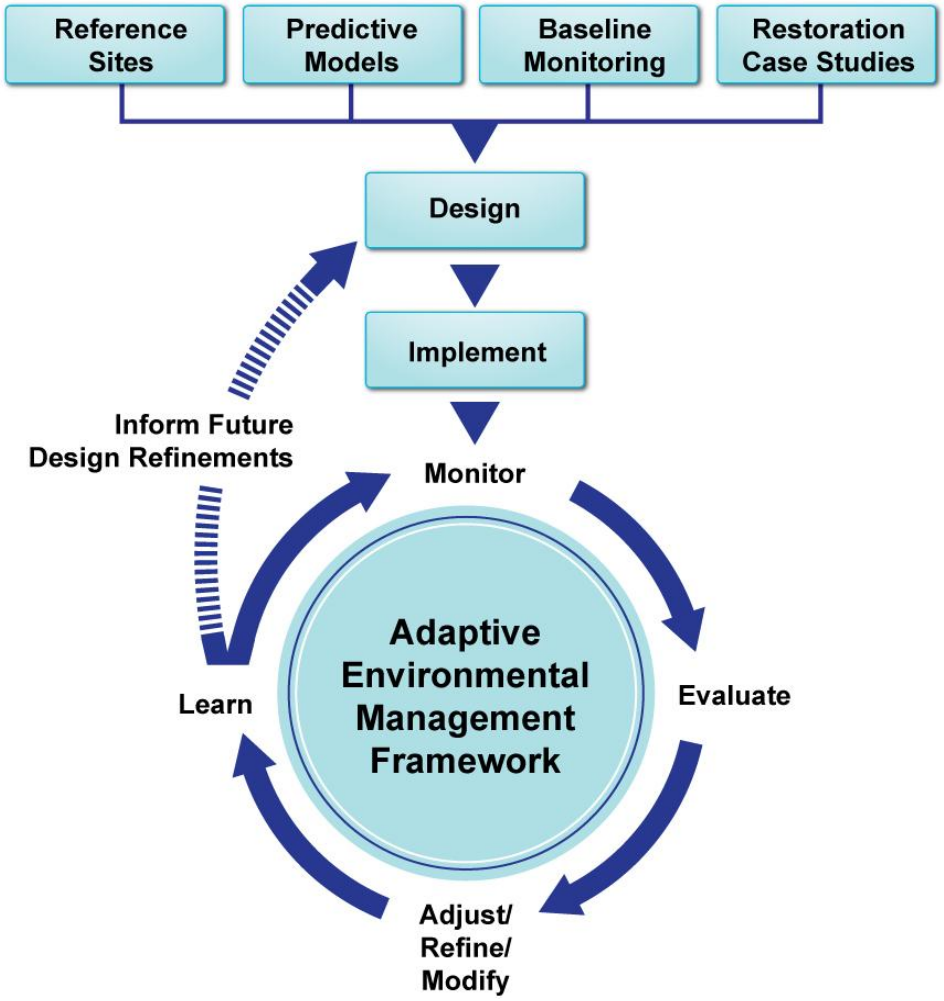

Figure 8-2 Relationship between Project Design and AEM

In the face of such complexity, the ability to affect the outcome through monitoring and adaptation in response to stochastic events is paramount. The AEM process offers the best process by which to achieve this flexibility. The purpose of AEM and associated monitoring programs is to increase the likelihood of meeting project goals despite uncertainty surrounding various project elements.

8.2.2.1 Monitoring and Evaluation within the DMNP AEM Process

Monitoring is a key component of the adaptive management framework as it establishes conditions pre- and post construction and allows the determination of what effects are occurring as a result of project activities. It identifies environmental changes that are occurring at various spatial scales that may affect project outcomes. Monitoring allows for the systematic testing of different actions to assess their ability to achieve a desired outcome. The key is to develop an understanding of not only which actions work and which do not, but also which stressors are creating an impact to the system and how. The monitoring data that feed into the AEM process will be robust and scientifically defensible, providing information that will maximize opportunities to achieve desired outcomes.

The achievement of project objectives is assessed by monitoring the system and evaluating the data against pre-defined performance indicators. If the desired outcomes are not achieved, the project implementation may need to be adapted. The objective is to maximize benefits in relation to the performance indicators (i.e., AEM will seek to maximize measured values related to indicators wherever possible).

An advantage of the extended "build-out" period for the DMNP is that techniques and designs can be monitored and evaluated as they are installed and provide insight in terms of adaptations that will better fulfill the project objectives.

The evaluation component of AEM will include specific triggers that will determine when management interventions will be examined and implemented (see **Figure 8-3**). Evaluation of monitoring data provides the foundation for learning from the DMNP. These lessons will inform required modifications to the monitoring program (i.e., increase or decrease in monitoring frequency; changes in performance indicators; identification of new objectives or better techniques) and modifications to the ecological models used for project design.

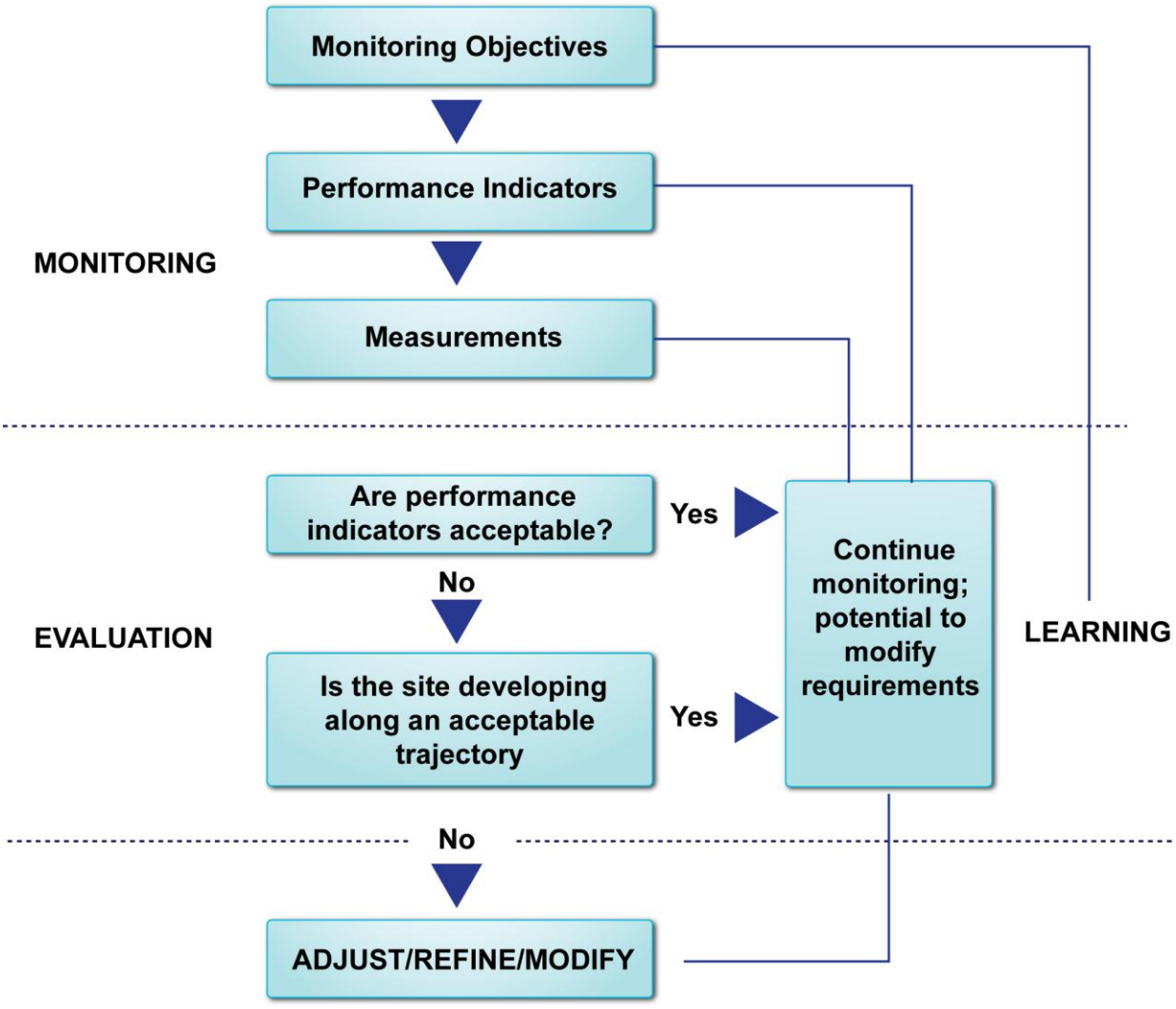

Figure 8-3 Monitoring and Evaluation within the AEM Cycle

8.2.2.2 Adjustments, Refinements, Modifications within the DMNP AEM Process

Adaptation (adjust, refine and/or modify) is about taking action to increase the likelihood of achieving project objectives. The purpose of an AEM strategy is to identify undesirable environmental effects early so management interventions can be implemented to avoid major problems before they occur. The environmental performance monitoring described in **Section 8.1.3** will provide clear evidence of project outcomes during Establishment. Results from monitoring and evaluation will inform the need for adjustments, refinements or modifications to project design or operations. **Table 8-4** provides examples of potential AEM triggers and possible adjustments, refinements, or modifications that could be implemented to address any identified problems. The specific triggers for adjustments, refinements or modifications and the specific management options will be refined during detailed design and included in an AEM work plan.

Table 8-4 Potential AEM Triggers and Adaptive Measures for Project Components

Project Component	Potential AEM Triggers	Potential Adjustments, Refinements or Modifications
Aquatic Habitat and Species	• Undesired fish species composition • Underperformance of species recruitment to the area (as predicted by the various habitat models) • Undesired spatial distribution of riparian or wetland ELC communities • Impairment of habitat features (sedimentation, ice scour, etc.) that significantly affects performance as intended / designed • Over representation of undesirable species (e.g., carp) • Impacts to created habitat and/or wildlife by people and/or pets	• Adjust / enhance aquatic habitat features and habitats to promote desired species composition • Expand monitoring to identify root causes of low species recruitment • Adjust weir management to adjust plant community • Repair/re-establish habitat features • Refine invasive species (e.g., carp) management program • Adjust public access to habitat areas, bylaw changes, enforcement, etc
Wetland Function	• Excess sedimentation of wetland areas • Ineffective hydraulic connection to the river • Undesired hydroperiod in wetlands • Undesired species composition	• Revise sediment management; implement corrective action for accumulated sediment • Adjust artificial levees (e.g., to avoid excess sedimentation, to retain water in flood events) • Modify frequency and volume of sediment management upstream • Modify flooding frequency, depth and/or duration • Modify vegetation composition using appropriate methods • Adjust weir management
River Form and Function	• Flooding occurring in unanticipated areas within the valley system • Flooding occurring at different frequency/intensity than predicted • Bank stability engineering controls not functioning as expected • Sediment trap not collecting sediment as expected • Ice management system not functioning as designed	• Change weir management in response to observed levels • Modify bank stability controls to address erosion problems • Reconfigure sediment trap design or modify sediment removal schedule as appropriate • Reconfigure debris trap design as appropriate • Reconfigure ice management design as appropriate
Terrestrial Habitat and Species	• Undesired species composition • Undesired spatial distribution of ELC communities • Inadequate species diversity • Cover not effectively controlling erosion • Recreation/human use causing degradation of habitat • In-adequate species diversity and abundance utilizing habitats as project desired	• Conduct vegetation management (herbicide application, manual removal, re-seeding, etc.) • Re-vegetate or adjust cover management system to control erosion • Reconfigure/manage human use patterns • Adjust/enhance wetland and terrestrial habitats as required to attract desired species or abundance

Project Component	Potential AEM Triggers	Potential Adjustments, Refinements or Modifications
Surface and Groundwater Quality	• Contamination from adjacent port lands area migrating into the naturalized area	• Review engineering controls for contamination isolation and adjust as appropriate
Flow and Precipitation	• Flood control not occurring as expected	• Change weir management in response to observed flow levels

8.2.2.3 Learning within the DMNP AEM Process

One of the greatest benefits of the proposed AEM strategy is that it will allow for ongoing learning related to the outcomes of the DMNP and future projects. Learning involves systematically documenting the results of monitoring, evaluation and adaptive measures, and providing lessons learned to a wide audience. TRCA, Waterfront Toronto, academia, other agencies and organizations and the global urban renewal community will benefit from an improved understanding of effective naturalization techniques established through the AEM strategy for the DMNP. Monitoring programs will determine if predictive models provided accurate information to appropriately inform design. Where monitoring reveals any inaccuracies within the predictive models, adjustments can be made for future designs. It is important to recognize that projects of this magnitude and complexity are rare in the world and should be documented for communication to a wide audience.

Documentation of the monitoring, evaluation and adaptive measures described in this chapter will be used to inform similar projects that are undertaken in the future. By applying the monitoring and adaptive management process outlined in this Chapter, a robust database will be created that can be drawn upon for future projects related to Toronto's Waterfront revitalization and other naturalization efforts.

This cycle of monitoring, evaluation, learning and adaptation will be applied to the DMNP to respond to uncertainties and external influences related to the DMNP and the environment. Examples of external influences are numerous with a prime example being climate. Climate change is expected to influence management of the DMNP into the future given the duration of the build-out period and the fact that the DMNP will establish a new ecological system that will exist and evolve in perpetuity. Climate change may result in lower water levels in Lake Ontario, influencing recharge capabilities or inundation levels in the constructed wetlands. To address these potential changes, the wetlands and feeder channels will be designed with a diverse range of bathymetries to ensure that vegetation can adapt appropriately. Monitoring the conditions over time following completion of Construction and Establishment will allow TRCA to respond to change by implementing appropriate AEM measures.

Further complications arise as a result of the build out period for the DMNP that may extend over a number of years. This may trigger a management response to address change to the environmental, social or economic context of the DMNP. It can also be anticipated that the performance of sediment, debris and ice management components will also potentially require refinement throughout the life of the project.

8.2.3 Operationalizing the AEM Strategy

The sections above outline the AEM strategy and how it relates to project objectives and monitoring. However, the details of the strategy will be defined during detailed design as project details become more concrete. Using existing monitoring frameworks developed for Tommy Thompson Park and Port Union as a template, TRCA working in consultation with Waterfront Toronto and other relevant stakeholders will develop monitoring objectives and performance indicators and measures during the detailed design process for the DMNP. The timing of this activity will be determined by the availability of funding and how quickly the detailed design proceeds.

As the first phase of construction is complete the AEM strategy will start to be applied and it will be refined as necessary as information is collected and assessed. As long as the naturalized and flood protection systems are functioning as anticipated there will be no need to identify adaptations, modifications or refinements to either system elements and/or operational systems.