

Healthy Waterways Strategy

Monitoring, Evaluation, Reporting and Improvement Framework

Working together for healthy waterways



This document is version 1.1 of the Healthy Waterways Strategy – Monitoring Evaluation, Reporting and Improvement Framework

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

Establishing monitoring, evaluation, reporting and improvement (MERI) processes provides a framework for continuous improvement and learning. In this way, changes in the environment such as climatic variations, policy modifications and technology advances can be acknowledged and management approaches modified accordingly.

The management of rivers, wetlands and estuaries in the regional Healthy Waterways Strategy 2018 will be conducted within a continuous improvement cycle. At the core of improvement is the ability to learn from previous experience and update management approaches to reflect knowledge gained. The Healthy Waterways Strategy and the Co-Designed Catchment Programs are available at <https://yoursay.melbournewater.com.au/healthy-waterways/document-library>

The MERI ensures correct data is gathered throughout the 10-year duration of the strategy so a robust evidence base can be drawn on to assess progress, effectiveness and impact, and identify improvement opportunities.

This document serves as a framework for how these MERI processes will be enabled and:

- establishes the scope of the MERI
- sets out key principles for guiding MERI activities
- outlines the high-level program logic that underpins targets in the Strategy
- presents high-level key evaluation questions (KEQs), which will guide data collection and evaluation and reporting
- describes how high-risk assumptions and externalities in the logic will be monitored
- summarises the indicators and evaluation methods used for tracking progress against targets and performance objectives
- outlines how continuous improvement will be enabled
- presents a staged approach for implementing and improving the MERI plan.

Scope of the MERI

The MERI outlines monitoring requirements for all targets (i.e. value and condition) and the regional and sub-catchment performance objectives in the Healthy Waterways Strategy and the Co-Designed Catchment Programs. The MERI will include detailed monitoring and evaluation plans (MEPs) for the targets, and the performance objectives for each of the three ecosystem types – rivers, wetlands and estuaries. The MERI 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 is a collaborative plan in line with the co-delivery model of the strategy. A number of partner organisations, community groups and individuals will contribute data and information, and contribute to evaluations as prescribed in the MERI Framework or the MEPs.

MERI Principles

A number of principles have guided the development of the MERI Framework:

- Be fit for purpose.
- Prioritise health, safety and wellbeing.
- Support continuous improvement and enduring monitoring programs.
- Foster effective partnerships and alignment with other relevant strategies.
- Strive for open collaboration and transparency.
- Be cost effective – collect once; use many times.
- Ensure consistency, data integrity and robustness.
- Establish clear roles and responsibilities.
- Be risk based.
- Link research to conceptual models.

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 that ultimately lead to the goals and visions set for each of the five catchments across the Port Phillip and Westernport 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 MERI Framework. More detailed assumptions and logics will be outlined within the MEPs.

Key evaluation questions

The following KEQs guide evaluation of the Strategy:

Key evaluation question	When it is asked
KEQ 1 – To what extent have the performance objectives of the strategy been achieved?	Annual Event-based (as needed)
KEQ 2 – To what extent has progress been made towards the longer term environmental condition targets for rivers, wetlands and estuaries?	Mid-term (2022) End of Strategy (2026)
KEQ 3 – What is the state of waterway values?	Mid-term (2022) End of Strategy (2026)
KEQ 4 – To what extent have the delivery methods of the strategy been cost effective and efficient?	Mid-term (2022) End of Strategy (2026)
KEQ 5 – To what extent have legacy items been identified and planned for?	Mid-term (2022) End of Strategy (2026)

Data to inform the evaluation

The data required to answer the key evaluation questions need to support informed and collective decision-making. Investment in waterway monitoring, applied research, data collection and information over past decades has been critical to the development of the Strategy. Continued investment to track both short-term outputs and longer term outcomes is essential for successful implementation.

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

Pathways for learning and improving

While monitoring is conducted in an ongoing way, evaluation is done at various times, and learning and improvement can happen at any time.

Four evaluation and reporting activities underpin this MERI Framework: annual reporting, a mid-term evaluation, an end-of-Strategy review and a 'Red Report'. 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 bushfire.

The main ways in which continuous improvement will occur are through:

- tracking implementation using short-term indicators
- research and intervention monitoring
- surveillance monitoring.

Individual delivery partners will improve programs in response to the MERI in an ongoing way that is embedded within business processes. The catchment forums and the Regional Leadership Group will also be fundamental to enabling improvement and adjustment. The catchment forums will set the measures of success, contribute to the judgement of achievements, and identify lessons. Regular progress reporting through these groups will be critical to understanding issues and making decisions on how to adapt.

Implementation of the MERI Framework

The Healthy Waterways Strategy MERI Framework allows for a number of gaps in our knowledge and understanding of 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, 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 MEPs for rivers, estuaries and wetlands. The MERI Framework will be updated following the development of the MEPs. The MERI Framework may also be updated as a result of actions undertaken to improve the science models and clarify targets, research results or a mid-term review of the 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. **Refinement and adjustment** (years 5–10: 2023/24 – 2024/28) involves regularly evaluating how the MERI is being implemented and making improvements as required.

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Introduction

The 2018 Healthy Waterways Strategy provides a shared vision and goals for protecting and improving waterways across our region. The strategy guides 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 Healthy Waterways Strategy implementation ensures correct data are gathered throughout the life of the Strategy. This progressive step will ensure a robust evidence base can be obtained and used to assess progress, effectiveness, impact and improvement opportunities. As better monitoring indicators or methods are identified, the MERI will adapt.

The MERI processes will enable outcomes to be measured, evaluated and reported, and help to improve knowledge and practice. The MERI plan provides a way of understanding Strategy implementation successes and improvement opportunities.

Structure of the 2018 Healthy Waterways Strategy MERI

Establishing monitoring, evaluation, reporting and improvement processes for the Healthy Waterways Strategy includes a MERI Framework (this document), and monitoring and evaluation plans (MEPs) for each of the three ecosystem types considered: rivers, wetlands and estuaries Figure 1.

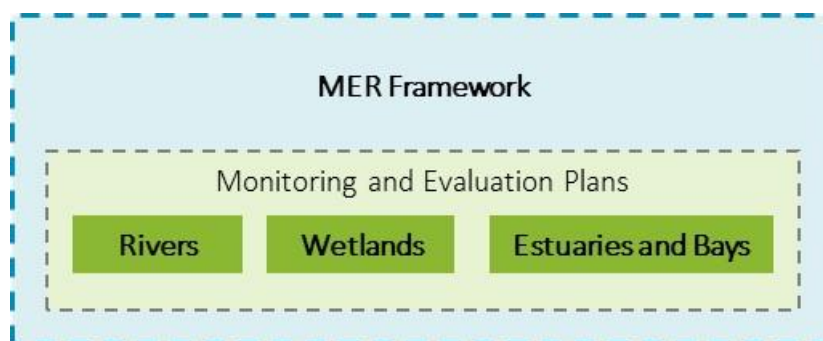


Figure 1. 2018 Healthy Waterways MERI structure

The **MERI Framework** (this document):

- clarifies the scope and rationale of the MERI
- sets the strategic direction for the MERI
- documents the overarching program logic for the MERI
- establishes high-level key evaluation questions and methods to evaluate Strategy progress
- summarises key indicators to monitor linking to regional and sub-catchment performance objectives
- outlines the reporting approach
- establishes and clarifies processes and opportunities for continuous improvement

- outlines governance arrangements for MERI processes.

Supporting the MERI Framework, **monitoring and evaluation plans (MEPs)** for rivers, wetlands, estuaries:

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

MERI Framework principles

Ten principles are the compass for development of the MERI Framework, and they will be used as the framework is refined over time. The principles ensure monitoring methods are safe, cost effective and fit for purpose. They are applied to each indicator, monitoring design, evaluation and reporting method.

Be fit for purpose

A rigorous methodology must guide data collection, analysis and decision making. It should be easy to implement, transparent and appropriate to the aims of the Strategy. Using a mix of qualitative and quantitative methods ensures robustness of data collection and analysis. It is important to facilitate effective communication of results to the broadest audience possible.

Prioritise healthy, safety and wellbeing

As monitoring programs and activities are undertaken for the MERI, 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.

Foster effective partnerships and alignment with other relevant strategies

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. The MERI Framework should align where possible with broader environmental goals of the state and contribute to the achievement of other plans and targets.

Strive for open collaboration and transparency

The MERI Framework should provide the structure by which stakeholders at the regional, catchment and sub-catchment scales can consistently and transparently report data, information and results of evaluation, communicating them to relevant audiences.

Be cost effective – collect once; use many times

All monitoring efforts should have clear objectives and relevance. Existing monitoring programs and associated data should be used where appropriate to avoid duplication. Where possible, data should be used and shared for several purposes.

Support continuous improvement and enduring monitoring programs

The MERI should be based on the foundation of past monitoring programs and knowledge. It should recognise that monitoring is required consistently over long periods, often decades, to detect trends. The MERI Framework and the MEPs should be regularly reviewed and refined over time.

Ensure consistency, data integrity and robustness

Standard methodologies, particularly state-wide protocols, are required to support consistency in data collection. There should be broad consideration of similar national and international programs. Data should be maintained and good data management processes and systems embedded. Stable and sensitive indicators should be employed that do not have constantly changing methodologies preventing comparison of data over time and that respond to changes in the environment and management actions.

Establish clear roles and responsibilities

Clear roles and responsibilities within and between agencies and partners for data collection, analysis, evaluation, reporting and adapting to evaluation outcomes are crucial to effective implementation of the MERI.

Be risk based

There should be a balance to monitoring threatened species along with status and condition of all other species and locations across the region. Monitoring effort should be directed to the highest risk threats to waterway values. Risk profiles should be used to prioritise monitoring effort.

Link research to conceptual models

Conceptual and quantitative models should be used and continuously revised, and research should be targeted to high-risk, low-confidence links within the models.

MERI Framework scope and focus

The scope of this MERI Framework covers all waterway assets within the Port Phillip and Westernport region that are referred to in the Strategy. Not all wetlands in the strategy include performance objectives. Wetland condition monitoring will be broader, based on appropriate selection of sites and metrics. The MEPs provide details on monitoring the trajectory of values and conditions for rivers, wetlands and estuaries.

The MERI will span the full 10 years of Strategy implementation and provide an end-of-Strategy review to guide its refresh in 2028.

The MERI is collaborative, aligned with the co-delivery model of the Strategy. Partner organisations, community groups and individuals will contribute data and information, and to evaluations, as prescribed in the MERI Framework or the MEPs.

MERI Framework key documents

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.



Figure 2 Healthy Waterways Strategy 2018

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 50-year outcomes.



Figure 3. Co-designed Catchment Programs

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')

The Healthy Waterways Strategy and the Co-Designed Catchment Programs are available at <https://yoursay.melbournwater.com.au/healthy-waterways/document-library>

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.

Targets and performance objective groupings

The strategy includes outcomes and targets, including vision statements, regional and catchment goals, key value and condition targets and performance objectives. These have been summarised in terms of their spatial and temporal scale in Table 1. The Program Logic section provides more description.

Table 1. Summary of outcomes and targets in the Healthy Waterways Strategy

Time frame	Type of outcome/target		
	Region	Catchment	Sub-catchment (rivers, wetlands and estuaries)
50 years +	Vision statement	Vision statement Goals	
20 years +		Key value targets (average of sub-catchments) Condition targets (average of sub-catchments)	Key value targets Condition targets
Up to 10 years	Performance objectives		Performance objectives

The strategy includes 45 regional performance objectives. The Co-Designed Catchment Programs contain 911 individual performance objectives – across rivers, wetlands and estuaries. The performance objectives can be categorised into 12 groups, with a number of sub-groups (**Table 2**). These groupings help to structure the monitoring, evaluation and reporting into similar indicators and evaluation approaches. Figure 4 presents a spatial breakdown of the performance objectives.

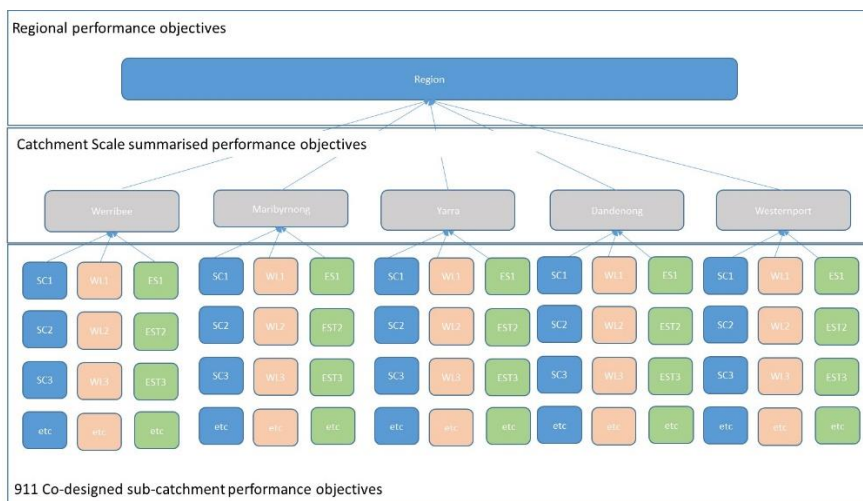


Figure 4. Conceptual view of the different scales and types of performance objectives

Table 2. Performance objective groups and sub-groups

Group	Co-designed Catchment Program performance objective sub-group	Regional performance objective
Habitat	<ul style="list-style-type: none"> Increase instream connectivity (fish passage) Protect and/or improve physical form/habitat Protect specific species and habitats Re-engage floodplains 	<p>RPO-32: Programs are in place to protect and enhance sites of biodiversity significance associated with the region’s waterways, such as through Melbourne Water’s Sites of Biodiversity Significance Strategy</p>
Vegetation	<ul style="list-style-type: none"> Increase or maintain vegetation quality Increase or maintain vegetation extent 	<p>RPO-28: Seasonal herbaceous wetland vegetation communities are identified and a management program is in place to protect them on public and private land.</p> <p>RPO-29: Programs, standards, tools and guidelines are in place to protect wetland vegetation communities from urban and rural threats, including adequate planning controls</p> <p>RPO-30: Climate change resilient revegetation management practices are understood and implemented by selecting plant species, provenances and vegetation communities that are</p>

		suited to projected future climatic conditions
Pests	Reduce threat of invasive species (flora and fauna)	RPO-31: A risk-based approach is adopted to prevent, eradicate and contain pest plants and animals (including deer) and protect waterway assets
Water Quality	<p>Address urban diffuse sources of water quality impact</p> <p>Improve water quality from agricultural land practices</p> <p>Maintain water quality levels for recreational uses</p> <p>Maintain or improve quality of point source pollution (e.g. sewage treatment plant discharges)</p> <p>Reduce sedimentation from runoff associated with construction for urban development</p> <p>Artificial estuary mouth openings are only undertaken when a risk assessment concludes that opening conditions are low risk for the environment</p>	<p>RPO-23: The potential impacts of emerging contaminants of concern such as microplastics, pesticides and pharmaceuticals and toxic chemicals are better understood and mechanisms to respond collaboratively developed</p> <p>RPO-24: Risk-based programs are in place to mitigate sources of urban pollution (licenced and unlicenced discharges) to protect bays and waterways</p> <p>RPO-25: Programs, standards, tools and guidelines are in place to manage nutrients, sediments and other pollutants from rural land in priority areas</p> <p>RPO-17: Water quality in waterways and bays is improved by reducing inputs of sediment and other pollutants from urban construction and development</p>
Stormwater	Infiltrate and harvest stormwater from new and/or existing developments	<p>RPO-13: Industry capacity for whole of water cycle and stormwater management is increased to enable collaboration, improved access to information and knowledge, and a skilful and capable industry with strong established networks</p> <p>RPO-14: Standards, tools and guidelines are in place and implemented to enable re-use and infiltration of excess stormwater, and protect and/or restore urban waterways</p>

Water for the Environment	<p>Increase environmental water reserve in regulated systems</p> <p>Maintain or improve flow regimes in unregulated systems</p>	<p>RPO-12: Water for the environment continues to be managed and delivered to the region’s rivers and wetlands and recovery options continue to be investigated</p> <p>RPO-11: Understanding of groundwater dependent ecosystems is improved and opportunities to maintain or improve these continue to be investigated</p>
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Community Places	<p>Increase access to and along waterways, wetlands and estuaries by filling gaps and improving connections to existing path networks.</p>	<p>RPO-43: The social values framework, information and methods used to develop values assessments, targets and performance objectives are further developed and improved during the life of the Healthy Waterways Strategy</p> <p>RPO-19: Options to transform modified waterways by creating more natural, community-loved spaces are identified and implemented</p> <p>RPO-20: The amenity, community connection and recreation values of wetlands are better understood. Performance objectives are developed to enhance these values</p> <p>RPO-21: The many benefits of waterways investment are tracked and understood</p> <p>RPO-22: Cooler, greener and more liveable urban environments are created through revegetation and as part of managing excess stormwater</p> <p>RPO-26: Methods are in place to assess volume and source of litter to inform and promote litter-reduction programs</p> <p>RPO-27: The incidence of littering and illegal dumping is reduced through raised community awareness and knowledge, infrastructure and enforcement</p>
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Engaged Communities	<p>Increase participation rates</p> <p>Support community groups and citizen science</p> <p>Connect with growth area communities</p> <p>Build capacity of landholders through rural programs</p> <p>Increase participation through promotion of high-value species in the region</p>	<p>RPO-37: Participation rates in education, capacity building, incentive programs and citizen science activities have increased and enable greater levels of environmental stewardship for waterways</p> <p>RPO-38: Key messages, stories and resources for waterways and waterway health are collaboratively developed and broadly distributed, increasing community knowledge and engagement around waterways</p> <p>RPO-39: Systems and pathways to share knowledge and information between communities and stakeholders have been developed and expanded to empower communities to participate and influence waterway management (e.g. digital portals, social media, communities of practice, signage programs)</p> <p>RPO-40: The profile of waterways is lifted, local connections to waterways are increased, and leaders in waterway management are celebrated and fostered</p>
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Group	Regional performance objective
<p>Traditional Owners</p> <p>(note there are no sub-groups for this group)</p>	<p>RPO-1: Traditional Owners and Aboriginal Victorians have an increased expertise in contemporary land and waterway management, waterway science and lore</p> <p>RPO-2: Partnership projects build on what is working. Expertise developed in one project is applied in others</p> <p>RPO-3: Traditional Owner groups and Aboriginal Victorians are supported by industry partners to influence the agenda for waterway management by proactively developing communications, resolutions or project scopes and seeking industry partners</p> <p>RPO-4: Aboriginal and Traditional Owner cultural awareness training is available to all industry professionals and is actively pursued</p>

RPO-5: Cultural competency is valued as a career skill and leads to ongoing relationships

RPO-6: Partnerships are fostered between Traditional Owner groups and research groups, and between Traditional Owner groups and community groups

RPO-7: Public events led and/or organised by Traditional Owners are regular and frequent

Collaborative Governance

RPO-15: Victoria’s planning system is used effectively to protect and enhance waterway values

(note there are no sub-groups for this group)

RPO-33: A Regional Leadership Group and catchment implementation forums are established to support work towards the vision and goals of the Healthy Waterways Strategy at the regional and catchment scales

RPO-34: Waterway Labs are established as needed to tackle complex or region-wide priorities

RPO-35: The effectiveness of the Regional Leadership Group, catchment implementation forums and Waterways Lab are evaluated, through ongoing feedback, and one interim and one final assessment undertaken during the life of the Strategy

RPO-36: The catchment implementation forums improve the coordination of information and activities by catchment stakeholders and communities (while ensuring waterway management includes the whole-of-catchment perspective)

Economic Values

RPO-8: Environmental–economic accounts are developed for the region’s waterways using contemporary international standards, and are used to demonstrate the returns on catchment and waterway investment

(note there are no sub-groups for this group)

RPO-9: Environmental–economic accounting is incorporated into Healthy Waterways Strategy monitoring, evaluation and reporting by 2023

Adaptive Management and Research

RPO-10: An adaptive pathways approach is adopted to understand and manage the risks of climate change on waterways

(note there are no sub-groups for this group)

RPO-16: Protection mechanisms are in place for headwaters to ensure that they are retained as features in the landscape for environmental, social, cultural and economic benefits

RPO-18: Critical waterway health assets including stormwater treatment systems, fishways and erosion control structures are maintained for their designed purpose, or the same outcomes are delivered by alternative means

RPO-41: A monitoring, evaluation and reporting plan is in place by 30 June 2019

RPO-42: Wetland condition information and prioritisation with a focus on vulnerable wetlands is understood and informs collaborative planning

RPO-44: Web-based systems are established to report performance and measure outcomes of the catchment implementation forums (by 30 June 2020)

RPO-45: Research partnerships with universities and other research institutions are in place to address the key research areas and build our knowledge and capacity to efficiently and effectively achieve the Healthy Waterways Strategy performance objectives and targets

Program logic for the Healthy Waterways Strategy

Program logic is a planning approach using 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.

Program logic 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.

The high-level program logic in the Healthy Waterways Strategy is shown in Figure 6. A more detailed program logic of the strategy has been developed for the MERI plan to better articulate the links between short-term and longer term outcomes (**Figure 6**).

The MEPs (developed for rivers, wetlands and estuaries) will include further detailed logics and conceptual models for waterway values and conditions. The logics presented in the MEPs will explore and describe the explicit links between foundational activities, outputs, performance objectives and outcomes (values and conditions).

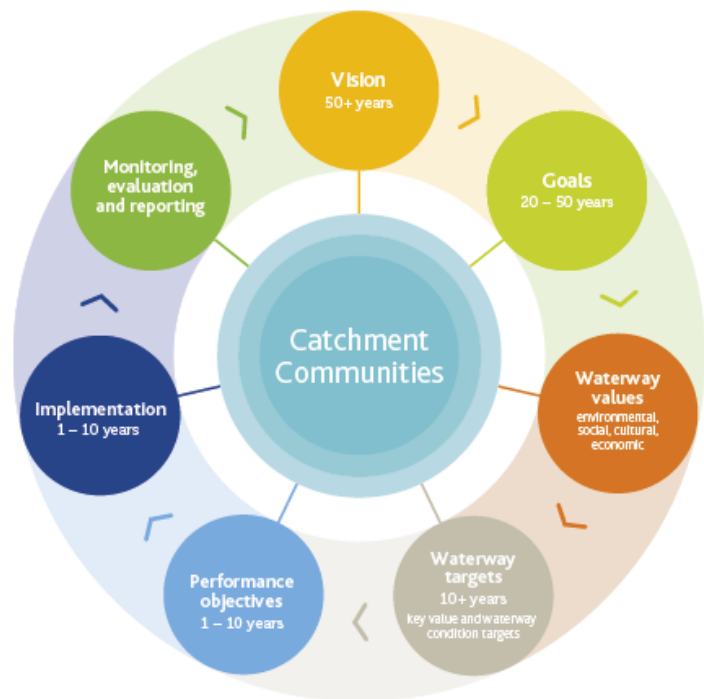
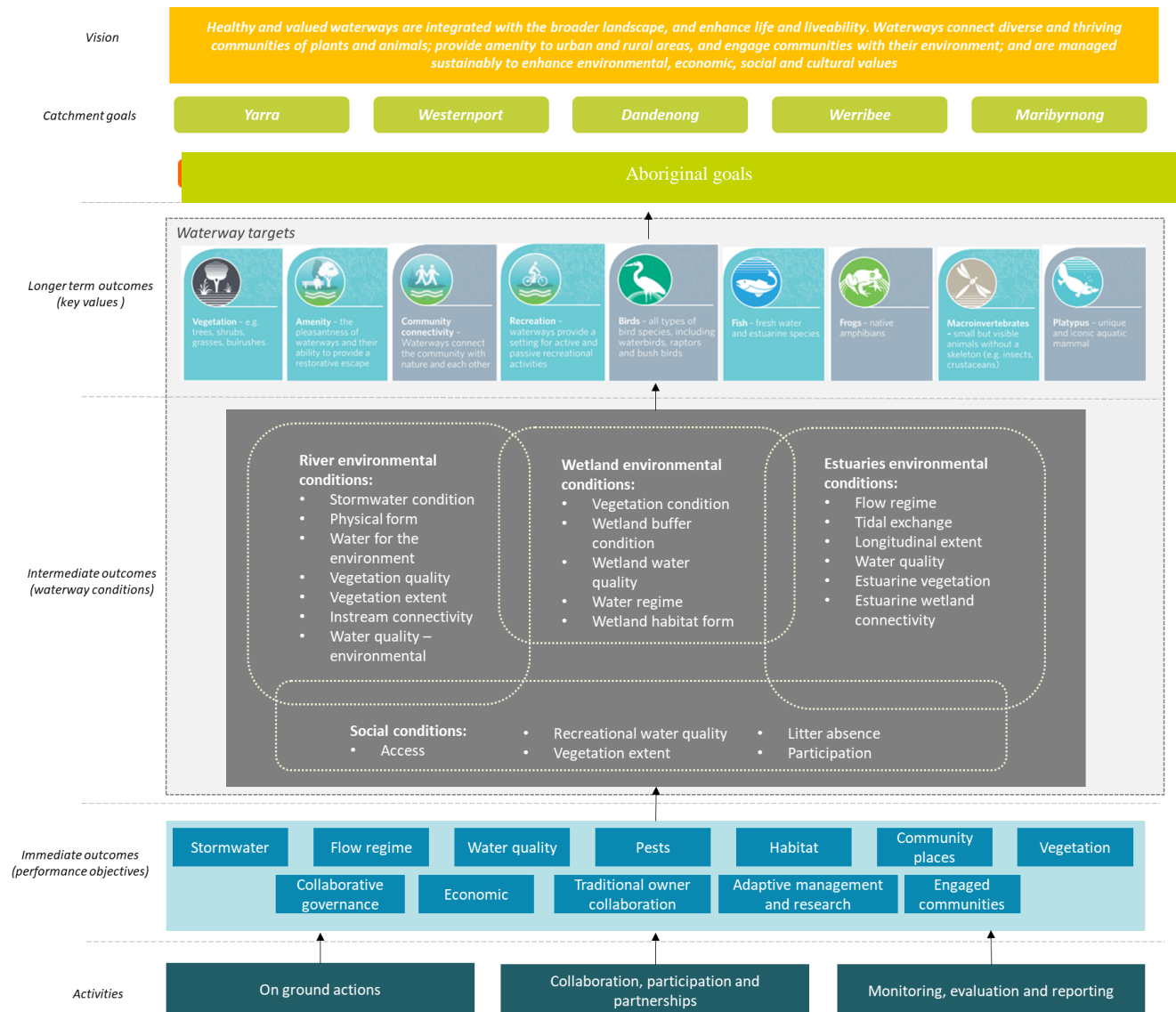


Figure 5. High-level program logic for the Healthy Waterways Strategy



Vision – The vision is established for the region and for each of the five catchments in the region.

Goals – A goal for recognising Aboriginal waterway values was developed by Traditional Owners. The community goals for each catchment were intended to apply to a time frame generally longer than 20 years and assist in priority setting.

Longer term outcomes (key values) – These are waterway targets set collectively for key values, which include both social and environmental values. Economic values are still to be explicitly developed.

Intermediate outcomes (waterway conditions) – These are targets for conditions required to achieve key value targets.

Immediate outcomes (performance objectives) – These provide short-term, tangible outcomes, which indicate progress towards less tangible, long-term outcomes. 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 Murrong) 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.

Figure 6. Detailed program logic for the Healthy Waterways Strategy

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 causal 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 how they will be tested are documented in Table 3. The Regional Leadership Group will play a critical role in managing risks associated with these assumptions.

Although economic values and benefits were discussed in the Strategy, outcomes or targets were not developed. The program logic should be reviewed once the System of Environmental Economic Accounting has been developed for the region as per regional performance objectives 8 and 9.

Table 3. Key assumptions underpinning achievement of outcomes

Assumption	Approach to monitoring assumption
It is assumed that low confidence interventions will result in the intended outcome	Testing of low confidence links within conceptual models will be part of the ongoing research program
It is assumed that increased collaboration and partnerships is a more effective and efficient way to deliver on the strategy targets	A key evaluation question, KEQ 4, addresses this assumption directly
It is assumed that to achieve the long-term targets in the strategy there will be increased and sustained investment in actions, particularly around natural wetlands. It is assumed that Melbourne Water will receive adequate funding through its 5 year Waterways and Drainage Investment Plan	Assess all delivery partner willingness to invest in actions (particularly Melbourne Water's investment plan process which is based on a willingness to pay study) Assess collaboration and partnerships in increasing efficiency
It is assumed that we will experience climate change. It is assumed that in some cases actions can offset these impacts (e.g. maintaining base flows for platypus through innovative stormwater management)	Monitoring programs will be established to better understand the impacts of climate change (e.g. macroinvertebrate and vegetation condition monitoring)
It is assumed that increased stormwater standards to better manage impacts of flow will be applied (with feasible solutions) to new urban development – at least within the priority stormwater catchments	Monitoring of changes to policy will be included in tracking progress to stormwater conditions
It is assumed that actions and targets for social values will not negatively impact areas of high environmental value	Areas of conflict should be raised and reviewed as part of a mid-term evaluation

Externalities, context and indirect drivers of Strategy performance

External factors outside of the control of the strategy may affect the achievement of outcomes. Although the strategy factored in projections for climate change, population growth and managing drought conditions, the magnitude, severity and spatial distribution 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 4 presents the data and indicators that will form part of the ongoing surveillance.

Table 4. Data and indicators to help understand externalities, context and indirect drivers of Strategy performance

Context	Data and indicators	
Physical	Flow regime	Natural disaster events (e.g. bushfire, flood)
	Temperature	
	Sea-level rise	Emergency events (e.g. pollution spills, fish kills)
	Land development patterns (e.g. impervious surfaces)	Illegal activities
	Population growth	Threatened species and potential extinctions
	Land use change	Introduced species, pathogens and disease
	Major development, such as major roads	
	New and emerging contaminants	
Policy	Government regulations	Governance structure
	Legislation, policy	Political drivers
Implementation	Funding – agencies, volunteers	Voluntary involvement in catchment management
	Agency structures	Technologies

Questions to guide evaluation of the strategy

The strategy and planning phase of the MERI cycle includes the development of pre-determined key evaluation questions (KEQs) to assess the strategy and gain new knowledge and information. Key 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 provides direction and improved knowledge for subsequent planning cycles.

Key evaluation questions and sub-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.

KEQs have been guided by several standard evaluation categories. These are included in Table 5 along with the KEQs for the Healthy Waterways Strategy. Along with the category is the time frame for evaluation and reporting. Below the KEQs are sub-questions, providing further context and guide data needs. It is intended to refine sub-questions during the life of the strategy.

Table 5. Key evaluation questions for the Healthy Waterways Strategy

Key evaluation question and sub-questions	When it is asked	Question category and description
<p>KEQ 1 – To what extent have the performance objectives of the strategy been achieved?</p> <p>1a. Is annual and cumulative progress towards the 10-year objectives on track? If not why not?</p> <p>1b. To what extent have the fundamental changes required to implement the strategy in full been made? If not, why not?</p> <p>1c. To what extent has the strategy influenced emergency and critical events (if or as they occur) and to what extent have critical events impacted on the achievement of the Strategy? How effective was the response to the event in minimising impact?</p> <p>1d. To what extent has the delivery of the strategy been safe?</p>	<ul style="list-style-type: none"> • Annual • Event-based (as needed) 	<p>Effectiveness</p> <p>These questions seek to identify the achievement of the performance objectives identified in the MERI plan. They evaluate the achievement of desired management outputs and resource condition objectives.</p>
<p>KEQ 2 – To what extent has progress been made towards the longer term environmental condition targets for rivers, wetlands and estuaries?</p> <p>To what extent are the conditions on the target trajectory? If not, what are the possible causes?</p>	<p>Mid-term (2022)</p> <p>End of Strategy (2026)</p>	<p>Impact</p> <p>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.</p>
<p>KEQ 3 – What is the state of waterway values?</p> <p>3a. To what extent are key values on the predicted trajectory?</p> <p>3b. What is the trajectory of macroinvertebrates at key monitoring sites and what inferences can be drawn about stream health? (see Box 1)</p> <p>3c. To what extent have the ecosystems services and benefits as defined through the System of Environmental Economic Accounting changed as a result of investment in waterways?</p>	<p>Mid-term (2022)</p> <p>End of Strategy (2026)</p>	<p>Impact</p> <p>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.</p>
<p>KEQ 4 – To what extent have the delivery methods of the strategy been cost effective and efficient?</p> <p>4a. How and to what extent has collaboration enabled effective and efficient delivery of the Strategy?</p> <p>4b. To what extent have monitoring and research contributed to effective and efficient delivery of the Strategy?</p>	<p>Mid-term (2022)</p> <p>End of Strategy (2026)</p>	<p>Efficiency and appropriateness</p> <p>These learning questions seek to identify how the strategy can be delivered more efficiently, and to identify opportunities for improving the design and delivery of the strategy to ensure</p>

Key evaluation question and sub-questions	When it is asked	Question category and description
<p>4c. To what extent have data been used to inform and validate models and assumptions, and to inform adaptive management?</p> <p>4d. How appropriate were interventions in achieving the intended outcomes and aligning with needs of beneficiaries?</p> <p>4e. How have Traditional Owner and Aboriginal Victorian knowledge informed and been advanced through Strategy implementation?</p>		<p>that it is meeting the needs of its intended beneficiaries, and its obligations.</p>
<p>KEQ 5 – To what extent have legacy items been identified and planned for?</p> <p>5a. Which programs should continue or be modified and are resources being planned for?</p> <p>5b. What are the long-term arrangements for managing and resourcing maintenance of outcomes?</p>	<p>Mid-term (2022)</p> <p>End of Strategy (2026)</p>	<p>Legacy</p> <p>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.</p>

Box 1. Macroinvertebrates as an overarching indicator of river health

The sensitivity of macroinvertebrates to changes in conditions, threats and management interventions make them good to assess (Rosenberg & Resh 1993). They are used as biological objectives within environment protection policies for Victoria. Across the catchments, sites have been monitored since the 1990s. Many sites have several years of data.

As part of the Health Waterways Strategy, macroinvertebrates will be used as an annual indicator to track environmental values. Fixed sites will be monitored regularly for annual analysis and reporting. The Rivers MEP will outline the detailed monitoring and data analysis plan for macroinvertebrates. Data will be reported annually in the annual Healthy Waterways Strategy MERI report.

Frequency of evaluation and reporting

Monitoring is ongoing and evaluation is performed less frequently and at points in time. This MERI Framework includes annual reporting, a mid-term evaluation, an end-of-Strategy review and a Red Report at points in time or event based (Figure 7). More frequent reporting of planned and completed activities (using spatial datasets) may become feasible through the web-based reporting platform being developed.

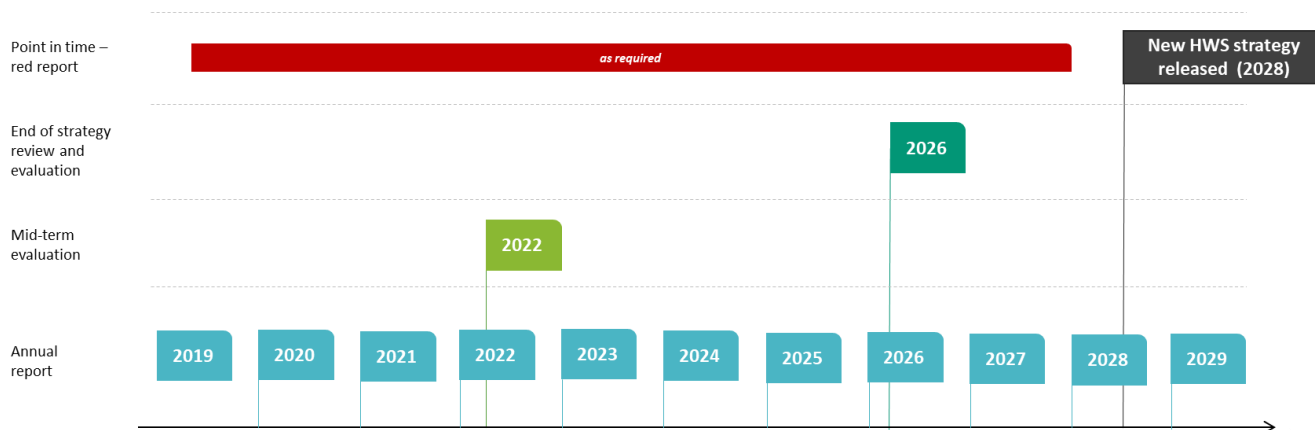


Figure 7. Time frame for evaluations over the life of the Healthy Waterways Strategy

The Red Report will capture evaluation of significant events that should be immediately communicated and addressed. It may include the need to respond to increasing drying conditions or an acute event such as a severe flood or bushfire.

Methods of evaluation

Evaluation methods adopted assist collaborative and participatory approaches and are informed by robust scientific data and analytical methods.

A mix of comparative and qualitative methods will be applied for Strategy evaluation, providing rigour and certainty to assess performance towards outcomes, make recommendations and identify opportunities for improvement and decision making.

Comparative methods

To analyse data and assess Strategy performance; the evaluation will 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 ensures high quality comparative assessments. This enables clear and confident judgement on the success of a program.

Rubrics will be developed collaboratively, involving program managers and beneficiaries. This process will define what 'success looks like' in terms of evaluation criteria and standards, which in turn encourages 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. They are particularly useful for drawing out broader evaluative findings about why activities or outcomes were or were not successful and if there were any additional unanticipated positive or negative outcomes.

To rigorously assess performance using qualitative methods, the data will be applied systematically when drawing evaluative conclusions. Conclusions will be based on thematic analysis of data, in some cases a rating scale, or rubric, may be used such as poor/fair/good, to gauge outcomes qualitatively, using expert judgement.

Six qualitative methods form part of the MERI Framework:

- **Reviews** include a retrospective consideration and assessment of a delivery program, technique, management action or practice, process or output of the Healthy Waterways Strategy. They will generally involve the revision of existing data, including monitoring data. They may also require the collection of new data, for example a literature review or comparison of existing or emerging documentation.
- **Expert reviews** are similar to reviews but are conducted by an expert in the relevant technical field. An 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. These interviews are particularly useful for identifying barriers or challenges experienced through the delivery of the Strategy, unanticipated outcomes and opportunities for improvement.
- **Surveys** can be used to gather a large amount of data from several individuals on a variety of issues and are particularly useful for identifying differences in responses/opinions.

- **Case studies/outcome narratives** are discrete investigations or pieces 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 workshops** have the primary purpose of reaching agreement 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 often require expert facilitation to navigate varying opinions and experiences. It is the facilitator's role to either document the variation in perspectives or try to achieve a consensus on decision making.

Who evaluates and who judges success

Table 6 summarises the evaluation approach and methods, and who judges the performance against each KEQ.

The Regional Leadership Group and catchment forums, including Traditional Owners, have the most significant role in judging the program. Under its obligations in the *Water Act 1989* (Vic) Melbourne Water is ultimately responsible for developing and implementing this MERI, and as such will produce the annual and evaluation reports, as well as sharing new information as it becomes available.

Through consensus, the catchment forums will have the ability to modify targets in the Co-Designed Catchment Programs based on new information. The Regional Leadership Group will be made aware of significant issues that require high-level attention so that appropriate improvements can be made. Any proposed changes to the regional performance objectives or the Healthy Waterways Strategy main document must be endorsed by the Regional Leadership Group and be signed off by the Minister for Water.

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. Partners, such as the Environment Protection Authority, Department of Environment, Land, Water and Planning, Parks Victoria, Port Phillip and Westernport catchment management authorities and local government, will be involved in informing the evaluation of effectiveness and efficiency of the delivery.

Delivery partners will 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 Strategy performance objectives).

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

Table 6. Summary of the evaluation approach, methods and who judges progress and success of key evaluation questions

Key evaluation question and sub-questions	Evaluation approach and method	Data required to inform evaluation	Who judges progress and success?
KEQ 1 – To what extent have the performance objectives of the strategy been achieved?			
1a. Is annual and cumulative progress towards the 10-year objectives on track? If not why not? 1b. Have the fundamental changes required to implement the strategy in full been made? If not, why not?	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	Collaborative forums Regional Leadership Group
1c. To what extent has the strategy influenced emergency and critical events (if or as they occur) and to what extent have critical events impacted on the achievement of the Strategy? How effective was the response to the event in minimising impact?	Investigations Review Expert review Case study/outcome narratives	Context and drivers Emergency event, incident data Safety data	Regional Leadership Group Relevant experts
1d. To what extent has the delivery of the strategy been safe?	Review		Melbourne Water Regional Leadership Group
KEQ 2 – To what extent has progress been made towards the long-term environmental condition targets for rivers, wetlands and estuaries?			

<p>To what extent are the conditions on the target trajectory? If not, what are the possible causes?</p>	<p>Comparative methods – status of conditions will be compared to predicted target trajectory in the Strategy.</p> <p>Evaluation will be undertaken based on methods applied for conditions (as outlined in the Healthy Waterways Strategy Resource Document) unless modified or a different method adopted in the asset-based MEPs.</p>	<p>Waterway conditions Context and drivers</p>	<p>Healthy Waterways Strategy Science Panel Regional Leadership Group</p>
<p>KEQ 3 – What is the state of waterway values?</p>			
<p>3a. To what extent are key values on the predicted trajectory?</p>	<p>Comparative methods – status of key values will be compared to the predicted target trajectory in the Strategy.</p>	<p>Key values (see Key Values and Waterway Conditions section)</p>	<p>Healthy Waterways Strategy Science Panel Regional Leadership Group</p>
<p>3b. What is the trajectory of macroinvertebrates at key monitoring sites and what inferences can be drawn about stream health?</p>	<p>Evaluation will be undertaken based on methods applied for each key value (outlined in the Healthy Waterways Strategy Resource Document) unless modified or a different method adopted in the asset-based MEPs.</p>	<p>Annual macroinvertebrate data</p>	
<p>3c. To what extent have the ecosystems services and benefits as defined through the System of Environmental Economic Accounting changed as a result of investment in waterways?</p>	<p>Economic evaluation will be undertaken using environmental-economic accounts. This will be determined through the establishment of accounts.</p>	<p>Service and benefits data (as identified in environmental-economic accounts)</p>	
<p>KEQ 4 – To what extent have the delivery methods of the strategy been cost effective and efficient?</p>			
<p>4a. How, and in what ways, has collaboration enabled effective and efficient delivery of the Strategy?</p>	<p>Review Reflective interviews Comparative methods Expert review</p>	<p>Delivery program evaluations Social research – interviews, surveys, capacity assessment</p>	<p>Catchment forums Regional Leadership Group</p>

4b. How has monitoring and research contributed to effective and efficient delivery of the Strategy?			Traditional Owner Groups Delivery Partners Healthy Waterways Strategy Science Panel Regional Leadership Group Traditional Owners
4c. To what extent has data been used to inform and validate models, assumptions and to inform adaptive management?	Review Reflective interviews Comparative methods Expert review	Research program evaluation MERI review Social research – interviews, surveys, capacity assessment	Healthy Waterways Strategy Science Panel Regional Leadership Group Traditional Owners
4d. How appropriate were interventions in achieving the intended outcomes and aligning with needs of beneficiaries?		Other Strategy and program evaluations Expert review Social research – interviews, surveys, capacity assessment	Healthy Waterways Strategy Science Panel Regional Leadership Group Traditional Owners
4e. 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
KEQ 5 – To what extent have legacy items been identified and planned for?			
5a. Which programs should continue or be modified and are resources being planned for?	Review Summit workshop	MERI evaluation outputs	Healthy Waterways Strategy Science Panel Regional Leadership Group Catchment forums Traditional Owners
5b. What are the long-term arrangements for managing and resourcing maintenance of outcomes?			

Data to inform evaluation

The data for evaluation need to enable informed, collective decision making. The strategy relies 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 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. Addressing key gaps and assessing 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 waterways 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.

Monitoring data collection and management

Monitoring activities inform evaluation of and reporting on Strategy implementation. They enable input, validation and calibration data for estimations made of key-value outcomes where we cannot collect all the information necessary to 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 and population growth above what was assumed in the Strategy, 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. Department of Environment, Land, Water and Planning 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 *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), the *Flora and Fauna Guarantee Act 1988* (Vic) and of 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 strategy and provide greatest value to the community.

Data availability will comply where possible with the DataVic access policy (see Box 2).

Box 2. 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, licencing 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

This data comprises 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

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.
2. Government data will be made available under flexible licences.
3. With limited exceptions, government data will be made available at no or minimal cost.
4. Government data will be easy to find (discoverable) and accessible in formats that promote its re-use.
5. Government will follow standards and guidelines relating to release of data and agency accountability for that release.

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

Methods of monitoring data collection

Four types of data will be collected as part of the Strategy:

- **social research data** – including perception surveys, needs analysis, interviews
- **spatial data** – including remote sensing, aerial photography, satellite imagery
- **field survey data** – on-ground assessments (e.g. flora surveys)
- activity tracking data (i.e. outputs).

Further information regarding methods is provided in Table 7, and will be described in detail in each MEP. Further collaboration with delivery partners is required around data-sharing arrangements.

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

Data type	Monitoring survey method	Who collects data	Frequency of data collection
Social research	Qualitative perceptions survey	Melbourne Water Parks Victoria Local government	Annual Biennial
	Interviews and surveys	Traditional Owners Melbourne Water	To be determined
	Water Sensitive Cities index	To be determined	To be determined
Light	Remote sensing	Melbourne Water	To be determined
	Light detection and ranging	Melbourne Water	To be determined
	Spatial data layers	Melbourne Water Parks Victoria Local government	Annual Project initiation or completion
Field-based	eDNA (see Box 3)	Citizen scientists Melbourne Water	To be determined
	Traditional sampling	Citizen scientists Melbourne Water Birdlife Australia Environment Protection Authority	To be determined
	Assessment tools	Citizen scientists	To be determined
	Condition indexes (e.g. Index of Wetland Condition, Index of Estuary Condition)	Citizen scientists Melbourne Water	To be determined
	Gauging stations	Department of Environment, Land, Water and Planning Environment Protection Authority Melbourne Water	Continuous Monthly/every second month Event-based
Activity tracking (spatial where possible)	Progress reporting of actions, outputs and immediate outcomes	Program delivery agents	Collected as works undertaken. Reported quarterly to Healthy Waterways Strategy lead agency

Data analysis plan

A data analysis plan will be developed as an intrinsic component of all the various monitoring programs. This plan is a map of planned analysis created and committed to before observing outcomes. It fosters transparency, openness and reproducibility, and ensures integrity and quality to the MERI. It ensures specifications and protocols for data collection, analysis, use and storage that respond to the KEQs and tests key assumptions.

Role of citizen science

Citizen 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. Existing long-term surveillance monitoring citizen science programs are Frog Census, Platypus Spot, Waterwatch and bird monitoring through Birdlife Australia.

Training and support will be provided to citizen scientists, who will be encouraged to support the MER. Protocols and standards will be used to ensure data is of an appropriate standard. A system for entering, collating and reporting citizen science data will be developed.

Box 3. eDNA sampling and applications in waterways of the Port Phillip and Westernport region

All organisms leave traces of DNA in the environment (environmental DNA or eDNA). These include the cells in hair, scales, mucus, faeces and skin. When extracted from water or soil, eDNA can be amplified in a laboratory. DNA sequences can be analysed to identify species and to indicate rank or relative abundance (Doi et al. 2017; Lacoursiere-Roussel et al. 2016; Pilliod et al. 2013; 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 5 years, as part of an Australian Research Council Linkage project, Melbourne Water, The University of Melbourne and Cesar Australia/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 allows sampling of sites that traditionally have been difficult to survey (e.g. water that is fast flowing, deep or turbid).

In 2017, Melbourne Water in partnership with Cesar Australia/EnviroDNA undertook Aquablitz, a large-scale eDNA metabarcoding project, to survey freshwater biodiversity at about 340 sites. These included 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 & Coleman, manuscript in preparation).

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

Storing and managing data

A number of data storage systems identified in the MERI plan as suitable for use are shown in Table 8 (although not an exhaustive list).

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. Some 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
GrantsTracker/Smarty Grants	Information relating to incentives provided by Melbourne Water	Melbourne Water
Geographical Information System	Impervious cover, light detection and ranging Vegetation extent and quality Fish barriers Waterway network, etc. Fences, pathways	Melbourne Water
HydStra (hydrographic database)	Flow	Melbourne Water
EnviroSys	Water quality and sediment quality	Melbourne Water
Melbourne Water waterbug database	Macroinvertebrates	Melbourne Water
Frog Census app	Frogs	Melbourne Water
Healthy Waterways Strategy AVIRA dataset	Values, conditions, threats for wetlands and estuaries	Melbourne Water
Community perception survey database	Community perception of waterways survey	Melbourne Water
Atlas of Living Australia	Species observations	Hosted by CSIRO
Victorian Biodiversity Atlas	Species observations, including fish	Department of Environment, Land, Water and Planning
Waterwatch Victoria data portal	Water quality	Department of Environment, Land, Water and Planning
Spatial temporal activity recorder	Waterway and catchment management activity mapping – standard outputs	Melbourne Water Department of Environment, Land, Water and Planning
Bureau of Meteorology	Climate, flow and rainfall data	Bureau of Meteorology
Atlas of Australian Birds Database	Birds	Birdlife Australia
Platypus Spot	Platypus	Cesar Australia
Principal bicycle network	Bicycle trails	VicRoads

Reporting on the Healthy Waterways Strategy

Regular reporting ensures accountability for investment into activities delivering waterway health outcomes. Sharing outcomes and progress against goals of the Healthy Waterways Strategy builds awareness and connection with Victoria’s waterways, celebrates successes and encourages participation.

Regular reporting and periodic evaluation enables tracking of progress towards outcomes and identification of opportunities for adaptive management. Consistent and effective reporting provides evidence to evaluate and communicate the effectiveness of the Strategy. Reporting includes:

- annual public reporting against the strategy targets and performance objectives, including key lessons and recommendations for what needs to change
- at least one interim and one final assessment during the life of the strategy to support continuous improvement of the program and independent oversight to hold everyone to account
- a Red Report, which flags significant events that 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
- spatial data on the web, identifying location of work sites.

Simpler communication products and briefings will be 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. It is also important to recognise that this kind of report does not amount to an investigative evaluation, although it may be underpinned by one.

Table 9. Strategy 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, critical thresholds
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
Content	Physical context Policy context	Evaluation of activities, outputs and outcomes from years 1 to 4 of the strategy	Evaluation of activities, outputs and outcomes from years 1 to 8 of the Strategy	Specific to particular event

	Annual reporting	Mid-term evaluation (2022)	End-of-Strategy evaluation (2026)	Point-in-time reporting – Red Report
	Implementation context Summary of activities and outputs, lessons learned	Recommendations and learnings for continuous improvement	Recommendations and learnings for the next Strategy	
Purpose	Provides accountability and tracks implementation of the Strategy	To track progress towards outcomes and identify opportunities for continuous improvement, if required	To demonstrate the achievement of outcomes To celebrate success To identify learnings to incorporate into the next Strategy	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 a 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.

Contributing to other reporting products

Information gathered through the MERI 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 Environmental Management Plan reporting
- Regional Catchment Strategy reporting
- Yarra Strategic Plan reporting
- Yarra and Bay Report Card
- State Environment Protection Policy (waters) reporting
- Biodiversity 2037 reporting
- Victorian Catchment Management Council Catchment Condition and Management reporting.

Pathways for learning and improving

At the core of MERI processes is the ability to learn from previous experience, update management approaches to reflect knowledge gained and changes in the environment during implementation, while managing future uncertainty such as changes in rainfall patterns, changes to policy or technology advances.

Four evaluation and reporting activities underpin this MERI Framework: annual reporting, a mid-term evaluation, an end-of-Strategy review (Table 10) and a Red Report. 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.

Table 10. Strategy reporting schedule

Annual process	Mid-term evaluation	End-of-Strategy review
Tracks progress against performance objectives – using indicators and rubrics Presents data on physical, policy and implementation contexts Presents status of key values and conditions (if monitored in that year), and trends if detectable Presents any new outputs from research and intervention monitoring Presents project-based learnings using case studies Documents changes to any performance objectives Triggers need for special investigation or a Red Report	Opportunity for an independent review Looks at all KEQs but focuses on 2, 3 and 4 Key assumptions of the strategy are reviewed and habitat suitability models are rerun to assess if long-term targets are on track Will evaluate whether the continuous improvement cycle (including use of annual report) is effective	Opportunity for an independent review Looks at all KEQs – particularly one around legacy Key assumptions of the strategy are reviewed and habitat suitability models are rerun to assess if long-term targets are on track

Learning and improvement can happen at any time, but the strategy MERI annual report is the formal mechanism through which learnings will be shared and any improvements documented. Learnings will be also be shared at the collaborative forums and the Regional Leadership Group to act upon learnings.

Individual delivery partners will improve programs in response to monitoring, evaluation and reporting in an ongoing way that is embedded within business processes. The catchment forums and the Regional Leadership Group will also be fundamental to sharing learnings and addressing critical issues. Figure 8 shows key milestones and approaches for enabling ‘continuous improvement’ through the life of the Strategy.

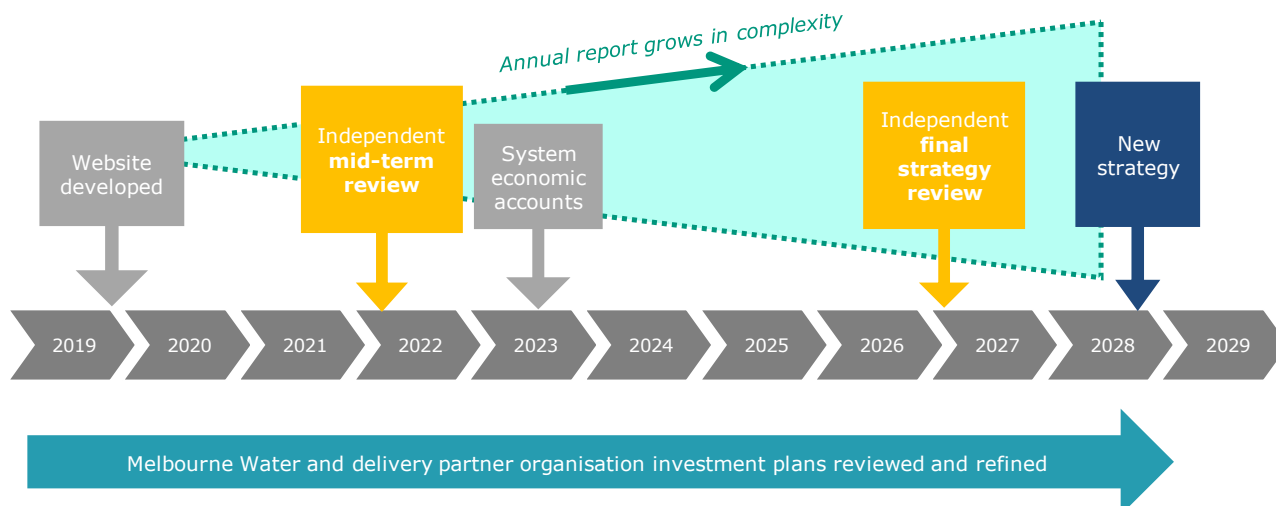


Figure 8. Key time frames and process for enabling continuous improvement

Three levels of change are expected during Strategy implementation:

Level 1 – We may need to improve the efficiency of how we deliver actions and achieve outcomes. We may learn through evaluation, particularly KEQ 4, how to improve efficiency of delivery programs.

Level 2 – More significant findings may require greater change. For example, a significant knowledge gain, such as better understanding of a relationship within a key-value conceptual model, may have implications for the achievement of the 10-year performance objectives or long-term targets in the Strategy. Some examples are:

- a major event such as a bushfire triggers the need for significant changes to resources, and performance objectives may need to change – A Red Report may be issued
- performance objective targets (within the catchment programs) are significantly off track (according to agreed rubric) and decisions need to be made about increasing resources or changing the target
- new knowledge through research has identified a new area of management that is critical to the health of waterways (e.g. a new and emerging pollutant requires urgent attention).

Level 3 – The entire Strategy may need to be reconsidered if performance objectives are off track to the extent that catchment-wide targets will not be met. Evidence to support this would be based on trajectories of key-value or condition-monitoring data combined with modelled predictions of long-term key-value outcomes.

The strategy annual report will provide the key mechanism through which learnings and decisions are documented and whether a Red Report is required. The annual report is expected to become more complex as the strategy is implemented and more data become available. The annual report will be coordinated by Melbourne Water. Mid- and end-of-Strategy reviews will be independent.

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 requiring high-level attention so appropriate improvements can be made.

The Healthy Waterways Strategy Science Panel will provide a key forum through which outcomes of the evaluation are critiqued. The panel will provide recommendations to the Regional Leadership Group of significant learnings and recommended improvements. These are likely to be the Level 2 or 3 pathways.

The three key lines of evidence to be used to ensure continuous improvement are:

- tracking implementation through short-term indicators
- research and intervention monitoring
- surveillance monitoring.

The following sub-sections outline how these pathways will be used to guide evaluation of the Strategy.

Table 10 provides practical examples of learnings that may occur during Strategy implementation and how these lead to improvements.

Table 10. Examples of change pathways from different investigation types in the MERI Framework

Learning	How lessons are shared	What can change learning loop
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
Trajectory of platypus changes	Collaborative forums Regional Leadership Group Annual or mid-term report	Targets Performance objectives Investment Policy
New approach to weed control	Social media Collaborative forums Communities of practice	Best-practice guidelines
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
Significant underachievement of performance objectives across the region	Collaborative forums Regional Leadership Group Annual or mid-term report	Targets Performance objectives Investment Policy
Better understanding of components of key-value conceptual models	Research forums Technical reports Papers Catchment forums Regional Leadership Group	Conceptual models Quantitative models Management guidelines

Learning	How lessons are shared	What can change learning loop
Better understanding of impacts of climate change on riparian vegetation	Research forums Technical reports Papers Catchment forums Regional Leadership Group Delivery teams	Vegetation guidelines Specifications

Tracking implementation through short-term indicators (including tracking of performance objectives)

The main purpose of tracking progress against the performance objectives is to understand if the effort being assigned to different investment programs is adequate, whether there are differences between the major catchments, or whether different approaches are more applicable in different areas. It is about maintaining or adjusting action to achieve the same outcome – 10-year performance objectives. Some performance objectives have readily trackable specific indicators. Others are described more qualitatively, and indicators and evaluation approaches will be developed.

All performance objectives will be tracked. Different levels of effort are required for different circumstances. Where there is lower confidence in an action leading to an outcome, as documented in the conceptual models, investment in research and intervention monitoring will increase confidence that actions will lead to the desired outcome.

Higher confidence performance objectives learning will focus on improving efficiency of delivering actions to achieve them and not need to be changed. A high confidence performance objective in the strategy is vegetation establishment along riparian zones to improve conditions for instream values. An improvement could be that direct seeding becomes a more cost-effective approach than tubestock planting.

Six steps will ensure continuous improvement enablement. The first two steps define evaluation scope for performance objective groups and establish agreed performance criteria and credible evidence upon which judgements will be made. These will be documented within the MERI Framework or the MEPs. The evaluation steps involve collecting and synthesising evidence, and making judgements on the performance of the Strategy. The final steps ensure learnings are acted upon. These steps include reporting and socialising results, and documenting decisions. An overview of this process is presented in **Figure 9**.



Figure 9. Steps for monitoring and evaluating performance objectives

Indicators and performance criteria to evaluate performance objective progress

There are 45 regional performance objectives and 911 sub-catchment performance objectives. Although each is unique, there are common themes across the spatial scales at which they apply, and also the waterway system elements. To simplify the way the performance objectives are managed, they have been grouped. There are 12 groups and, within each group, one or more sub-groups.

The Performance Objectives – Performance Monitoring Summaries (Attachment A) provide a summary of the group, the indicators proposed for each group or sub-group and how success will be judged. A summary is also provided in **Table 12** below.

Although these indicators will 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).

These indicators are targeted to the performance objectives, but Step 2 – ‘agree relevant performance criteria and credible evidence’ – has not yet been completed. Step 2 can also be referred to as a rubric. An example of a draft rubric for stormwater is outlined in Table 11.

Table 11. Example of a draft rubric for stormwater

Performance rating	Performance criterion
On track to exceed 10-year target	Exceeding linear trajectory by at least 10% for harvesting and infiltration targets + appropriate planning controls in place
On track to achieve 10-year target	Within 10% of linear trajectory for harvesting and infiltration targets
Slightly off track to achieve 10-year target	Up to 10% below linear trajectory for harvesting and infiltration targets
High chance that 10-year targets will not be met	10% below linear trajectory for harvesting and infiltration targets

Tracking cultural values

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 regional performance objectives 1–7 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 Traditional Owners Advisory Structure.

Tracking economic values

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.

Table 12. Indicators to track progress of performance objective groups

Performance objective group	Number of performance objectives in group				Indicators to track performance (not comprehensive; may be refined and updated)
	Reg.	Riv.	Wet.	Est.	
Engaged Communities	4	66			Percentage of population involved in grants and citizen science (related to waterways) over previous 5 years as a proportion of population within sub-catchment Number of resources collaboratively developed Additional indicator to be added to Melbourne Water Community Perception Survey Website collaboratively developed Annual Healthy Waterways Strategy report Signage Number of events Media articles Additional performance measures to be decided
Traditional Owner Collaboration	7				<i>To be developed by Traditional Owner groups during 2019/20</i>
Collaborative Governance	4				Regional Leadership Group and catchment forums have met as per their proposed schedule Waterway Labs delivered as per proposed schedule

Performance objective group	Number of performance objectives in group				Indicators to track performance (not comprehensive; may be refined and updated)
	Reg.	Riv.	Wet.	Est.	
					Regional Leadership Group evaluation reports show effectiveness above agreed target Waterway Lab evaluation reports show effectiveness above agreed target Level of satisfaction with coordination of information and activities
Economic Values	3				Economic accounts developed and reported
Adaptive Management and Research	8				Program progress reports, reviews undertaken MERI Framework and MEPs reviewed Conceptual and predictive models developed or updated Adaptive pathways approach developed and communicated Number of times new flow standards used in planning responses and complied with Number of times Healthy Waterways Strategy referenced in successful VCAT applications Victoria Planning Provisions references to Healthy Waterways Strategy Length of easements in place to protect headwater streams Proportion of headwater streams <i>not</i> piped or built over Melbourne Water investment plan for maintenance MERI plan in place, reviewed annually Wetland condition data and assessment of prioritisation shared Web-based system connected to active digital space, and designed collaboratively, is in place and live for reporting Research programs developed and communicated
Community Places	6	44	3	45	Program to transform modified waterways developed and implemented Program to understand potential community use of wetlands developed; performance objectives developed

Performance objective group	Number of performance objectives in group				Indicators to track performance (not comprehensive; may be refined and updated)
	Reg.	Riv.	Wet.	Est.	
					Kilometres of paths delivered Hectares of cooling (hectares with $\geq 30\%$ tree canopy, hectares of irrigated area, hectares of surface area of water) established Hectares of vegetation established
Water for the Environment	1	76	56	7	Gegalitres of environmental water recovered and delivered in accordance with flow studies Program to improve understanding of groundwater-dependent ecosystems developed and implemented Percentage flow compliance, diversion compliance, inundation frequency met Program progress reports
Water Quality	4	57	5	9	Proportion of all planning scheme policies that specify no sediment-laden runoff should enter waterways from construction activities <ul style="list-style-type: none"> • Developer services schemes – works surveillance • Local government works surveillance • Research program into emerging contaminants in place • Tools and guidelines developed • Key agency programs in place, program progress reports • Tonnes of nutrients removed, hectares of rural land treated to best practice • Hectares of vegetation established on headwater streams • Sewage treatment plant discharge compliance with licence discharges • No net increase in nutrient loads from sewage treatment plants • Percentage of new impervious surfaces treated to best practice • Investigate and mitigate impacts from septic systems • Percentage of impacting septic tanks mitigated • For key recreational areas identified in the Healthy Waterways Strategy report against State Environment Protection Policy guidelines

Performance objective group	Number of performance objectives in group				Indicators to track performance (not comprehensive; may be refined and updated)
	Reg.	Riv.	Wet.	Est.	
					<ul style="list-style-type: none"> Environmental risk assessments for estuary opening
Stormwater	2	36			<ul style="list-style-type: none"> Megalitres of stormwater harvested, megalitres of stormwater infiltrated Water Sensitive Cities index Guidelines developed, protection mechanisms in place Infiltration and flow guidelines developed, MUSIC model software revised and guidelines produced New flow-based stormwater standards developed and implemented
Habitat	1	60	20	19	<ul style="list-style-type: none"> Number of fish barriers removed Hectares or length of floodplain re-engaged <p>Hectares of habitat protected (e.g. area of wetlands protected from urban development) or created for specific species</p> <p>Implementation of Melbourne Water's Sites of Biodiversity Strategy</p> <p>Investigation of options for species translocation – progress report</p> <p>Implementation of Melbourne Water's Sites of Biodiversity Strategy – program progress reports</p> <p>Physical form and habitat program developed – program progress reports</p>
Vegetation	3	127	70	55	<p>Hectares of vegetation established, hectares of vegetation maintained (to required quality level)</p> <p>Program developed to identify and manage seasonal herbaceous wetlands and protect wetland vegetation</p> <p>Program developed to protect wetland vegetation</p> <p>Vegetation management guidelines in place</p> <p>Ecological vegetation class extents along estuaries are monitored</p>
Pests	1	1	80	19	Risk-based approach to pest control adopted

(Reg. = regional performance objectives, Riv. = sub-catchment performance objectives for rivers, Wet. = sub-catchment performance objectives for wetlands, Est. = sub-catchment performance objectives for estuaries) (For further detail see Attachment A.)

Monitoring using research and intervention

The main purpose of research and intervention monitoring is to re-evaluate key assumptions, relationships and conceptual and quantitative models.

Research monitoring is any targeted study that aims to improve knowledge about a particular aspect of a system (or a particular parameter in a system model). Research may improve management indirectly by improving system models and therefore assisting in better identification of optimal management strategies (Figure 10).

Intervention monitoring is about testing assumptions within conceptual or quantitative models where confidence is low. A structured adaptive management approach should be undertaken, which typically includes:

- clear management objectives (e.g. maintain base flows for platypus breeding)
- alternative decision actions/interventions
- model(s) (conceptual or quantitative) that represent system understanding and predict system responses to alternative interventions
- measures of confidence in the model(s) and a monitoring program and data analysis plan to provide estimates of system state and other relevant variables. This enables model validation or discrimination between competing models and updating of model structures and predictions over time.

The strategy identifies key research areas, and individual research and intervention monitoring projects will be scoped and developed annually. Research findings will be presented and reported annually through a mix of approaches ranging from academic and technical papers to presentations at the catchment forums and summary information in annual Healthy Waterways Strategy MERI reports. It is also expected that the MERI website will provide access to research information and outputs.

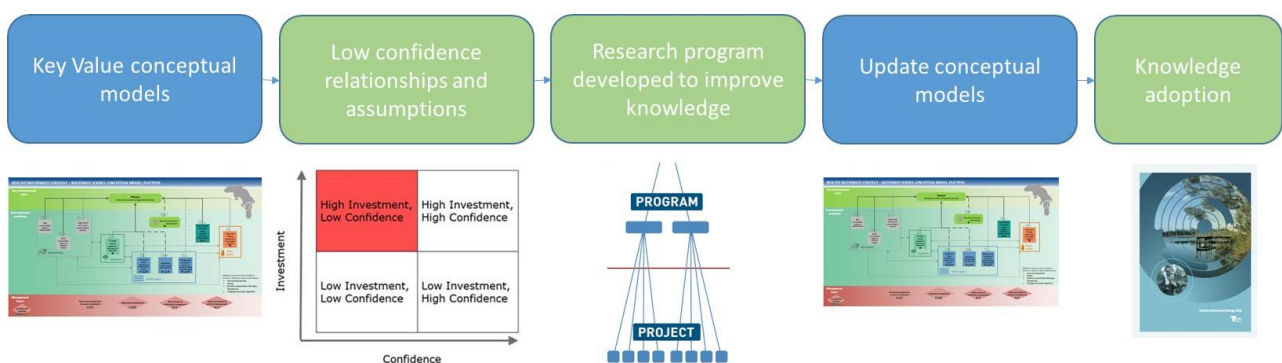


Figure 10. Link between conceptual models developed for the strategy and how research will be used to refine relationships within these models

Monitoring using surveillance

Surveillance monitoring encompasses two main types of monitoring:

- **Externalities and emerging trends** – This is generally focused on monitoring trends outside the direct influence of management, such as policy changes or climate change.

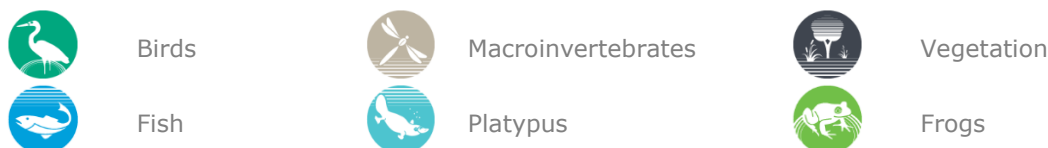
- **Condition and value status and trends** – This is focused on monitoring the key values and the conditions that support those values.
- Monitoring externalities and emerging trends

A number of existing datasets (Table 4) have been identified and will be analysed to better understand the physical and policy contexts across the Melbourne Water region.

Monitoring condition and value status and trends

The key values within the Healthy Waterways Strategy are represented by six environmental key values and three social key values (Figure 8). 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.

Environmental key values:



Social key values:

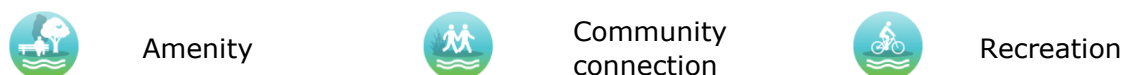


Figure 8. Six environmental values and three social values of the Strategy

Waterway conditions in the strategy as identified within the conceptual models are 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, degraded riparian zones (as measured by vegetation condition) are a threat to macroinvertebrates.

Waterways are considered in three broad asset classes – rivers, wetlands and estuaries – as there are significant differences between the values and conditions, which can mean differences in how they are monitored. 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, which may also contain wetlands. The water regime of a wetland often depends on the flows from the adjoining river.

Monitoring loads to receiving waters

It is important to acknowledge how works that benefit water quality in waterways also contribute to achieving targets for the receiving waters (Port Phillip Bay and Westernport). Targets for Port Phillip Bay are outlined within the Port Phillip Bay Environmental Monitoring Plan (DELWP 2013). The Estuaries MEP will include details of how catchment contributions to pollutant loads for Port Phillip Bay and Westernport will be monitored.

Monitoring key values (Figure 8) and conditions is required to assess whether the long-term targets for the strategy are on the projected target trajectory, as articulated in KEQ 3. The way in which this is carried out for each value and condition will vary and will be detailed within the MEPs. The monitoring of key values and conditions along with associated contextual and threat data will help provide an understanding of what factors are driving changes over time and

across the various catchments. Attachment B provides a summary of the monitoring approach proposed for each of the key values and waterway conditions.

Habitat suitability models will be used in conjunction with monitoring data to better understand the likely trajectory of various values. At present, habitat suitability models exist for the instream values (fish, platypus and macroinvertebrates). We envisage that the models will be rerun at the middle and end of the strategy to assist in evaluating progress towards the long-term outcomes expressed in the Strategy.

Actions undertaken can be entered into the habitat suitability 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 be revisited to understand the implications of different assumptions that 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 habitat suitability 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.

Understanding the status of rare and threatened species across the region and approaches to management is critical. The approach to monitoring rare and threatened species is outlined in Box 4.

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. As such, they will be a primary focus of long-term surveillance and intervention monitoring¹. 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 4. Monitoring threatened species

The *Flora and Fauna Guarantee Act 1988* (Vic.) provides the state framework for listing threatened species, threatened communities and potentially threatening processes. The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) lists threatened species or communities at the national scale and provides legal protections for these. Listed values include:

- flora communities (e.g. coastal saltmarsh, temperate grasslands, seasonal herbaceous wetlands)
- flora species (e.g. Spiny Rice-flower)
- fauna species (e.g. Swamp Skink, Orange-bellied Parrot).

Melbourne Water manages portions of two Ramsar wetlands, protected under the EPBC Act, and is required to prepare and implement management plans including monitoring, evaluation and reporting.

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

¹ 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 five sample pairs. Thus, if a gradual improvement (or decline) was predicted at a site over 5 years, five sampling occasions over the 5 years is likely to be sufficient to test that prediction.

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 the EPBC Act relating to waterways that require ongoing monitoring and reporting. These include:

- Western Treatment Plant – 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 have controlled actions under the EPBC Act:

- 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 (Western Treatment Plant environmental improvement plan) – compliance with controlled action conditions to 2017/18.

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

The Healthy Waterways Strategy 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 the Sites of Biodiversity Significance Strategy. Other water-dependent threatened species identified through the strategy will be monitored and reported in accordance with the Rivers, Wetlands and Estuaries MEPs.

Monitoring conditions and threats

Strategy conditions were defined based on available data and their relevance to the key values as specified in the conceptual models. A summary of the approach to monitoring conditions for estuaries, wetlands and rivers is outlined below and details of indicators are in Attachment B. Strategy metrics will be used to compare and assess progress towards the targets. There may methodology improvements for some conditions. Care will be taken to avoid shifting baselines, which may make comparisons over time problematic.

There are more 24,000 km of **rivers** in the Melbourne Water region. As spatial data is becoming more readily available and useful for assessing condition of rivers, information will be available at a more detailed scale. This is a significant advancement from only a decade ago when very limited field-based survey information was available. Remotely sensed data is becoming more useful, but some condition indicators still require field-based survey methods. The Rivers MEP will outline the detailed condition monitoring plan for rivers.

Our region includes around 68,000 **wetlands**, including around 50,000 farm dams and more than 370 other constructed wetlands. There are 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. Detailed field-based monitoring is feasible at a relatively small number of sites. With advancement of remote sensing data, more information will be available across the entire network. The Wetlands MEP will outline the detailed monitoring plan for wetlands.

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 that 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 Westernport in acknowledgement that works to benefit water quality in waterways, wetlands and estuaries contribute to the achievement of targets for the bays.

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

The longstanding Community Perception Survey will continue to be used to assess these values, along with other methods under development.

Implementing the Healthy Waterways Strategy MERI

Melbourne Water is committed to undertake its share of this Healthy Waterways Strategy. 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

Collective action from state government and regulators (such as the Environment Protection Authority), local government and other land managers such as Parks Victoria is required for an effective MERI. Collective action by the development sector, landholders, Traditional Owners and community groups is needed.

The Regional Leadership Group governs Strategy implementation, including the MERI. Its role is to ensure linkages with related processes and policies, and oversee Strategy implementation, reporting and adaptive management.

Melbourne Water will lead in developing and implementing the MERI and will co-ordinate with delivery partners. These agencies include local government, Parks Victoria, other water corporations, the Environment Protection Authority, the Port Phillip and Westernport Catchment Management Authority, the Department of Environment, Land, Water and Planning, and the Department of Health and Human Services.

Staging implementation of the MERI plan

The Healthy Waterways Strategy MERI will be implemented in a staged manner to allow time for indicators to be refined, evaluation methods to be scoped and data management improvements to be rolled out. Table 14 outlines the 3 main stages proposed for the implementation of the MERI.

Further consultation with Strategy partners and development of supporting Rivers, Estuaries and Wetlands MEPs will occur in coming months. The Healthy Waterways Strategy MERI Framework will be updated in response to these next steps. Updates may also occur as a result of actions undertaken to improve the models and clarify targets, research results or a review or evaluation of the strategy.

Table 13. Staging implementation of the MERI plan

Stage	Tasks	Timing
1 – Foundation	<ul style="list-style-type: none"> • Develop and finalise monitoring and evaluation plans • Establish indicators and specifications • Pilot monitoring data collection (where required) • Collect, evaluate and report data 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 	Years 1–2 (2019/20 – 2020/21)

Stage	Tasks	Timing
	<ul style="list-style-type: none"> • Scope and develop web-based reporting • Confirm quality assurance processes for data management • Implement approach to managing safety • Establish and implement adaptive management processes 	
2 – Implementation	<ul style="list-style-type: none"> • Refine website • Refine monitoring and evaluation plans based on findings of pilot/testing in stage 1 • Collect, evaluate and report data for all Melbourne Water programs • Collect, evaluate and report data for established programs in other agencies • Include additional indicators • Conduct annual check-in on safety • Communicate MERI reports across all partner organisations • Conduct annual and mid-term evaluation, produce report and share findings 	Years 3–5 (2021/22 – 2023/24)
3 – Refinement and adjustment	<ul style="list-style-type: none"> • Website fully operational – data sharing in place • All partners contributing to data as required • Conduct annual check-in on safety • Conduct annual and end-of-Strategy reviews, produce report and share findings 	Years 6–10 (2024/25 – 2027/28)

Reviewing the MERI plan

The MERI Framework will be reviewed and updated annually to capture information needed to ensure the MERI 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.

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Attachments

Attachment A: Performance objective monitoring information sheets

Attachment B: Waterways values and condition monitoring information sheets
Table B1. Monitoring framework for key values

Key value	Healthy Waterways Strategy 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 natural wetlands
Macroinvertebrates	(R) Lumar index	Specific studies on threatened species Key threat data (e.g. urbanisation) State Environment Protection Policy objectives	Combination of eDNA and field-based sampling Annual sampling About 100 fixed sites	Annual assessment of trends 4-yearly sub-catchment scale analysis Review habitat suitability model 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 (e.g. age, size, sex) Key threat data (e.g. barriers)	Combination of eDNA and field-based sampling <i>Sampling frequency TBC</i>	Mid- and end-of-Strategy review	Annual status Evaluation report at middle and end of Strategy	Relevant	Relevant	Relevant
Platypus	Catch per unit effort (R)	Population dynamics for selected sites (e.g. age, size, sex) Key threat data (e.g. entanglement)	Combination of eDNA and field-based sampling <i>Sampling frequency TBC</i>	Mid- and end-of-Strategy review	Annual status Evaluation report at middle and end of Strategy	Of most relevance	Not usually found in estuaries	Relevant to some wetlands
Birds	(R) Observed over expected species richness, modified by reporting rate (W and E) Data-based measure of density (during summer months); species richness; number of species breeding; number of threatened species	Evidence of successful breeding; persistence of threatened species; balance of feeding guilds recorded Key threat data (habitat extent and condition)	Quarterly, targeted community-based bird surveys through Birdlife Australia at as many sites as possible (>250) generating sub-catchment metrics Evolving to eDNA analysis in future years	Mid- and end-of-Strategy review	Annual status Evaluation report at middle and end of Strategy	Relevant Data collected at site scale and combined into metric at sub-catchment scale	Relevant Sampling regime under development	Relevant
Frogs	(R and W) Species richness (observed to expected) modified to reflect survey effort	Evidence of successful breeding; persistence of threatened species Key threat data (water regime, water quality, habitat condition and extent)	Currently community-based monitoring (Frog Census) but evolving to eDNA analysis. <i>Spatial and temporal scales TBC</i>	Mid- and end-of-Strategy review	Evaluation report at middle and end of Strategy	Relevant	Not usually found along estuaries	Relevant
Vegetation	(R) Vegetation vision rating scale (W) AVIRA metrics	TBC Key threat data (e.g. deer, weeds)	TBC – The expert elicitation method used in the strategy has been considered inappropriate for ongoing monitoring	Under development	Evaluation report at middle and end of Strategy	Relevant	Relevant	Relevant

TBC, to be confirmed.

Table B2. Environmental condition monitoring for rivers

Performance objective group	Performance objective theme	Environmental condition terminology from Strategy	Strategy 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 based on the percentage or reach that has continuous vegetation canopy cover within 20 m either side of stream	Lidar Percentage or reach that has continuous vegetation canopy cover within 20 m either side of the stream (based on Lidar method) – i.e. 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 based on description of quality of vegetation relative to ecological vegetation classes. Based on Melbourne Water 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 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	TBC 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 based on the proportion of waterway length within the sub-catchment that 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 Some specific habitat conditions require tailored assessment for particular values – e.g. habitat to support <i>Pseudophryne semimarmorata</i> (Southern Toadlet)	As specified	As specified		4 and 8 years	Yes
Water for the Environment	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, a state-based approach for assessing flow requirements of freshwater 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 State Environment Protection Policy (Waters) environmental water quality objectives, and the Environment Protection Authority Water Quality Index	Monthly and bimonthly monitoring at a range of sites across the catchment An index has been developed based on land-use classes and expected water quality levels and applied to land uses within sub-catchment Sediment quality data captured at a range of sites across catchment	Land-use data 4 and 8 years Water quality monitoring data – all sub-catchments monthly or bimonthly at a combination of fixed and roving sites	Sediment quality data – selected sites annually	4 and 8 years	No
Water Quality	Protect and improve water quality for social values	Water quality – recreational	Based on compliance with draft State Environment Protection Policy (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 based on directly connected imperviousness, which is the proportion of the impervious surface 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 directly connected imperviousness levels for all waterway reaches	All waterway reaches 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 runoff 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

NA = not applicable. TBC = to be confirmed.

Table B3. Environmental condition monitoring for natural wetlands

Performance objective group	Performance objective theme	Environmental condition terminology from Strategy	Strategy 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	Aquatic vegetation, and wetland buffer	Based on AVIRA threat metric for degraded buffer vegetation, mostly unknown	Surveillance monitoring: Index of Wetland Condition modified to include an enhanced vegetation condition assessment (testing underway). Frequency of assessments being determined This may evolve into remote sensing of all regional wetlands Tracking implementation: Wetlands with this performance objective will be assessed individually	Sampling program for regional wetlands is being developed Priority wetlands will be assessed for mid-and end-of-Strategy reporting	TBC	Middle and end of Strategy	Yes
Vegetation, Pests, Habitat	Protect specific values and habitat Protect / maintain or improve vegetation quality	Vegetation condition	Based on AVIRA value metric for wetland vegetation condition	Surveillance monitoring: Index of Wetland Condition modified to include an enhanced vegetation condition assessment (testing underway). Frequency of assessments being determined This may evolve into remote sensing of all regional wetlands Tracking implementation: Wetlands with this performance objective will be assessed individually	Sampling program for regional wetlands is being developed Healthy Waterways Strategy Wetland with this performance objective will be assessed for mid- and end-of-Strategy reporting	TBC	Middle and end of Strategy	Yes
Habitat, Pests	protect specific values and habitat Mitigate threats to physical form Re-engage floodplains	Habitat form	Wetlands habitat form based on AVIRA threat metrics for reduced wetland area and altered wetland form	Surveillance monitoring: Index of Wetland Condition. Frequency of assessments being determined This may evolve into remote sensing of all regional wetlands Tracking implementation: Wetlands with this performance objective will be assessed individually	Sampling program for regional wetlands is being developed Healthy Waterways Strategy Wetland with this performance objective will be assessed for mid- and end-of-Strategy reporting	Fish surveys (Gambusia and Carp)	Middle and end of Strategy	Yes
Water for Environment	Maintain or improve flow regimes in unregulated systems	Flow regime	Based on a simplified AVIRA threat metric for changed water regime	Surveillance monitoring: Index of Wetland Condition. Frequency of assessments being determined This may evolve into remote sensing of hydroperiod for all regional wetlands Tracking implementation: Wetlands with this performance objective will be assessed individually	Sampling program for regional wetlands is being developed Healthy Waterways Strategy Wetland with this performance objective will be assessed for mid- and end-of-Strategy reporting	TBC	Middle and end of Strategy	Yes
Water Quality	Address multiple sources of impact on water quality Improve water quality runoff from agricultural land practices	Water quality – environmental	Wetland water quality based on wetland threat metrics: changed water properties salinity, changed water properties nutrients and disturbance or acid sulfate soils	Surveillance monitoring: Index of Wetland Condition. Frequency of assessments being determined Tracking implementation: Wetlands with this performance objective will be assessed individually	Sampling program for regional wetlands is being developed Healthy Waterways Strategy Wetland with this performance objective will be assessed for mid- and end-of-Strategy reporting	TBC	Middle and end of Strategy	Yes

TBC = to be confirmed.

Image acknowledgements

Canoeing on the Yarra – Canoeing Victoria

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Date	Reviewed/actioned By	Version	Action
June 2019	Framework released to meet RPO41	1	Version 1 released via YourSay website
November 2019	Framework revised based on feedback received during consultation period	1.1	Version 1.1 released via YourSay website

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

