Healthy Waterways Strategy

Monitoring, Evaluation, Reporting and Improvement Framework

Working together for healthy waterways

Acknowledgement of Country

The communities, stakeholders and Melbourne Water, who together are responsible for implementing this *Healthy Waterways Strategy Monitoring, Evaluation, Reporting and Improvement Framework*, acknowledge and respect Traditional Owners and Aboriginal communities and organisations. We recognise the diversity of their cultures and the deep connections they have with the region's lands and waters.

We value partnerships with them for the health of people and Country.

We pay our respects to Elders past and present, and acknowledge and recognise the primacy of Traditional Owners' obligations, rights and responsibilities to use and care for their traditional lands and waters.

Executive Summary

The establishment of monitoring, evaluation, reporting and improvement (MERI) processes at the start of the Healthy Waterways Strategy ensures that the correct data will be gathered initially and throughout the duration so that a robust evidence-base can be drawn on to assess progress, effectiveness, impact and improvement opportunities.

This document serves as a framework for how these processes will be enabled and establishes the following:

- The scope of the MERI plan

- Key principles for guiding MERI plan activities

- High level key evaluation questions (KEQs) which will guide data collection and evaluation and reporting

- Outlines the high level program logic which underpins targets in the Strategy

- Describes how high risk assumptions and externalities in the logic will be monitored

- Summarises the indicators which will be used for tracking progress against targets

- Outlines standards for data management

- Outlines how continuous improvement and adaptive management will be enabled

- Presents a staged approach for implementing and improving the MERI Plan

Scope of the MERI plan

The MERI Plan outlines monitoring requirements for all the Regional and Sub-catchment Performance Objectives in the Strategy. The Plan will include detailed monitoring and evaluation plans (MEPs) for key values and conditions for each of the three ecosystem types – rivers, wetlands and estuaries. The MERI Plan will span the full 10 years of the Strategy implementation and provide an end of strategy review to guide a refresh of the strategy in 2028.

The MERI Plan will not be limited to evaluating actions solely carried out by Melbourne Water but will include all management activities that contribute to performance objectives. As such is it expected that partner organisations will contribute data and information as it relates to indicators prescribes in the MERI framework or the MEPs.

Principles for the MERI framework

The principles that have guided the development of the MERI framework are the following:

- Be fit-for-purpose
- Use mixed methods
- Contribute to adaptive management
- Foster effective partnerships
- Enable consistent communication

- Flexible
- Be cost-effective
- Prioritise the health, safety and wellbeing of those undertaking MERI activities

A framework for adaptive management

The management of rivers, wetlands and estuaries in the region will be conducted within an adaptive management framework. At the core of adaptive management is the ability to learn from previous experience, update management approaches to reflect the knowledge gained and changes in our environment that occur during implementation, and manage uncertainty such as increase in temperature, changed rainfall patterns or sea level rise.

Adaptive management will happen at a range of spatial and temporal scales and across all the partners involved in the HWS. The key investigative pathways through which adaptation may occur include:

- **Surveillance** – environmental scans and broadscale condition monitoring will highlight what is changing and what the drivers are

- **Intervention** – monitoring effectiveness of works and evaluation of investment programs will highlight what is working well and what can be improved

- **Research** - improving knowledge about values and threats, and testing program logic assumptions will allow conceptual and quantitative models to be refined over time allowing better strategic decisions to be made. Research into new technologies and management approaches will ensure the most cost-effective actions are being implemented

While lessons will be disseminated broadly through various formal and informal networks that either exist or will evolve over the coming years - the Catchment Forums and the Regional Leadership Group will be fundamental to enabling adaptation to occur. The Catchment Forums will set the measures of success, contribute to the judgement of achievements and identification of lessons. Regular progress reporting through these groups on the achievement of targets and key outcomes from surveillance monitoring, intervention monitoring and research will be critical to understanding issues and making decisions about how to adapt.

Through consensus the Catchment Forums will have the ability to modify targets in the Co-Designed Catchments Programs based on new information. The Regional Leadership Group will be made aware of significant issues which require high level attention so that appropriate improvements can be made.

Program logic

A program logic explains how change is expected to occur. The program logic presented in the MERI framework outlines how the various types of performance objectives lead to condition and value outcomes which ultimately lead to the goals and visions set for each of the five catchments across the region.

Assumptions underpinning the program show weaknesses and potential for failure in the achievement of outcomes. Key assumptions underpinning the program logic and how they will be monitored and tracked are described in the framework. More detailed assumptions and logics will be outlined within the MEPs.

There are also a number of external factors that are outside of the control of the Strategy but will affect the achievement of outcomes regardless e.g. major bushfires or floods. While there was a base case for the strategy that included projections for climate change, population growth and managing drought conditions, the magnitude and severity of these factors may go beyond that assumed in the strategy. Surveillance monitoring of these important contextual drivers is important to understand their influence and how they impact on the achievement of outcomes.

Key Evaluation Questions

The following key evaluation questions will guide evaluation of the Strategy.

Evaluation question	When it is asked
KEQ No. 1 - To what extent have the performance objectives of the Strategy been achieved?	• Annual • Event-based (as needed)
KEQ No. 2 - To what extent have river, wetland and estuary conditions been maintained or improved?	• Mid-term (2022) • End of Strategy (2026)
KEQ No. 3 – What is the state of waterway values?	• Mid-term (2022) • End of Strategy (2026)
KEQ No. 4 -To what extent has the delivery of the Strategy been effective and efficient?	• Mid-term (2022) • End of Strategy (2026)
KEQ No. 5 – Will the environmental, social and cultural benefits acquired through the HWS continue over time?	• End of Strategy (2026)

Evaluation and reporting

It is important to note that while monitoring is conducted in an ongoing way, evaluation is done at various points in time. Learning and improvement can happen at any time.

Four evaluation activities underpin this MERI framework: annual reporting, a mid-term evaluation, an end of strategy evaluation and a 'Red Report' (Figure 2). An event based Red Report will ensure significant events can be communicated and addressed in a timely manner. It may include the need to respond to increasing drying conditions or an acute event such as a flood or a fire.
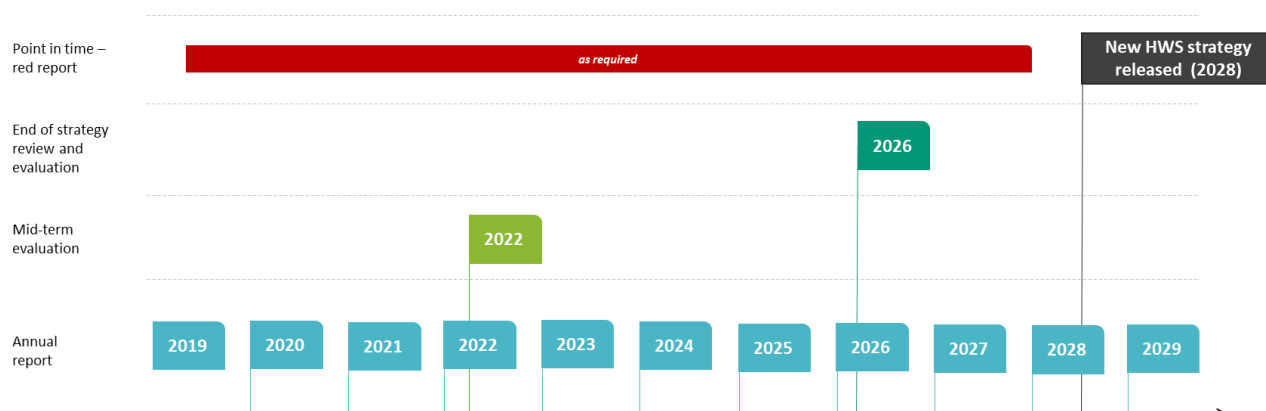
Implementation of the MERI framework

The HWS MERI framework includes a number of gaps in our knowledge and understanding around what should be monitored and how evaluation will occur. As such the MERI framework will need to be reviewed and improved over time. New indicators will be developed and specifications and data requirements and systems will need to be developed and implemented.

A key step over the coming months is further consultation with Strategy partners on the development of more detailed Monitoring and Evaluation Plans for Rivers, Estuaries and Wetlands. The HWS MERI Framework will be updated following a consultation period and following the development of the MEPs. The HWS MERI Framework may also be updated as a result of actions undertaken to improve the models and clarify targets, research results or a review of the HWS Strategy.

The following three stages are proposed:

1. **Foundation** years 1-2 (2019/20-2020/21) involves finalising MEPs, refining indicators, improving systems and data management, collecting phase 1 data, testing evaluation methods and developing report templates and conducting the first annual review.

2. **Implementation** years 3-5 (2021/22-2023/24) involves refining the website reporting system and implementing agreed evaluation and reporting methods

3. **Refine and adjust** years 5-10 (2023/24 – 2024/2028) regular evaluation of how the MERI Plan is being implemented and make improvements as required

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Introduction

The Healthy Waterways Strategy provides a shared vision and goals for protecting and improving waterways across our region. Following release in 2018, the Strategy is being put into action - using it to guide how we work together, share knowledge, set priorities, and plan ahead.

The establishment of monitoring, evaluation, reporting and improvement (MERI) processes at the start of the Strategy implementation ensures that the correct data will be gathered initially and throughout the duration of its implementation so that a robust evidence base can be drawn upon to assess progress, effectiveness, impact and improvement opportunities. Noting, that as better monitoring indicators or methods are identified through reviews and assessments, MERI processes will adapt.

MERI processes enable program outcomes to be measured, evaluated and reported, and help to improve organisational knowledge and practice. A well-designed MERI Plan can help to accurately map out the key evaluation questions and indicators to measure in order to help understand the success of strategy implementation and improve future implementation.

Structure of the Healthy Structure of the Healthy Waterways Strategy MERI Plan

Setting up appropriate monitoring, evaluation, reporting and improvement processes for the Healthy Waterways Strategy (HWS or the Strategy) includes two key components: A MERI framework (this document), and a series of Monitoring and Evaluation Plans (MEPs) for each element of the waterway network (rivers, wetlands, estuaries).
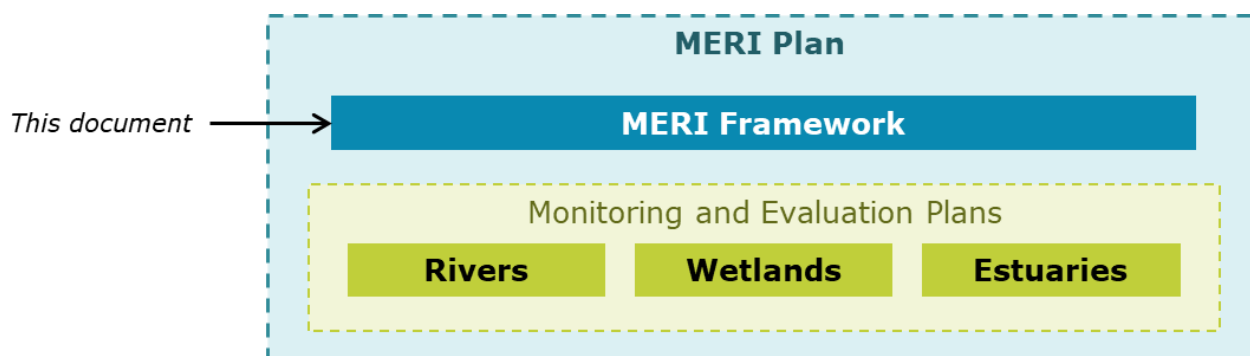
The **MERI framework** (this document) is designed to:

- Clarify the scope and rationale for MERI

- Set the strategic direction for HWS MERI

- Document the overarching program logic for the HWS MERI

- Establish high level key evaluation questions and methods to evaluate the progress of the strategy

- Summarise key indicators that will be monitored (and links to regional and sub-catchment performance objectives)

- Outline the approach to reporting

- Establish and clarify processes and opportunities for adaptive management to occur

- Outline the governance arrangements associated with MERI processes

Sitting below the MERI Framework, separate **Monitoring and Evaluation Plans (MEPs)** for each element of the waterway system (rivers, wetlands, estuaries), these are designed to:

- Document the theory of change between foundational activities, outputs, performance objectives and outcomes specific to all conditions

- Provide further specific detail on what MERI activity is required – including how key knowledge gaps will be addressed, how values, conditions and threats will be monitored and links to relevant research

- Outline operational roles and responsibilities for MERI activites

Principles for the MERI framework

This MERI Framework is informed by the scope, goals and objectives of the Healthy Waterways Strategy and a pragmatic approach to resources, stakeholders and program delivery. The principles that have guided the development of the MERI framework are:

- **Be fit-for-purpose**
  Must be simple, grounded in a rigorous methodology guiding data collection, analysis and decision making, easy to implement, transparent and appropriate to the aims of the Strategy.

- **Use mixed methods**
  Use a mix of qualitative and quantitative methods to ensure the robustness of data collection and analysis and to facilitate effective communication of results to the broadest audience possible. Redundant monitoring will attenuate risk of indicators not accurately representing key values.

- **Contribute to adaptive management**
  Must seek to enhance the capacity of all stakeholders to identify what works well and what can be improved in current practices by informing adaptive management approaches.

- **Foster effective partnerships**
  The MERI framework should foster effective partnerships between all stakeholders involved in implementing the Strategy. The MERI framework should explore opportunities for collaborative monitoring and reporting, and seek to assign responsibilities for those activities effectively.

- **Enable consistent communication**
  The MERI framework should provide the structure by which stakeholders at the regional, catchment and sub-catchment scales can consistently report evaluation results and communicate them to relevant audiences.

- **Flexible**
  The MERI framework needs to allow for changes over time and not be unnecessarily rigid or prescriptive.

- **Be cost-effective**
  The MERI framework is to ensure cost-effectiveness of monitoring and evaluating by ensuring that benefits outweigh costs, including using existing monitoring programs and associated data where appropriate to avoid duplication.

- **Prioritise healthy, safety and wellbeing**
  As monitoring programs and activities are undertaken for the MERI plan, they must prioritise the healthy, safety and wellbeing of those delivering these programs. Safety must be embedded and considered upfront in all planning and strategic decisions. Achievement of a strategic objective should not be at the expense of safety and wellbeing.

Scope and focus of the MERI framework

The scope of this MERI framework covers all waterway assets within the Port Phillip and Westernport Region that are referred to in the Strategy. So while not all wetlands in the HWS include Performance Objectives, condition monitoring of wetlands will be broader and based on an appropriate selection of sites and metrics. Further details on monitoring the trajectory of values and conditions for rivers, wetlands and estuaries will be captured in the MEPs.

The MERI Plan will span the full 10 years of HWS implementation and will provide an end of strategy review which will guide a refresh of the strategy in 2028.

The MERI Plan will not be limited to evaluating actions solely carried out by Melbourne Water but will include all management activities that contribute to performance objectives. As such is it expected that partner organisations will contribute data and information as it relates to indicators prescribes in the MERI framework or the MEPs.

Key documents for the MERI framework

Healthy Waterways Strategy

The Strategy is the overarching planning document for the management of rivers, wetlands and estuaries in the Port Phillip and Westernport region aiming to ensure their value to the community is protected and improved, taking a 50-year outlook. The document provides the context for the Strategy, outlines the methodology for its development, and summarises the performance objectives for the five major catchments.

The Strategy is the foundation for the MERI framework, describing at a regional scale the target outcomes, baseline for comparison, assumptions and external drivers, and the ways in which the strategy will be implemented. This MERI framework meets target RPO41 in the Strategy.

Co-Designed Catchment Programs

Adaptive programs have been collaboratively designed for each of the five major catchments. These programs will be reviewed and updated over the 10-year life of the Strategy to reflect

changes in catchment condition, progress of works, and to respond flexibly to emerging opportunities or challenges.

These programs provide specific details of 10-year outcomes required in each of the local sub-catchments (a total of 69 across the region) and are written in alignment with the overarching Strategy. Their delivery will enable successful implementation of the Strategy and therefore contribute to long-term, 50-year outcomes.

The co-designed catchment programs describe the sub-catchment scale outcomes and expected response of conditions and key values.
Note: the catchment programs do not outline activities that are planned to be undertaken, rather the intended outcomes (articulated as 'performance objectives').

Co-Designed Catchment Programs

Healthy Waterways Strategy Resource Document

This technical reference documents the methods and approaches, assumptions and limitations relevant to the development of the Strategy.

The resource document provides the technical background to the data and methodologies applied in determining the baseline that much of the MERI activity will compare to. Where changes to the methods applied to determine the baselines are recommended, the MERI outlines the proposed changes and new methods to be used.

A framework for adaptive management

At the core of adaptive management is the ability to learn from previous experience, update management approaches to reflect knowledge gained and changes in our environment during implementation, whilst managing future uncertainty such as increases in air temperature, changed rainfall patterns or sea level rise.

A successful adaptive management approach is one that is flexible and responsive to change; focused holistically on socio-ecological interactions; well informed by a diversity of perspectives; reflective in decision-making, and innovative in problem-solving. There are some important points to bear in mind when undertaking the process:

- **Adaptive management is a big space**. There is lots of potential to get lost in the detail, sacrificing efficiency for 'busy-ness' so the scope and objectives must be clear. Initiatives need to stay at the appropriate level.

- **There is no silver bullet**. Introducing adaptive management practices requires change in attitudes and behaviour which can be a long process. Different people will approach it differently, so it is important to offer a range of activities that appeal to varied applications.

- **It's about 'learning by doing'.** The adaptive management program should be learning as well. The process involves taking small steps and learning as we go using short feedback loops that allow us to make changes quickly and constantly improve.

- **It's <u>not</u> about more monitoring.** Rather than gather more information, the adaptive management approach will put processes in place to ensure monitoring is targeted, efficient and coordinated, to inform the direction of programs and the next Strategy.

Who is involved

While lessons will be disseminated broadly through various formal and informal networks that either exist or will evolve over the coming years, the Catchment Forums and the Regional Leadership Group will be fundamental to enabling adaptation to occur. The Catchment Forums will set the measures of success and also contribute to the judgement of achievements and identification of lessons.

Regular progress reporting through these groups on the achievement of targets and key outcomes from surveillance monitoring, intervention monitoring and research will be critical to understanding issues and making decisions about how to adapt.

Through consensus the Catchment Forums will have the ability to modify targets in the Catchments Programs based on new information. The Regional Leadership Group will be made aware of significant issues which require high level attention so that appropriate improvements can be made.

How targets in the Strategy might evolve and change

The following principles will guide how both the strategy and the catchment programs can adapt over time:

- **Co-Designed Catchment Programs**
  Changes to the Waterway Targets within the co-designed catchment programs and the sub-catchment performance objectives will be endorsed by the Catchment Collaborative Forums so long as they do not lead to a decline in the major catchment average projected targets contained within the HWS main document.

- **Healthy Waterways Strategy 2018**
  Proposed changes that result in a predicted decline to the major catchment average value and condition target trajectories requires a review of the HWS main document and approval by the minster via the Regional Leadership Group.

  Proposed changes to Regional Performance Objectives should be endorsed by the Catchment Collaborative Forums and also require approval by the Minister.

Pathways to embed improvement in Strategy implementation

The MERI plan leads by example, using feedback loops and learning-by-doing to gain insights and react quickly to new information.

Ongoing collaboration during strategy implementation is a foundation to the successful practice of adaptive management. In the MERI plan there are the following lines of investigations to help learn and change:

- **Surveillance** – environmental scans and broadscale value and condition monitoring will highlight what is changing and what the drivers are.

- **Intervention** – monitoring effectiveness of works and evaluation of investment programs will highlight what is working well and what can be improved.

- **Research** - improving knowledge about values and threats, and testing program logic assumptions to allow conceptual and quantitative models to be refined over time, as well as supporting better strategic decision making. Research into new technologies and management approaches will ensure the most cost-effective actions are being implemented.

Table 1 further outlines what these lines of investigation will lead to, in terms of scale of change, what we might learn, how we share the results and how we conclude to make change. The type of things that may change include new/revised targets, new/amended actions, new conceptual models, development of guidelines, revising of investment programs and delivery mechanisms. The KEQs are designed to further help focus the types of investigations that occur.

There are many delivery programs and activities associated with the Strategy that may have their own detailed MERI plan. Alignment of the indicators between the HWS MERI framework and these other plans is critical to embed improvement pathways into delivery organisations and also ensure the efficient and effective linking of evaluations to make them relevant at a strategic level.

Table 1: Examples of the change pathways from different investigation types in the MERI framework

Type of investigation	Scale – spatial and temporal	What you might learn	How lessons are shared	What can change
Surveillance	Reach scale value and condition data	Threatened species found	Social media Collaborative Forums Communities of practice	Level of monitoring New performance objective

Type of investigation	Scale – spatial and temporal	What you might learn	How lessons are shared	What can change
	Sub-catchment scale trajectories	Stormwater condition declining due to lack of new standards	Collaborative Forums Regional Leadership Group Annual report Red Report	Targets Performance Objectives Best Practice Guidelines Investment Policy
	Strategy – region wide – value and condition trajectories	Trajectory of platypus changes	Collaborative Forums Regional Leadership Group Annual or mid-term report	Targets Performance Objectives Investment Policy
Intervention	Project - site / reach scale	New approach to weed control	Social media Collaborative Forums Communities of practice	Best Practice Guidelines
	Investment Program – catchment scale	A more cost-effective delivery mechanism e.g. grants versus capital investment	Within and between agencies Collaborative Forums Feedback to Regional Leadership Group	Program budget allocations
	Strategy investment – region wide	Significant under achievement of performance objectives across the region	Collaborative Forums Regional Leadership Group Annual or mid-term report	Targets Performance Objectives Investment Policy
Research	Region-wide – values	Better understanding of critical ecological processes and the ecology of key species	Research forums Technical reports Papers Catchment Forums Regional Leadership Group	Conceptual models Quantitative models Management Guidelines
	Region-wide – values and conditions	Better understand the impacts of climate change on riparian vegetation	Research forums Technical reports Papers Catchment Forums	Vegetation guidelines Specifications

Type of investigation	Scale – spatial and temporal	What you might learn	How lessons are shared	What can change
			Regional Leadership Group Delivery teams	
	Region-wide	Better understand the compatibility between social and environmental values and where there are competing objectives	Catchment Forums Regional Leadership Group Delivery teams	Performance Objectives

Program logic for the MERI framework

Program logic is an approach to planning (commonly used in natural resource management) that uses a diagram to demonstrate the rationale for a program, including the relationships between actions, targets, goals and ultimately how the vision is expected to be achieved.

It provides the rationale for how, over the 10-year implementation period, the shorter-term outcomes (performance objectives) collectively contribute to either maintaining or improving the waterway conditions, in turn maintaining or improving the status of the key waterway values, and ultimately contributing to the regional and catchment visions and goals for waterways.

In the long term, this will ensure that the waterways can continue to support environmental, social, cultural and economic values. The MERI plan provides a mechanism to check and adjust implementation, performance objectives and targets to respond to changing conditions, successes or failures, and evolving challenges during the life of the Strategy. The program logic presented in the Strategy is shown in Box 1.

The overarching program logic for the MERI plan is shown in Figure 1.

The scope of the Strategy is such that the number of outputs and outcomes being targeted are too many, and too broad in categorisation to capture in a single logic. Therefore, this MERI Framework contains an overarching program logic to demonstrate the basic connections between key values, waterway conditions and performance objectives, without describing them in comprehensive detail.

The Monitoring and Evaluation Plans (developed for rivers, wetlands and estuaries) will include further detailed program logics under key categories of waterway conditions or performance objective groupings. The logics presented in the MEPs will explore and describe the explicit links between foundational activities, outputs, performance objectives and outcomes.

The overarching Strategy program logic recognizes that management activities and outcomes occur over a range of timeframes. It covers:

- Aspirational long-term regional vision and catchment goals: (50+ years)

- Longer term outcomes - key values targets (~ 20+ years)

- Intermediate outcomes - waterway condition targets (~10+ years)

- Immediate outcomes– performance objectives (1-10 years)

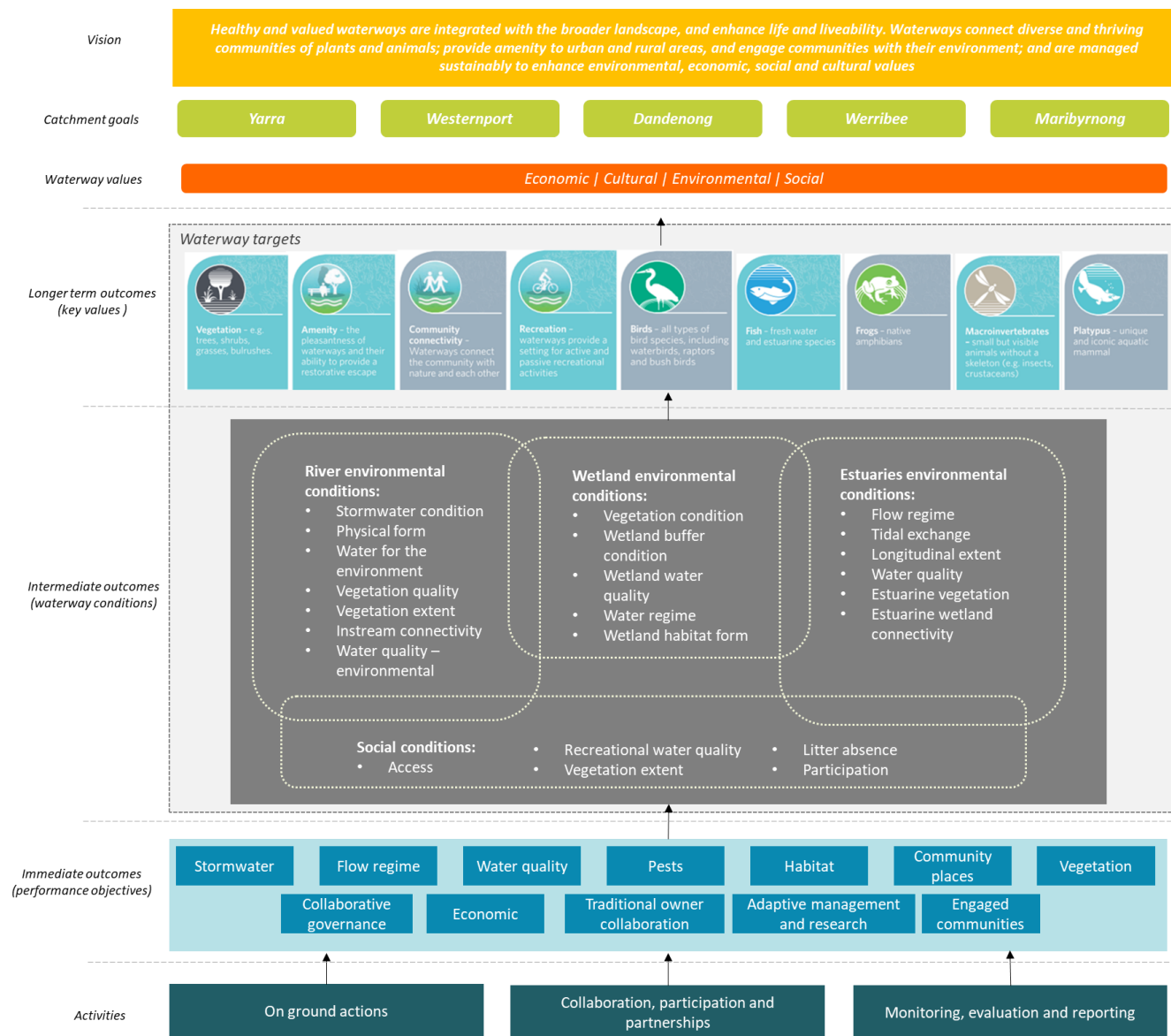- Activities – on-ground actions, partnerships, governance, tracking performance

Figure 1: Program logic for the Strategy

Box 1: Program logic and important terminology used in the Strategy

The HWS was guided by a flexible framework for meeting outcomes described in Performance Objectives, Waterway Targets, Goals and a Vision co-designed for each catchment. This logic is diagrammatically represented to the right.

Terminology used in the Strategy are described below:

Vision – The Vision is established for the region and for each of the five catchments in the region. Each catchment vision is intended to:

- Be aspirational and inspiring

- Be credible but not easily or completely achievable

- Enable action and aid decision making

- Focus on assets rather than how the vision will be achieved

- Be written in the present tense and answer the question: What will the region's waterways and waterway management be like in 50 years?

Goals – The community goals for each catchment were intended to apply to a time frame generally longer than 20 years and assist in priority setting.

Values – In the Strategy, there are two specific uses of the word 'values': Waterway values and Key values

Waterway targets – These are the targets set collectively for waterway conditions and the key values. Waterway targets are the quantification of improvement that is required in order to achieve the desired waterway conditions and waterway values.

Performance objectives are measures that guide progress towards the waterway targets, and ultimately the goals and vision. They may define an area of land that must be revegetated, or a number of fish barriers that need to be removed from rivers. The terminology 'performance objectives' is aligned with the requirements of the *Yarra River Protection (Wilip-gin Birrarung Murron) Act 2017*.

Performance objectives:

- are outcome-based, and not actions

- enable a partnership approach

- are quantitative, measurable and achievable in 10 years

- inform short-term management aims through annual planning processes

- describe where they link to environmental conditions

- are underpinned by transparent and best available information and knowledge

- are able to be assessed without needing to measure waterway values and condition outcomes on every asset.

Performance objectives provide short-term, tangible outcomes, which indicate progress towards less tangible, long-term outcomes.

Program logic assumptions

Documenting the assumptions that underpin a program logic recognises where there are weaknesses and potential for failure in the achievement of outcomes. In any program logic, a number of assumptions are implied, which often rest on some of the casual links that are believed to be somewhat accurate – documenting these is a vital component for encouraging adaptive management because they are the first point of call when outcomes are not achieved as intended. Key assumptions underpinning the program logic and the consequences if wrong are documented in Table 2.

Table 2. Key assumptions the underpin the achievement of outcomes

ASSUMPTIONS	How we will monitor
Collaboration and partnerships is a more effective and efficient way to deliver on the Strategy targets	• An evaluation question - KEQ 4 - addresses this assumption directly.
To achieve the long-term targets in the strategy there will be increased and sustained investment in actions (due in part to people responding to issues and willingness to pay for outcomes)	• Melbourne Water's willingness to pay assessments will be reviewed
Proposed actions in the strategy will on balance mitigate the impacts of climate change	• Monitoring programs will be established to better understand the impacts of climate change (e.g. macroinvertebrate and vegetation condition monitoring)
Higher stormwater standards will be developed and applied (with feasible solutions) to all new urban development within the priority stormwater catchments	• Monitoring of changes to policy will be included in tracking progress to stormwater conditions
There will be a significant additional investment in the next 10 years to protect and enhance wetlands across the region through appropriate management actions	• All wetland performance objectives will be monitored and issues around lack of investment raised through the Regional Leadership Group
The tension between social, economic and environmental values can be balanced and a mutually agreeable way found	• Areas of potential conflict should be raised and reviewed as part of a midterm evaluation

Externalities, context and indirect drivers of strategy performance

There are external factors that are outside of the control of the Strategy but may affect the achievement of outcomes regardless of what actions are undertaken.

While the Strategy factored in included projections for climate change, population growth and managing drought conditions, the magnitude and severity of these factors may go beyond that assumed in the Strategy. As a result, there may be unanticipated responses that will impact the trajectories of key values and conditions.

Surveillance monitoring of these important contextual drivers is important to understand their influence and how they impact on the achievement of outcomes. Table 3 outlines indicators that will form part of the ongoing surveillance.

Table 3: Indicators for externalities, context and indirect drivers of Strategy performance

Area	Indicators	
Physical context	• Streamflow • Temperature • Sea level rise • Land development patterns • Population growth • Land use change • Major development, such as major roads • New and emerging contaminants	• Natural disaster events, i.e. bushfire, flood • Emergency events, i.e. pollution spills, fish kills • Illegal activities • Threatened species and potential extinctions • Introduced species, pathogens and disease
Policy context	• Government regulations • Legislation, policy	• Governance structure • Political drivers
Implementation context	• Funding – agencies, volunteers • Agency structures	• Voluntary involvement in catchment management • Technologies

Research and knowledge gaps

The process of developing the program logic and evaluation questions demonstrates the areas where critical knowledge gaps exist. The MEPs will outline more detailed logics and high-risk assumptions that need testing.

The Strategy lists the initial key research areas identified. These research areas will evolve during the life of the Strategy.

Research will be directed to investigating relationships where there is likely to be strong relationships between threats and values but confidence in the effectiveness of certain management actions is low. This targeted approach to research provides an increased focus on prediction and testing of predictions, rather than more general, descriptive research.

It is vital that research is targeted to better understanding the effectiveness of management activities with significant Victorian Government investment (for example, streamside revegetation).

Research findings will be presented and reported annually through a mix of mechanisms ranging from academic and technical papers through to presentations at the MERI collaborative forums and summary information in annual MERI reports. It is also expected that the MERI website will provide an opportunity to provide access to research information and outputs.

Questions to guide evaluation of the Strategy

The strategy and planning phase of the adaptive management cycle includes the development of pre-determined key evaluation questions (KEQs) by which to assess the Strategy and gain new knowledge and information. Evaluation questions provide the basis for evaluation design and associated monitoring processes.

Evaluation of the Strategy includes an assessment of the extent to which the outcomes have been achieved at each level of the program logic underpinning the Strategy. It also addresses the assumptions in the program logic and provide direction and improved knowledge for subsequent planning cycles.

Key evaluation questions

KEQs are broad questions that guide evaluation inquiry and influence the methodology required for data collection to make it easier to decide what data to collect, who collects it, how to analyse it, and how to report it.

Key evaluation questions have been developed for the Strategy to address five categories:

- **Effectiveness** i.e. *Were the planned activities performed, and to the standard required?*

- **Impact** i.e. *What is the outcome, or result of having done the planned activities - i.e. what changes in the condition of environmental assets, changes in management practices and/or changes in institutions can be observed?*

- **Appropriateness** i.e. *Was this the best way to have addressed the problem? Did the activities and the way they were undertaken align with stakeholder needs and expectations. Were they consistent with relevant policy and priorities?*

- **Efficiency** i.e. *Did the project / program achieve the desired results within budget? To what extent did the project / program attain the highest value from available resources – could the same outcomes be achieved more simply and for less cost next time?*

- **Legacy** i.e. *Will the project / program continue to have an impact after its completion?*

KEQs for the Healthy Waterways Strategy are outlined in Table 4. The KEQs have been grouped in terms of their category and timeframe for evaluation. Sitting under the KEQs are a series of proposed sub-questions to provide further context to the evaluation question and guide data collection.

Table 4: Key Evaluation Questions for the Healthy Waterways Strategy

Evaluation question	When it is asked	KEQ category and description of type
KEQ No. 1 - To what extent have the performance objectives of the Strategy been achieved? - Sub-question 1a. What progress has been made towards achieving the regional and sub-catchment performance objectives?	- Annual - Event-based (as needed)	**Effectiveness** These questions seek to identify the achievement of the performance objectives identified in the plan. They evaluate the achievement of desired management outputs

Evaluation question	When it is asked	KEQ category and description of type
• Sub-question 1b. Have the fundamental changes required to implement the strategy in full been made? If not, why not? • Sub-question 1c. To what extent have emergency and critical events (if, and as they occur) impacted on the achievement of the Strategy? How effective was the response to the event in minimizing impact? • Sub-question 1d. To what extent has the delivery of the Strategy been safe?		and resource condition objectives.
KEQ No. 2 - To what extent have river, wetland and estuary conditions been maintained or improved? **KEQ No. 3 – What is the state of waterway values?** • Sub question 3a. To what extent are key values on the predicted trajectory? • Sub-question 3b. Have macroinvertebrates exceeded acceptable risk thresholds? (see Box 2) • Sub question 3c. How have the ecosystems services and benefits as defined through the System of Environmental Economic Accounting changed as a result of investment in waterways	• Mid-term (2022) • End of Strategy (2026)	**Impact** These questions seek to identify the achievement or trajectory towards the long-term outcomes. The questions focus on tracking changes to resource condition, values or institutions.
KEQ No. 4-To what extent has the delivery of the Strategy been effective and efficient? • Sub-question 4a. How, and in what ways, has collaboration enabled effective and efficient delivery of the Strategy? • Sub-question 4b. How has monitoring and research contributed to effective and efficient delivery of the Strategy? • Sub-question 4c. To what extent has data been used to inform and validate models, assumptions and to inform adaptive management? • Sub-question 4d. How appropriate were our interventions in achieving the intended outcomes and aligning with needs of beneficiaries?	• Mid-term (2022) • End of Strategy (2026)	**Efficiency and appropriateness** These learning questions seek to identify how the HWS can be delivered more efficiently, and to identify opportunities for improving the design and delivery of the HWS to ensure that it is meeting the needs of its intended beneficiaries, and its obligations.
KEQ No. 5 – Will the environmental, social and cultural benefits acquired through the HWS continue over time? • Sub-question 5a. How has Traditional Owner and Aboriginal Victorian knowledge informed, and been advanced through Strategy implementation?	• End of Strategy (2026)	**Legacy** These questions seek to identify if the Strategy will have a lasting positive impact, and what can be done to ensure the long-term sustainability of its benefits after the activity/program ends.

Box 2: Macroinvertebrates as an annual indicator to track environmental values

Macroinvertebrates are a very good indicator of overall stream health and are sensitive to environmental change and management actions. For example, this is reflected in their use as biological objectives within State Environment Protection Policies for Victoria. Melbourne Water has been monitoring a number of sites across the catchments since the 1990s and for many sites there are multiple years of data. Trend analysis of this data each year will ensure both increases or decreases in trends are detected and early intervention occurs to address risks.

Analysis and reporting of macroinvertebrate data will be done on a more regular basis than the other key values. It is proposed to monitor, evaluate and report on long term fixed site macroinvertebrate data on an annual basis.

Frequency of evaluation and reporting

While monitoring is conducted in an ongoing manner, evaluation is done less frequently and at various points in time. Four evaluation activities underpin this MERI framework – shown in Figure 2 – and include annual reporting, a mid-term evaluation, an end of strategy evaluation and at points in time (or event based, referred to as a 'Red Report').
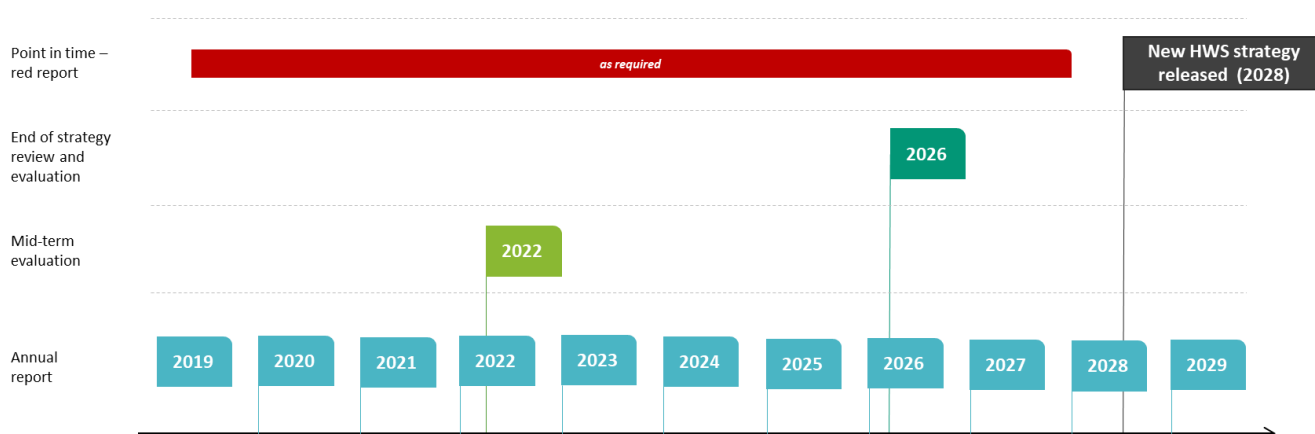

Figure 2: Timeframe for evaluations over the life of the Strategy

The Red Report will capture evaluation of significant events which require immediate attention to be communicated and addressed. It may include the need to respond to increasing drying conditions or an acute event such as a flood or a fire.

How the questions will be evaluated

There are many different approaches to conducting evaluation. The purpose of the evaluation will influence the most appropriate approach to adopt and may entail the use of different evaluation techniques. Evaluation methods adopted in this framework lend themselves to collaborative approaches and the application of participatory evaluation techniques, drawing on a robust foundation of scientific data and analytical methods.

Evaluation methods

A variety of methods can be utilised for the evaluation of the Strategy. Some of the methods are designed to provide rigour and certainty in judgement making, while others can be used to provide in-depth narratives on outcomes, or identification of recommendations and opportunities for improvement.

Comparative methods

In order to rigorously analyse data to assess the achievements of the Strategy; the evaluation will need to compare measures of expected success, described through the performance objectives, waterway targets, waterway values and goals. Having clear indicators of success and purposeful data collection clarified at the start of a program is key to ensuring high quality comparative assessments. This enables clear and confident judgement on the success of a program.

A pre-defined evaluation matrix will be developed to identify, to the greatest extent possible, predefined outputs and outcomes upon which the evaluation can be based. Rubrics[1] are a tool used by evaluators to provide rigour in judgement making or evaluative conclusions. They allow the evaluator to set a clear scale of criteria about relative levels of success and are often used when judgements are complex and needing to take into account of multiple (often qualitative) criteria.

Rubrics to be used in the Strategy evaluation will be developed in a collaborative manner, involving program managers and beneficiaries. This process will define what 'success looks like' in terms of evaluation criteria and standards, which in turn encourage a shared understanding, ownership and empowerment for the ongoing success of the program.

Qualitative evaluation methods

Qualitative methods will be used when quantitative data is not available or is not appropriate. Qualitative methods are preferable for developing in-depth narratives about the achievement of outcomes and are particularly useful for drawing out the broader evaluative findings about why activities or outcomes were or were not successful and if there were any additional unanticipated positive or negative outcomes.

When qualitative methods are employed to demonstrate achievements in a rigorous way, this will require analysis or process by which qualitative data is assessed to systematically draw

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[1] Rubrics contain three key components: 1) A set of criteria (non-overlapping dimensions of quality) on a Y axis; 2) A set of standards organised on a spectrum by degree of goodness or level of performance on the X axis; and 3) descriptor cells outlining what evidence will look like for each level of performance for each quality dimension.

evaluative conclusions from. Conclusions will be based on thematic analysis of data, in some cases a rating scale, or rubric, may be used (e.g. poor/fair/good) to gauge outcomes qualitatively, using expert judgement.

Qualitative methods identified in the MERI framework are:

- **Reviews -** Reviews include a retrospective consideration and assessment of a delivery program, technique, management action or practice, process or output of the Healthy Waterways Strategy. It will generally involve the revision of existing data, including monitoring data. It may also require the collection of new data, for example a literature review or comparison of existing or emerging documentation.

- **Expert review -** An expert review is similar to a review (see above) but is conducted by an expert in the relevant technical field. The expert reviewer should be an independent party external to Melbourne Water or the Regional Leadership Group.

- **Reflective interviews –** can be conducted to gather data from targeted individuals. Interviews are particularly useful for identifying barriers or challenges experienced through the delivery of the strategy, unanticipated outcomes, and opportunities for improvement.

- **Survey –** Surveys can be used to gather a large amount of data from multiple individuals on a variety of issues and are particularly useful for identifying differences in responses/opinions.

- **Case study/outcome narratives** – A case study is a discrete investigation or piece of research designed to document detailed information around the achievement of a specific outcome, or to help answer a specific KEQ. Often it is not realistic to document the achievement of all outcomes to this level of detail, so it is important to select representative case studies.

- **Summit workshop –** The primary purpose of a summit workshop is to agree on key evaluative judgements and recommendations. A variety of tools can be used to facilitate a summit workshop, including online polling on key evaluation criteria/indicators of success, and facilitated discussions on recommendations. Summit workshops can be used to critically reflect on outcomes and processes of program delivery and may often require expert facilitation to navigate varying opinions and experiences. It is the facilitators role to either document the variation in perspectives or try to achieve a consensus on decision making.

Who evaluates and who judges success

Table 5 outlines who judges the success (or otherwise) against each KEQ.

The Regional Leadership Group and Catchment Forums, including Traditional Owners, play the most significant role in judging the program. Under its obligations in the *Water Act* Melbourne Water is ultimately responsible for developing and implementing this MERI plan, and as such will produce the annual and evaluation reports, as well as sharing new information as it becomes available.

The contribution of delivery partners and practitioners to the evaluation of the Strategy will be integral to embedding continual improvement and timely program adjustment based on the learning and conclusions from evaluations. Delivery partners, such as EPA, DELWP, Parks Victoria and Port Phillip and Westernport CMA, will be involved in informing the evaluation of effectiveness and efficiency of the delivery.

Delivery partners will also provide program evaluation reports to contribute to the evaluations and therefore some evaluation work will be done by these stakeholders (i.e. a program evaluation of the effectiveness of investment that contributes to achieving HWS performance objectives).

The HWS Science Panel will guide the technical aspects of the Strategy and will contribute their scientific rigour to the evaluation.

Table 5: Summary of the evaluation approach, methods and who ultimately judges the progress and success of the KEQ

KEQs addressed	Evaluation approach and method	Data required to inform evaluation	Who judges progress and success?
KEQ No. 1 - To what extent have the performance objectives of the Strategy been achieved?			
Sub-question 1a. What progress has been made towards achieving the regional and sub-catchment performance objectives?	Comparative methods using collaboratively developed rubrics – comparing to success measures. Annual collaboration forums will synthesise and determine findings and provide advice to the Regional Leadership Group	• Performance objective tracking (see section 'performance objectives' below) • Context and drivers	Collaborative Forums Regional Leadership Group
Sub-question 1b. Have the fundamental changes required to implement the strategy in full been made? If not, why not?			
Sub-question 1c. To what extent have emergency and critical events (if, and as they occur) impacted on the achievement of the Strategy? How effective was the response to the event in minimizing impact?	Investigations Review Expert review Case study/outcome narratives	• Emergency event, incident data • Safety data	Regional Leadership Group Relevant experts
Sub-question 1d. To what extent has the delivery of the Strategy been safe?	Review		Melbourne Water Regional Leadership Group
KEQ No. 2 - To what extent have river, wetland and estuary conditions been maintained or improved?			
To what extent have river, wetland and estuary conditions been maintained or improved?	Comparative methods - status of conditions will be compared to predicted target trajectory in the Strategy.	• Waterway conditions (see section 'Key values and	HWS Science Panel Regional Leadership Group

	Evaluation will be undertaken based on methods applied for conditions (as outlined in HWS Resource Document) unless modified / different method adopted in the asset-based MEPs.	waterway conditions' below) • Context and drivers	
KEQ No. 3 – What is the state of waterway values?			
Sub question 3a. To what extent are key values on the predicted trajectory?	Comparative methods -status of key values will be compared to predicted target trajectory in the Strategy. Evaluation will be undertaken based on methods applied for each key value (outlined in HWS Resource Document) unless modified / different method adopted in the asset-based MEPs.	• Key values (see section 'Key values and waterway conditions' below)	HWS Science Panel Regional Leadership Group
Sub-question 3b. Have macroinvertebrates exceeded acceptable risk thresholds?		• Annual macroinvertebrate data	
Sub question 3c. How have the ecosystems services and benefits as defined through the System of Environmental Economic Accounting changed as a result of investment in waterways	Economic evaluation using environmental-economic accounts. To be determined through the establishment of accounts	• Service and benefits data (as identified in environmental-economic accounts)	
KEQ No. 4 -To what extent has the delivery of the Strategy been effective and efficient?			
Sub-question 4a. How, and in what ways, has collaboration enabled effective and efficient delivery of the Strategy?	Review Reflective interviews Comparative methods Expert review	• Delivery program evaluations • Social research – interviews, surveys, capacity assessment	Catchment Forums Regional Leadership Group Traditional Owner Groups Delivery Partners
Sub-question 4b. How has monitoring and research contributed to effective and efficient delivery of the Strategy?		• Research program evaluation	HWS Science Panel

Sub-question 4c. To what extent has data been used to inform and validate models, assumptions and to inform adaptive management?		• MERI review • Social research – interviews, surveys, capacity assessment	Regional Leadership Group Traditional Owners
Sub-question 4d. How appropriate were our interventions in achieving the intended outcomes and aligning with needs of beneficiaries?		• other HWS and program evaluations • Expert review • Social research – interviews, surveys, capacity assessment	
KEQ No. 5 – Will the environmental, social and cultural benefits acquired through the HWS continue over time?			
Will the environmental, social and cultural benefits acquired through the HWS continue over time?	Review Summit workshop	MERI program evaluation outputs	HWS Science Panel Regional Leadership Group Catchment Forums Traditional Owners
Sub-question 5a. How has Traditional Owner and Aboriginal Victorian knowledge informed, and been advanced through Strategy implementation?	To be determined	To be determined	Traditional Owners Aboriginal Victorians

Data to inform the evaluation

The data to inform the evaluation, such as those used in the development of the Strategy, need to enable informed, collective decision making. The Strategy relied on a significant body of knowledge from many knowledge domains across rivers, estuaries and wetlands, their key values, supporting conditions and key drivers and threats. Assessment and modelling in these areas all require specialist expertise.

The advances in science that enabled the development of the Strategy come from committed investment in waterway monitoring, applied research, data collection and information over the past few decades. To address key gaps and assess Strategy performance and risks, will require continued investment in science and key data to understand the impacts of changing climate, urbanisation and the effectiveness of our management efforts to inform our adaptive collective waterway management.

Melbourne Water will have the lead role in ensuring the science underpinning our decision-making best supports co-delivery with our partners throughout the life of the Strategy.

Below is a summary of the data required to inform evaluation against the KEQs. These also relate to the three main levels of the logic – the performance objectives (annual progress towards POs), intermediate outcomes (condition monitoring), longer term outcomes (key values monitoring).

Indicators to monitor performance objectives

There are 45 Regional Performance Objectives and 911 Sub-catchment Performance Objectives and while they are all unique, there are common themes across the spatial scales they apply, and also the waterway system elements. To simplify the way the POs are managed, they have been grouped. There are 12 groups and within each group one to several themes.

The Performance Objectives – Performance Monitoring Summaries (Attachment A) outline the background to each group, the indicators proposed for each theme and how success will be judged. This information will eventually be included within the relevant MEPs.

While these indicators will all be tracked annually (unless otherwise noted), not all indicators will be ready to report immediately (see Implementation section for staging, and specific timing in Attachment A).

Table 6. Indicators to track progress of performance objective groups (for further detail see Attachment A)

PO group name	Number of PO in group				Indicators to track performance
	Reg.	Riv.	Wet.	Est.	
Engaged communities	4	66			• Percentage of population involved in education and capacity building programs, grants and citizen science • number of resources developed collaboratively
Traditional owner collaboration	7				*To be developed by TO groups*
Collaborative Governance	4				• RLG and catchment forums met and effective • no. waterway labs conducted and effective
Economic	3				• Economic accounts developed and reported
Adaptive management and research	5			4	• Program progress reports, reviews undertaken • Frameworks developed • Conceptual and Predictive Models developed or updated
Community places	6	44	3	45	• km paths delivered • ha cooling and vegetation established • # environmental risk assessments undertaken for estuary opening • Progress report against program
Flow regimes	1	76	56	7	• % flow compliance, diversion compliance, inundation frequency met • GL of environmental water recovered • Program progress reports
Water quality	3	47	5	8	• Tonnes of nutrients removed, ha of rural land treated to best practice • ha vegetation established on headwater streams

PO group name	Number of PO in group				Indicators to track performance
	Reg.	Riv.	Wet.	Est.	
					• Sewerage Treatment Plant discharges compliance with license discharges • % new impervious surfaces treated to best practice • Investigate and mitigate impacts from septic systems, % septic tanks decommissioned • For key recreational areas identified in the HWS report against SEPP guidelines. • Risk based program developed, Program progress reports
Stormwater	6	46	13		• ML stormwater harvested, ML stormwater infiltrated, • Water sensitive cities index • Guidelines developed, protection mechanisms in place
Habitat	1	50	20	19	• No. fish barriers removed • Ha or length of floodplain re-engaged • No. translocation investigations • Program progress reports
Vegetation	2	127	70	55	• ha vegetation established, maintained • change in EVC extents (along estuaries) • Program developed
Pests	1	1	80	19	• A risk-based approach to pest control is adopted

Waterway values and environmental conditions

Cultural values monitoring

Cultural values are based on the physical and spiritual connection of people to land and waters. Cultural values are both contemporary and ancient. The Strategy commits to working with Traditional Owners and Aboriginal Victorians to protect and promote their cultural and historical connections with waterways.

The Strategy will seek to establish a regional Traditional Owners Advisory Structure that will review the RPO's 1 to 7 and co-design what should be achieved, the measures of performance and the monitoring methods used to evaluate success. These will be incorporated into the MERI framework by mid-2020 and provide the plan for monitoring and evaluation.

An Interagency Working group consisting of agency cultural specialists and senior managers will be convened to determine how best to deliver targets and will be directed by and report to the Advisory Group.

Economic values monitoring

The MERI framework will apply new international environmental-economic standards to demonstrate the economic value of waterways and to understand the return on investment for efforts in waterway management.

The method to develop the environmental-economic accounts is under development and will be further detailed in future revisions to the MERI framework or MEPs.

Approach to monitoring key values and environmental conditions

The key values within the HWS are represented by six environmental key values and three social values. These values are somewhat representative of the whole environment, including other animals such as turtles, skinks, water rats and freshwater crayfish that will also be considered in the delivery of the Strategy, particularly threatened species (see Box 3).

Waterway conditions in the HWS are those environmental conditions which were identified within conceptual models as being important for supporting the values. For example: fish (a key value) need appropriate flow regimes (a waterway condition) and good instream connectivity (a waterway condition). In many cases the waterway conditions are synonymous with threats – for example a poor condition rating for the environmental water condition indicates a flow stress to specific values.

Waterways have been broken into three broad asset classes as there are significant differences between the values and conditions of each and ways in which these are monitored. It should be recognised that these systems are dynamically linked and as such there will be overlap between data and analysis. For example, floodplains are part of a river system and may contain wetlands. Flow conditions along a river are interlinked with the water regimes of a wetland. However, for the purposes of structuring monitoring, evaluation and reporting, detailed monitoring plans will be documented separately.

The MERI framework sets out the following key objectives for monitoring values and conditions under three key adaptive management pathways:

• **Surveillance monitoring** aims to track the status of values and conditions over time. Data is needed at the sub-catchment scale so we can track the trajectories set out in the HWS.

The monitoring programs should have a long-term view – ie will continue for 20+ years. Other objectives of this type of monitoring are to better understand the impacts of climate change and land use changes over time. Priority threats and conditions will also be monitored to enable appropriate management responses.

- **Intervention monitoring** is about testing assumptions within conceptual models where the confidence is low. This may be testing if an action leads to the predicted environmental condition (eg revegetation of a particular standard leads to a specific vegetation condition) or whether a particular condition leads to a response in a value (eg whether summer freshes lead to a spawning event for fish). An annual process will identify key assumptions which we would like to test. Results will be reported via case studies in annual and mid-term reviews.

- **Research** will improve knowledge about values and threats, and test management assumptions which will allow conceptual and quantitative models to be refined over time allowing better strategic decisions to be made. Research into new technologies and management approaches will ensure the most cost effective actions are being implemented

Key values (Environmental)

Birds	Macroinvertebrates	Vegetation
Fish	Platypus	Frogs

The three waterway system elements in the HWS - rivers, wetlands and estuaries - generally have similar key values associated with them however there are subtle differences in the indices used to assess condition.

For rivers it is envisaged that macroinvertebrates will provide the strongest dataset through which assessment of overall instream river health can be assessed. Macroinvertebrates are the most sensitive to broad environmental change and most management actions and as such will be a primary focus of long-term surveillance and intervention monitoring[2]. The proposed macroinvertebrate monitoring program will enable a better understanding of the responses to climate change, agricultural impacts, urban impacts and streams subject to flow regime modification.

Box 3: Threatened species monitoring

The *Flora and Fauna Guarantee Act* 1988 (Vic.) provides the framework that allows the listing of threatened species, threatened communities and potentially threatening processes. Threatened species/communities can be categorised as:
(a) Flora communities (e.g. Coastal Saltmarsh, Temperate Grasslands, Seasonal Herbaceous Wetlands)
(b) Flora species (e.g. Spiny Rice-flower)
(c) Fauna species (e.g. Swamp Skink, Orange-bellied Parrot)

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[2] Power analysis of long-term data in the Melbourne Water region shows that a decline or improvement in LUMaR over time of 0.15 (sufficient to detect a change between classes) is detectable with a high degree of confidence with as few as 5 sample-pairs. Thus, if a gradual improvement (or decline) was predicted at a site over five years, 5 sampling occasions over the five years is likely to be sufficient to test that prediction.

Under the Commonwealth's *Environment Protection & Biodiversity Conservation Act* 1999 Melbourne Water manages portions of two Ramsar wetlands and as such is required to prepare and implement a management plan which include monitoring, evaluation and reporting.

Within the Port Phillip and Westernport region the following areas are considered important from a threatened species perspective.

The Western Grassland Reserve has been created to offset the impacts of the expansion of Melbourne's Urban Growth boundary and to protect threatened species including the Growling Grass Frog, Golden Sun Moth, Southern Brown Bandicoot and, potentially, the Striped Legless Lizard.

Within the Melbourne Water region there are several Ramsar sites or controlled actions under EPBC relating to waterways which require on-going monitoring and reporting – these include:

* WTP – Ramsar site management and maintenance of Ecological Character

* Edithvale-Seaford Wetlands – Ramsar site management and maintenance of Ecological Character

* Westernport – Ramsar site management and maintenance of Ecological Character

A number of sites which have controlled actions under the EPBC Act i.e.:

* EPBC 2011/5992 (Bunyip Main Drain Bank Rehabilitation Works) – compliance with controlled action conditions to 2015/16 (with possible extension for a further 4 years, to 2019/20 should we not satisfy the Department of our success in protecting EPBC matters).

* EPBC 2002/688 (the WTP EIP) – compliance with controlled action conditions to 2017/18

Melbourne Water's Sites of Biodiversity Significance is a program which protects threatened species occurring on Melbourne Water owned land, many of which are along waterways.

The HWS aims to conserve all currently listed water dependent species and communities across the region. Species of concern have been identified within each of the 69 sub-catchments. Monitoring and reporting will occur either through the above legislative requirements or SOBs program. Other water dependent threatened species identified through the HWS will be monitored and reported in accordance with the Rivers, Wetlands and Estuaries MEPs.

Habitat Suitability Models were used in the HWS for setting targets for the instream values, i.e. fish, platypus and macroinvertebrates. It is envisaged that the models will be re-run at the midterm and end of strategy to assist in evaluating progress towards the long term outcomes expressed in the HWS.

Actions undertaken can be entered into the models along with scenarios of predicted timing of future actions, urban growth and climate change to adaptively plan for uncertainty. Changes to the long term assumptions can also be revisited to understand the implications of different assumptions which may be emerging as more relevant (e.g. rate of vegetation establishment needs to be scaled back significantly, or new standards for urban development are unlikely to occur within the 10 year life of the strategy.

New models are currently being developed for wetland birds and frogs, and will be tested during the strategy as a tool for setting targets in the future that are equivalent to those for streams.

Monitoring conditions and threats

The environmental conditions within the HWS were based on available data and their relevance to the key values as specified in the conceptual models developed for the strategy. A summary of the approach to monitoring conditions for each of the three waterway system elements is outlined below and details of indicators in Attachment B.

Monitoring conditions of rivers

There are over 24,000 kms of rivers. As spatial data is becoming more readily available and useful for assessing condition of rivers, information will be available at a more detailed scale. The data availability provides a significant advantage to a decade ago when only limited field-based survey information was available. However there are still some condition indicators which require detailed field based survey methods and sampling sites need to be selected based on a number of objectives – e.g. representativeness, cost etc. The Rivers MEP will outline the detailed monitoring plan for rivers.

Monitoring conditions of wetlands

Our region includes around 65,000 'wetlands' across our region and 370 constructed wetlands. There were 81 wetlands/ wetland complexes included in the strategy for which targets were set. The approach to monitoring the condition of wetlands will be a tiered approach that collects information at different spatial scales to answer different questions. We can collect detailed information on only a small number of sites (true monitoring), and limited information on many sites (surveillance). The Wetlands MEP will outline the detailed monitoring plan for wetlands.

Monitoring conditions of estuaries

For this Strategy, the definition of an estuary is that it must be at least 1 kilometre in length or have a lagoon greater than 300 metres in length. There are 133 waterways in the region that flow into the sea, 36 that flow into Port Phillip Bay and 97 into Westernport. Of these, 33 waterways can be considered to have an estuarine component, 13 in Port Phillip and 20 in Westernport. Targets were set for 28 estuaries across the region. The Index of Estuary condition is a state-wide condition assessment methodology which will be adopted to assess the condition of estuaries within the Strategy over time. The Estuaries MEP will outline the detailed monitoring plan for the MERI Plan. The Estuaries MEP will also include monitoring of catchment contributions to pollutant loads for Port Phillip Bay and Western Port in acknowledgement that works to benefit water quality in waterways, wetlands and estuaries contribute to the achievement of targets for the bays.

Key values (social) and conditions

The HWS also developed the targets for three social key values, recreation, community connectivity and recreation.

 Amenity   Community connection   Recreation

The social values of waterways are becoming better understood; however, it is recognised that methodologies and knowledge is still developing. The approach to monitoring social values and conditions will be further developed and outlined within the relevant MEP.

The long-standing Community Perception Survey will continue to be utilised to assess these values, along with other methods under development.

Other data

There will be other data that may be identified as important to inform evaluation of the Strategy. These may include data from environmental surveillance, other program evaluation data (i.e. service capability reports, investment plan evaluations, research partnership outcomes), social research (surveys, interviews) and emergency data.

Monitoring data collection and management

Monitoring activities aim to inform evaluation of and reporting on Strategy implementation. They also enable input, validation and calibration data for estimations made of key-value outcomes where we cannot possibly collect all the information necessary to traditionally measure an effect/change in response to our management effort.

Monitoring activities also include the collection of information relating to foundational influences and externalities that impact on Strategy implementation. Foundational influences include factors such as climatic variability, drought, flood, bushfire and potential impacts of climate change. Externalities include factors such as land use change, population growth, government support, economic conditions, community expectations and landholder attitudes.

Monitoring activities will be consistent with and build upon the state-wide monitoring processes coordinated through the Victorian Waterway Management Program. This program includes targeted resource condition and intervention monitoring to inform both state and regional evaluation and reporting processes. The DELWP Standard Outputs will form the basis for tracking many of the output indicators.

Monitoring activities will also be consistent with the reporting needs of other National and State-wide protection policies and plans such as the Environmental Management Plan for Port Phillip Bay, the State Environment Protection Policy (Waters), the Environmental Protection and Biodiversity Conservation Act, Ramsar Convention, Flora and Fauna Guarantee Act, the Office for the Commissioner of Environmental Sustainability. Where possible data format will remain consistent and comply with prescribed standards so that it will be useful to a range of stakeholders outside of the HWS and provide greatest value to the community.

Data availability will comply where possible with DataVic Access Policy (see Box 4).

Box 4: DataVic access policy

The Victorian government recognises the benefits associated with mandating a whole of government approach to the availability of Victorian government data for the public good.
The DataVic Access Policy provides direction on the release, licensing and management of Victorian Government data so that it can be used and reused by the community and businesses.

The Victorian government holds, creates and collects a vast amount of data, ranging from demographic and economic to geospatial data.

Victorian government data refers to datasets and databases owned and held by the Victorian government and stored in formats including hardcopy, electronic (digital), audio, video, image, graphical, cartographic, physical sample, textual, geospatial or numerical form.

Victorian government data does not include software.

Not all Victorian government data is suitable for release under the policy. Access to some data will need to be restricted for reasons of privacy, public safety, security and law enforcement, public health and compliance with the law. Only data owned by the State of Victoria or sufficiently licenced to the State of Victoria will be released under this policy.

DataVic access policy principles

- Principle 1: Government data will be made available unless access is restricted for reasons of privacy, public safety, security and law enforcement, public health, and compliance with the law.

- Principle 2: Government data will be made available under flexible licences.

- Principle 3: With limited exceptions, government data will be made available at no or minimal cost.

- Principle 4: Government data will be easy to find (discoverable) and accessible in formats that promote its reuse.

- Principle 5: Government will follow standards and guidelines relating to release of data and agency accountability for that release.

Further reading https://data.vic.gov.au/datavic-access-policy

Monitoring prioritisation

There will always be the potential for obtaining more information about waterways in the region than there are resources to obtain it. Monitoring prioritisation is an ongoing process and as new information emerges priorities may be revised and altered.

While the KEQs form the basis of the HWS MERI plan, it is not likely to be possible to monitor all of the indicators in all locations across the entire region. The principles of the MERI Framework can be applied to assess and identify monitoring priorities. Paramount is health, safety and wellbeing involved in MERI activities.

Additionally, the following considerations should be made when prioritising monitoring effort:

Cost effectiveness, value and relevance

- Monitoring has clear objectives and relevance and it is clear how data will be analysed and reported over time to support decision making – i.e. sub questions within the KEQs should be clear and measurable.

- Where possible integration or alignment of monitoring and data utilised and shared for multiple purposes.

- Research and intervention monitoring developed to utilise existing standards (e.g. DEWLP standard outputs) with broad consideration of similar national and international programs.

Data integrity and robustness

- Data can be maintained and good data management processes and systems embedded.

- Stable and sensitive indicators which do not have constantly changing methodologies that could prevent comparison of data over time and respond to changes in the environment and management actions.

- Monitoring is robust to enable evaluation of effectiveness of management actions and waterway outcomes.

Risk based

- A balance to monitoring threatened species along with status and condition of all other species and locations across the region – i.e. ensure site selection for broad scale surveillance monitoring factors in areas where threatened species are known or likely to occur.

- Key knowledge gaps are addressed within conceptual models where confidence in the links between either actions and conditions or conditions and a value is low.

Monitoring data collection methods

There are four main types of data being collected:

- Social research: includes perception surveys, needs analysis, interviews

- Spatial: including remote sensing, aerial photography, satellite imagery, etc.

- Field survey: on-ground assessments, e.g. flora surveys

- Activity tracking: i.e. outputs

Further information regarding methods is provided in Table 7, and will be described in detail in each MEP.

Table 7: Monitoring data collection methods, who collects data and frequency

Data type	Monitoring survey method	Who collects the data	Frequency of data collection
Social research	Qualitative perceptions survey	Melbourne Water Parks Victoria Local government	Annual Biennial
	Interviews / surveys	Traditional owners Melbourne Water	TBD
	Water Sensitive Cities index	TBD	TBD
Spatial	Remote sensing	Melbourne Water DELWP	4 years
	LiDAR	Melbourne Water DELWP	4 years
	Spatial data layers	Melbourne Water Parks Victoria Local government	Annual
Field based	eDNA (see Box 5)	Citizen science Melbourne Water	TBD
	Traditional sampling	Citizen science Melbourne Water Birdlife Australia EPA	TBD
	Assessment tools	Citizen science	TBD

Data type	Monitoring survey method	Who collects the data	Frequency of data collection
	Condition indexes – i.e. IWC, IEC,	Citizen science Melbourne Water	4 years
	Gauging stations	DELWP EPA Melbourne Water	continuous monthly/bio-monthly event based
Activity tracking	Progress reporting of actions, outputs and immediate outcomes	Program delivery agents	Collected as works undertaken. Reported to HWS lead agency quarterly.

Data Analysis Plan

It is recommended that a Data Analysis Plan (DAP) be developed as an intrinsic component of the monitoring program. A DAP is a map of planned analysis created and committed to before observing outcomes. It is an increasingly common tool for fostering transparency, openness and reproducibility, and thereby ensuring research integrity and quality. A DAP ensures that a statement of research questions or hypotheses is included, as well as specifications and protocols for data collection, analysis, use and storage.

Role of citizen science

Citizens participation in MER is an opportunity to connect to waterways, learn about the status of values and conditions and the actions required to protect and enhance them. Data sharing allows people to gain a greater appreciation of the bigger picture.

Filling knowledge gaps and monitoring progress are two key roles that citizen scientists can play. Many citizens are already collecting long term surveillance monitoring data, such as bird monitoring which is coordinated through Bird Life Australia – and they understand that change in ecosystems can require monitoring over long periods of time. Other examples of existing citizen science programs are Frog Census, Platypus Spot and Waterwatch.

Training and support will be provided to citizen scientists who will be encouraged to play a role in MER. It is important for protocols and standards to be used to ensure data is of an appropriate standard. A system for input, collation and reporting of citizen science data will be developed.

Box 5: eDNA sampling and applications in waterways of the region

All organisms leave traces of DNA in the environment (environmental DNA or eDNA) such as cells in hair, scales, mucous, faeces and skin. When extracted from water or soil, eDNA can be amplified in a laboratory, and DNA sequences analysed to identify species present, and give an indication of rank or relative abundance (Pilliod *et al*. 2013; Doi *et al*. 2017; Lacoursiere-Roussel *et al*. 2017; Tillotson *et al*. 2018). eDNA can potentially detect cryptic or rare species that evade capture with other methods, and also detect species at life stages that are hard to detect or distinguish between (Dejean *et al.* 2012).

Over the past five years, as part of an ARC Linkage project, Melbourne Water, The University of Melbourne and cesar/EnviroDNA have been investigating the benefits of using eDNA for determining the presence and absence of particular invasive and native species within waterways around

Melbourne. eDNA was generally found to be more sensitive, cheaper, and safer for operators and wildlife, and also allows sampling of sites that were traditionally difficult to survey e.g. fast flowing, deep, turbid.

In 2017, Melbourne Water in partnership with cesar/EnviroDNA undertook 'Aquablitz'—a large scale eDNA metabarcoding project to survey freshwater biodiversity at ~340 sites including major rivers, their tributaries, wetlands, lakes and reservoirs across the Melbourne Water region. The results and lessons from this exercise provide a strong foundation for the use of eDNA for broad-scale species inventory reporting (Weeks and Coleman, *in prep*).

Whilst eDNA has many advantages, it will not completely replace the need for traditional surveys, when it is important to obtain information such as the condition, health, sex and age of animals.

Data storage and management

A number of key data storage systems have been identified and are included in Table 8. The list is <u>not</u> exhaustive as not all data sources have been identified.

Detailed data storage and management requirements will be outlined in the MEPs. Agreements for data storage and sharing arrangements will also be required.

Existing data storage and management systems will be refined to allow new data to be collected. Updates and changes to systems will be carried out in the staged approach to implementing the MERI framework.

Table 8. Data storage systems that may be used in the MERI plan

Data system	Data stored	Data owner
DevConnect	Land development data	Melbourne Water
Maximo (asset information system)	Waterway asset information and activity tracking	Melbourne Water
Geographical Information System (GIS)	Impervious cover Lidar Vegetation extent and quality Fish barriers Waterway network, etc.	Melbourne Water
HydStra (hydrographic database)	Flow	Melbourne Water
EnviroSys	Water quality and sediment quality	Melbourne Water
MW Bug database	Macroinvertebrates	Melbourne Water
Frog Census app	Frogs	Melbourne Water
HWS AVIRA dataset	Values, conditions, threats for wetlands and estuaries	Melbourne Water
Community perception survey database	Community perception of waterways survey	Melbourne Water

Data system	Data stored	Data owner
Atlas of Living Australia (ALA)	Species observations	Hosted by CSIRO
Victorian Biodiversity Atlas (VBA)	Species observations, including fish	DELWP
Waterwatch Victoria data portal	Water quality	DELWP
Spatial temporal activity recorder	Waterway and catchment management activity mapping - standard outputs	DELWP
Bureau of Meteorology	Climate data Flow data Rainfall data	Bureau of Meteorology
Atlas of Australian Birds Database	Birds	Birdlife Australia
Platypus Spot	Platypus	Cesar Australia
Principal bicycle network database	Bicycle trails	Vic Roads

Reporting

Regular reporting is an important tool to ensure accountability for the investment of government and other funds into activities that deliver on waterway health outcomes. Sharing outcomes and progress against goals of the Health Waterways Strategy with the community and stakeholders provides the opportunity to further build awareness and connection with Victoria's waterways, celebrate successes, and encourage further participation in acting to protect and enhance waterways.

In addition, regular reporting and periodic evaluation provides opportunities for water managers and collaborative partners who are involved in the delivery of the Strategy to track their progress and trajectory towards outcomes, and to identify opportunities for adaptive management if required.

Reporting on the Strategy

Over the long term, consistent and effective reporting provides evidence to evaluate and communicate the effectiveness of the Strategy. The proposed reporting approach includes:

- Annual public reporting against the strategy targets and performance objectives

- At least one interim and one final assessment during the life of the strategy to support adaptive management of the program and independent oversight to hold everyone to account

- A Red Report which flags significant events which require immediate attention – and may be released at any time. It may include the need to respond to increasing drying conditions or an acute event such as a flood or a fire.

In addition to the reporting types, there will be other simpler communication products and briefings developed for public reporting. Most of the community are likely to seek quick, simple reports, such as a webpage progress report, perhaps with case studies. It is important to provide reports suitable for this largest audience. However, it is also important to recognise this kind of report does not amount to an investigative evaluation (although it may be underpinned by one).

Table 9. Reporting schedule

	Annual reporting	**Mid-term evaluation (2022)**	**End of strategy evaluation (2026)**	**Point in time reporting – Red Report**
Driver for report	Accountability Learning	Assessing outcomes Learning	Assessing outcomes Learning – inform planning for next strategy	Events
Target audience	• All partners • Catchment Forums • Regional Leadership Group	• All partners • Catchment Forums • Regional Leadership Group	• All partners • Catchment Forums • Regional Leadership Group	• All partners • Catchment Forums • Regional Leadership Group

	Annual reporting	**Mid-term evaluation (2022)**	**End of strategy evaluation (2026)**	**Point in time reporting – Red Report**
Content	• Physical context • Policy context • Implementation context • Summary of activities and outputs, lessons learned	• Evaluation of activities, outputs and outcomes from years 1 – 4 of the strategy. • Recommendations and learnings for adaptive management.	• Evaluation of activities, outputs and outcomes from years 1 – 8 of the strategy. • Recommendations and learnings for the next HWS.	• Specific to particular event
Purpose	Annual reporting provides accountability and tracks implementation of the strategy	To track progress towards outcomes and identify opportunities for adaptive management, if required.	To demonstrate the achievement of outcomes. To celebrate success. To identify learnings to incorporate into the next HWS	Enables immediate and appropriate intervention of an incident
Timing of report release	Annual	2023	2028	As required

The Strategy includes a performance objective to establish web-based system to report performance and measure outcomes of the catchment implementation forums by June 2020. This kind of reporting is an important component of stakeholder communication. Its communication and key messages will be managed to connect with the overall MERI Plan.

Contribution to other reporting products

Information gathered through the Strategy MERI plan will contribute to a number of other reporting obligations and activities including:

- State of the Environment reporting

- State of the Yarra and its Parklands reporting

- State of the Bays reporting

- Port Phillip Bay EMP reporting

- Yarra Strategic Plan reporting

- Yarra and Bay Report Card

- SEPP (waters) reporting

- Biodiversity 2037 reporting

- VCMC Catchment Condition and Management reporting

Implementation of the Healthy Waterways Strategy MERI plan

As the waterway manager for the region, Melbourne Water is committed to undertake its share of this *Healthy Waterways Strategy*. However, it has been recognised that action by Melbourne Water alone is not sufficient to unlock the full value of the region's waterways, nor stem their decline due to climate, development or land use change.

Implementation responsibilities

Like the Strategy, for the MERI plan to be effective, collective action is required from State government and regulators (such as the EPA), local government and other land managers such as Parks Victoria. Even more so, it needs collective action by the development sector, landholders, Traditional Owners and community groups.

A Regional Leadership Group will be established to govern the implementation of Strategy, including the MERI plan. Its role will include ensuring good linkages with related processes and policies, overseeing strategy implementation, reporting and adaptive management. The Regional Leadership Group is responsible for the MERI Plan which includes the framework and the MEPs.

As delegated caretaker for river health under the *Water Act 1989,* Melbourne Water will be the lead for developing and implementing the MERI Plan. The role involves coordination and integration with agencies who hold complementary responsibilities that impact waterways and stormwater. These agencies include local government, Parks Victoria, other water corporations, the EPA, the Port Phillip and Westernport Catchment Management Authority, DELWP, and the Department of Health and Human Services (DHHS). They rely on contributors for data and involvement in evaluations.

Staging implementation of the MERI plan

The HWS MERI plan includes a number of gaps in our knowledge and understanding and further work must be done its development.

A key next step over coming months is further consultation with Strategy partners and development of supporting MEPs for Rivers, Estuaries and Wetlands.

The HWS MERI Framework will be updated following consultation period, as well as following the development of the MEPs. The HWS MERI Framework may also be updated as a result of actions undertaken to improve the models and clarify targets, research results or a review or evaluation of the Strategy.

Table 10: Staging the implementation of the MERI plan

Stage	Tasks	Timing
I – Foundation	• Develop and finalise the monitoring and evaluation plans • Establish indicators and specifications • Pilot monitoring data collection (where required)	Years 1-2 (2019/20-2020/21)

Stage	Tasks	Timing
	• Data collected, evaluated and reported for established Melbourne Water programs (e.g. vegetation, habitat, flow) • Develop evaluation rubrics for each performance objective group • Conduct annual evaluation, produce report and share findings • Improve Melbourne Water data systems to streamline collection, storage and management • Scope and develop web-based reporting • Confirm QA processes for data management • Approach to managing safety implemented • Adaptive management processes established and implemented	
II – Implementation	• Refine website • Refine monitoring and evaluation plans based on findings of pilot / testing in stage 1. • Data collected, evaluated and reported for all Melbourne Water programs • Data collected, evaluated and reported for established programs in other agencies • Include additional indicators • Annual check-in on safety • MERI reports communicated across all partner organisations • Conduct annual and mid-term evaluation, produce report and share findings	Years 3-5 (2021/22-2023/24)
III – Refine and adjust	• Website fully operational – data sharing in place • All partners contributing to data as required • Annual check-in on safety • Conduct annual and end-strategy evaluation, produce report and share findings	Years 6-10 (2024/25-2027/28)

Review of the MERI plan

The MERI framework will be reviewed and updated annually to capture information needed to ensure the MERI plan is adequate, fit for purpose and deliverable.

The MEPs will also be reviewed periodically (at least at mid-term) to ensure new techniques and any safety issues are addressed.

Attachments

Attachment A: Performance objective monitoring information sheets

Attachment B: Waterways values and condition monitoring information sheets

Key Value	HWS Metric/s Rivers (R) Wetlands (W) Estuaries (E)	Other information / indicators that will be useful for evaluation	Monitoring - data collection method - spatial and temporal scale	Evaluation method and frequency	Reporting frequency	Relevance to rivers	Relevance to estuaries	Relevance to wetlands
Macroinvertebrates	(R) Lumar index	Specific studies on threatened species Key threat data (eg urbanisation) SEPP objectives	Combination of eDNA and field based sampling Annual sampling Around 100 fixed sites	Annual assessment of trends 4 yearly sub-catchment scale analysis Review HSM assumptions and trajectories	Annual status reporting	Of most relevance to rivers	Of limited applicability to estuaries	Not currently a key focus for wetlands
Fish	(R)Richness index (W) and (E) Presence	Specific studies on threatened species Population dynamics for selected sites eg age, size, gender etc Key threat data (eg barriers)	Combination of eDNA and field based sampling *Sampling frequency TBC*	Mid and end of strategy review	Annual status Evaluation report at mid and end of strategy	Relevant	Relevant	Relevant
Platypus	Catch per unit effort (R)	Population dynamics for selected sites eg age, size, gender etc Key threat data (eg entanglement)	Combination of eDNA and field based sampling *Sampling frequency TBC*	Mid and end of strategy review	Annual status Evaluation report at mid and end of strategy	Of most relevance	Not usually found in estuaries	Relevant to some wetlands
Birds	(R) Observed over expected index (W, E) Formally recognised sites and condition of vegetation	Population dynamics for selected sites eg age, size, gender etc Key threat data (TBC)	Combination of eDNA and community-based bird surveys through Birdlife Australia with data used to generate indices Annual sampling	Mid and end of strategy review	Annual status Evaluation report at mid and end of strategy	Relevant Data collected at sub-catchment scale	Relevant Sampling regime under development	Relevant C likely approximately 200 WLs
Frogs	species richness (observed to expected) modified to reflect survey effort. (W)	Population dynamics for selected sites eg age, size, gender etc Key threat data (water regime)	Combination of eDNA and community-based monitoring (Frog Census) *Spatial and temporal scales TBC*	Mid and end of strategy review	Annual status Evaluation report at mid and end of strategy	Relevant	Not usually found along estuaries – not a high priority value or indicator	Relevant
Vegetation	(R) Vegetation Vision rating scale (W) AVIRA metric #	TBC Key threat data (eg deer, weeds)	TBC - The expert elicitation method used in the HWS has been considered inappropriate for on-going monitoring	Under development	Evaluation report at mid and end of strategy	Relevant	Relevant	Relevant

Environmental Condition monitoring for rivers:

Performance Objective Group	Performance Objective Theme	Environmental Condition terminology from HWS	HWS metric	Monitoring - data collection method and frequency	Where and when data will be collected	Other data to support assessment of condition	reporting	Method being revised
Vegetation	Increase Vegetation Extent	Vegetation Extent	Vegetation extent is based on the percentage or reach which has continuous vegetation canopy cover within 20 meters either side of the stream	Lidar Percentage or reach which has continuous vegetation canopy cover within 20m either side of the stream (based on lidar method) – ie canopy cover above 1.5 m	All waterway reaches and reported at sub-catchment scale 4 and 8 years		4 and 8 years	No
Vegetation	Protect / maintain or improve vegetation quality	Vegetation Quality	Vegetation quality is based on description of quality of vegetation relative to Ecological Vegetation Classes (EVCs). Based on MW vegetation vision data	Improvements to this method are underway as passed data has been based on expert elicitation rather than field based data. A combination of remote sensing data and field based assessments are being explored.	TBC	Information on key threats such as pest plants and animals Information on climate change sensitive species	4 and 8 years	Yes
Habitat	Mitigate threats to physical form	Physical Form	Physical form is based on potential of channels to erode (deepen and/or widen). Score is an 'on average' assessment across the sub-catchment.	Improvements to this method are underway as passed data has been based on expert elicitation rather than field based data	TBC	To be confirmed based on development of new physical form monitoring program	4 and 8 years	Yes
Habitat	Improve / increase connectivity for fish passage	Instream connectivity	Instream connectivity is based on the proportion of waterway length within the sub-catchment which is free from barriers to fish movement.	Barrier and fishway datasets provide measures of connectivity which are assigned to a reach	All waterway reaches and reported at sub-catchment scale 4 and 8 years		4 and 8 years	No
Habitat	protect habitat for specific values	NA	NA There are some specific habitat conditions which require tailored assessment for particular values– e.g. habitat to support *Pseudophryne semimarmorata* (southern toadlet).	As specified	As specified		4 and 8 years	Yes
Flow regime	Maintain or improve flow regimes in unregulated systems Increase environmental water reserve in regulated systems	Water for environment	Based on compliance with environmental flow components identified through FLOWS method. The FLOWS method is a state-based approach for assessing flow requirements of fresh water river systems.	Comparison of flow data against flow requirements/objectives described in stream flow management plans	Flow gauged data for sub-catchments with flow requirements		4 and 8 years	No

Water Quality	Protect and improve water quality for environmental values	Water Quality – environmental	Based on compliance with draft *SEPP (Waters)* environmental water quality objectives, and the EPA Water Quality Index.	Monthly and bimonthly monitoring at a range of sites across the catchment	Land use data 4 and 8 years	Sediment quality data – selected sites annually	4 and 8 years	No
				An index has been developed based on land use classes and expected water quality levels and applied to land uses within the sub-catchment.	Water quality monitoring data-all sub-catchments monthly or bimonthly at a combination of fixed and roving sites			
				Sediment quality data captured at a range of sites across the catchment				
Water Quality	Protect and improve water quality for social values	Water Quality - recreational	Based on compliance with draft *SEPP (Waters)* recreational water quality objectives (swimming is considered as primary contact).	selected high recreation locations	Weekly monitoring during summer period		Annual	No
Stormwater	Infiltrating and harvesting stormwater	Stormwater	Stormwater condition score is based on Directly Connected Imperviousness (DCI) which is the proportion of the impervious surface that is directly connected to a stream through a conventional drainage connection.	Impervious surfaces will be mapped using aerial imagery and a defined methodology used to determine DCI levels for all waterway reaches	All waterway reaches Every 4 and 8 years	Analysis of flow data in key catchments to assess changes to flows based on upstream urbanisation	4 and 8 years	No
Stormwater	reduce sedimentation from run-off associated with construction for urban development	Water Quality environmental	NA	Specific catchment monitoring to better understand impacts and management interventions	Specific catchments as detailed in a monitoring plan	As required	4 and 8 years	Yes

Environmental Condition monitoring for Wetlands

Performance Objective Group	Performance Objective Theme	Environmental Condition terminology from HWS	HWS metric	Monitoring - data collection method and frequency	Where and when data will be collected	Other data to support assessment of condition	reporting	Method being revised
Vegetation	Increase Vegetation Extent	Wetland buffer	Based on the AVIRA threat metric for degraded buffer vegetation, which is based on an Index of Wetland Condition (IWC) buffer assessment score.	Index of Wetland Condition (review underway) Spatial and temporal scale being determined	TBC	TBC	TBC	Yes
Vegetation, pests, habitat	protect specific values and habitat Protect / maintain or improve vegetation quality	Vegetation Condition	Vegetation condition is based on the AVIRA value metric for wetland vegetation condition.	Index of Wetland Condition (review underway) Spatial and temporal scale being determined	TBC	TBC	TBC	Yes
Habitat, pests	protect specific values and habitat Mitigate threats to physical form Re-engage floodplains	Habitat form	Wetlands habitat form is based on the AVIRA threat metrics for reduced wetland area and altered wetland form.	Index of Wetland Condition (review underway)	TBC	TBC	TBC	Yes
Flow regime	Maintain or improve flow regimes in unregulated systems	Flow regime	Based on a simplified AVIRA threat metric for changed water regime.	Index of Wetland Condition (review underway) Spatial and temporal scale being determined	TBC	TBC	TBC	Yes
Water Quality	Address multiple sources of WQ impact Improve water quality from agricultural land practices	Water Quality environmental	Wetland water quality is based on wetland threat metrics: changed water properties salinity, changed water properties nutrients and disturbance or acid sulphate soils.	Index of Wetland Condition (review underway)	TBC	TBC	TBC	Yes

Image acknowledgements
Canoeing on the Yarra - Canoeing Victoria
Remaining images featured are credited to Melbourne Water.

Document History:

Date	Reviewed/Actioned By	Version	Action
June 2019	Framework released to meet RPO41	1	Version 1 released via YourSay Web site.

All data collection and reporting in this framework will be delivered subject to funding.