Reef Trust Partnership Mackay Whitsunday Water Quality Program

Regional Plan

Version 0

Water Quality Program

October 2020

Australian Government

REEF TRUST

Great Barrier Reef Foundation

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1. Overview

The Reef Trust – Great Barrier Reef Foundation Partnership (Partnership) is a $443.3 million six-year grant between the Australian Government Department of Agriculture, Water and the Environment, which manages the Reef Trust, and the Foundation. It is to build on and support delivery of the joint Australian and Queensland Government Reef 2050 Long-Term Sustainability Plan.

As part of the Reef Trust Partnership (the Partnership), the Great Barrier Reef Foundation (GBRF), in collaboration with a number of partners, is implementing a series of regional programs aimed at improving the quality of water entering the Great Barrier Reef lagoon from neighbouring catchments.

The Mackay Whitsunday Water Quality Program (MWWQP) aims to contribute to the goals of the Reef 2050 Water Quality Improvement Plan 2017-2022 (WQIP), and particularly to improve the quality of water flowing from the Pioneer and Plane Creek catchments. Running until June 2024, a total of $22.7 million has been allocated under the Partnership to the program.

The program will primarily support activities that aim to achieve an enduring improvement in sugarcane farming practices in the region, with the goal of reducing the end-of-catchment pollutant loads for dissolved inorganic nitrogen (DIN) and pesticides.

This regional plan describes the framework and activities underpinning the composition and subsequent implementation of the program.

The plan sets out:

- the objectives and scope of the program
- the governance arrangements
- an overview of the key actions proposed under the program
- the proposed approach to communications and engagement, including opportunities for stakeholders to be involved in the program.

2. Background

2.1 Background of the Reef Trust Partnership (RTP) Program

The Partnership, which was established by the Australian Government and the Great Barrier Reef Foundation (GBRF), is centred on a landmark investment of $443.3 million to build the resilience of the Great Barrier Reef (the Reef). Commencing in July 2018 and running for six years, the Partnership includes an investment of $201 million to address water quality improvement targets impacting the Great Barrier Reef World Heritage Area. Further detail on the various plans related to the Partnership, including the Partnership investment strategy, annual work plans, and the monitoring and evaluation plan, are available here.

The approach to investing the $201 million for water quality improvement is identified in the GBRF Annual Work Plan for 2019-20. The plan allocates:

- $141 million for regionally focussed on-ground actions
- $20 million for Traditional Owner-led water quality improvements
- $10 million for innovation and system change, and
- $10 million for protection and conservation measures aimed at maintaining water quality, particularly in less disturbed catchments.

To date, $19.7 million has already been contracted under the Reef Water Quality Improvement Grant Program Stage 1.

The $141 million for regionally focussed on-ground actions will be delivered through a series of regional programs, such as the Mackay Whitsunday program, targeting catchments identified by GBRF as a priority for water quality improvement. Regional priorities for investment have been guided by, amongst other factors, the priorities set out in the Reef 2050 WQIP and informed by an investment prioritisation report by Alluvium Consulting.

For each regional program, the GBRF has identified:

- **Priority catchments** and **target pollutants** based on a prioritisation process undertaken by GBRF that was underpinned by the Reef 2050 WQIP and informed by the Alluvium Report.
- **Target load reductions** for the target pollutants at the end of the catchment.

These targets are the intended load reduction at the end of the catchment to be achieved by the investment under the Partnership and are set out in the Partnership Monitoring and Evaluation Plan.

Significant efforts have been made to improve the quality of water entering the Reef through implementing a series of Reef Water Quality Protection Plans in 2003, 2009 and 2013. One of the key reports on the review of water quality issues in the Great Barrier Reef was the 2017 Scientific Consensus Statement. It is a comprehensive peer reviewed research report, that identified that progress towards the 2013 targets had been slow and that the projected medium and long-term goals would not be met. The report identified that the management options to reduce pollutant run-off to the Great Barrier Reef provide a solid foundation for program implementation, but an expanded scope of tailored and innovative solutions was urgently required to meet the Reef 2050 Water Quality Improvement Plan targets by 2025 or the targets of the Reef 2050 Long-Term Sustainability Plan (Reef 2050 Plan).

A few of the recommendations from the 2017 Scientific Consensus Statement can be summarised as:

- Introduce tailored practice change programs that work with and involve collaboration with landholders, industry organisations and service providers to design and deliver water quality programs. These programs would provide trusted and diverse advisory services, involve knowledge exchange between landholders, scientists and others; address perceptions of risk; and deliver adequate financial, cultural and social rewards.
- Develop a detailed comprehensive and costed water quality management plan, drawing on the existing regional water quality improvement plans, to guide strategic investment in priority, water catchment, areas. The Mulgrave-Russell, Johnstone, Tully, Herbert, Haughton, Burdekin, Pioneer, Plane, Fitzroy and Mary were identified as high priority catchments.
  Note: A detailed investment prioritisation study was commissioned by the GBRF and conducted by Alluvium Consulting and the Final Alluvium Report (available here) was released in 2019.

This led to the development of the Reef 2050 WQIP.

The Australian and Queensland Governments Reef 2050 WQIP reduction targets across the entire Great Barrier Reef Region are to reach a 60% reduction in anthropogenic end-of-catchment dissolved inorganic nitrogen (DIN) loads and for pesticides, to protect at least 99% of aquatic species by 2025. This target is an average of individual targets for the high priority catchments. For the Mackay Whitsunday region's high priority catchments, the Plane and Pioneer, the water quality target is a 70% reduction in DIN and for pesticides, to protect at least 99% of aquatic species by 2025. These reduction targets are relative to baseline measurements conducted in 2009 and are targets-towards the greater 2050 water quality targets of the Reef 2050 WQIP. The

Australian and Queensland Governments Reef 2050 Long-Term Sustainability Plan sets the long-term goal by defining targets, actions, objectives and outcomes, and responsibility to preserve the Reef's health and resilience, while allowing ecologically sustainable use.

There are a number of other activities under the RTP that the MWWQP will complement. These include:

- Innovation and Systems Change - A dedicated innovation program aimed to improve the cost-effectiveness of actions and ensure enduring outcomes from investments in water quality improvements
- Traditional Owner-led water quality Reef protection initiatives – The program aim is to improve Traditional Owner decision-making and participation in on-ground water quality activities as well as to address known information gaps around Traditional Owner values (cultural and other) associated with water sources.

2.2 Reginal Context - Mackay Whitsunday Region

The Mackay Whitsunday region sits at the gateway of the Great Barrier Reef and surrounding islands, drawing visitors from all over the world. Our productive agricultural land comprises sugarcane, cattle grazing and horticulture which has supported and shaped our economy, culture and heritage since the 19th Century.

The primary intensive land use in the region is sugarcane, which makes up one third of Queensland's sugarcane production. On the regional scale, sugarcane makes up 18% of the catchment land area and constitutes 96% of the intensive agriculture in the region and has a crop value of approximately $500 million per annum. The sugarcane industry has participated in Federal and State government programs and funding initiatives that have delivered positive environmental outcomes and improved productivity. This includes establishing and implementing the ABCD sugarcane framework as a benchmark for industry bestpractice. The MWWQP will build upon this legacy to increase stewardship through improved land management practices with positive water quality outcomes. The region has four catchments, the Plane, the Pioneer, the O'Connell and Proserpine (see Figure 1).

The Mackay Whitsunday region generates over $22 billion of economic value to the Queensland and Australian economy, and covers an area of 90,000km^2, with a regional residential population of approximately 170,000 in 2016.

Challenges, threats, issues and opportunities facing the Mackay Whitsunday region and the Great Barrier Reef include (see Figure 2):

- Land use change in the coastal zone has the potential to result in loss of biodiversity and new sources of water pollutants
- It is the most intensively land developed catchment within the Great Barrier Reef (GBRMPA Outlook Report). The Report highlights the loss of coastal connectivity and ecosystems, due to poorly designed development, as major health risks to the Great Barrier Reef
- Land use intensification, particularly in beef production areas, and to a lesser extent in sugar and horticulture areas will result in more erosion and chemical runoff unless well managed
- Population growth and tourism will trigger a greater demand for nature-based recreation and tourism. This reinforces the need to manage trade-offs between short-term development and long-term sustainability.

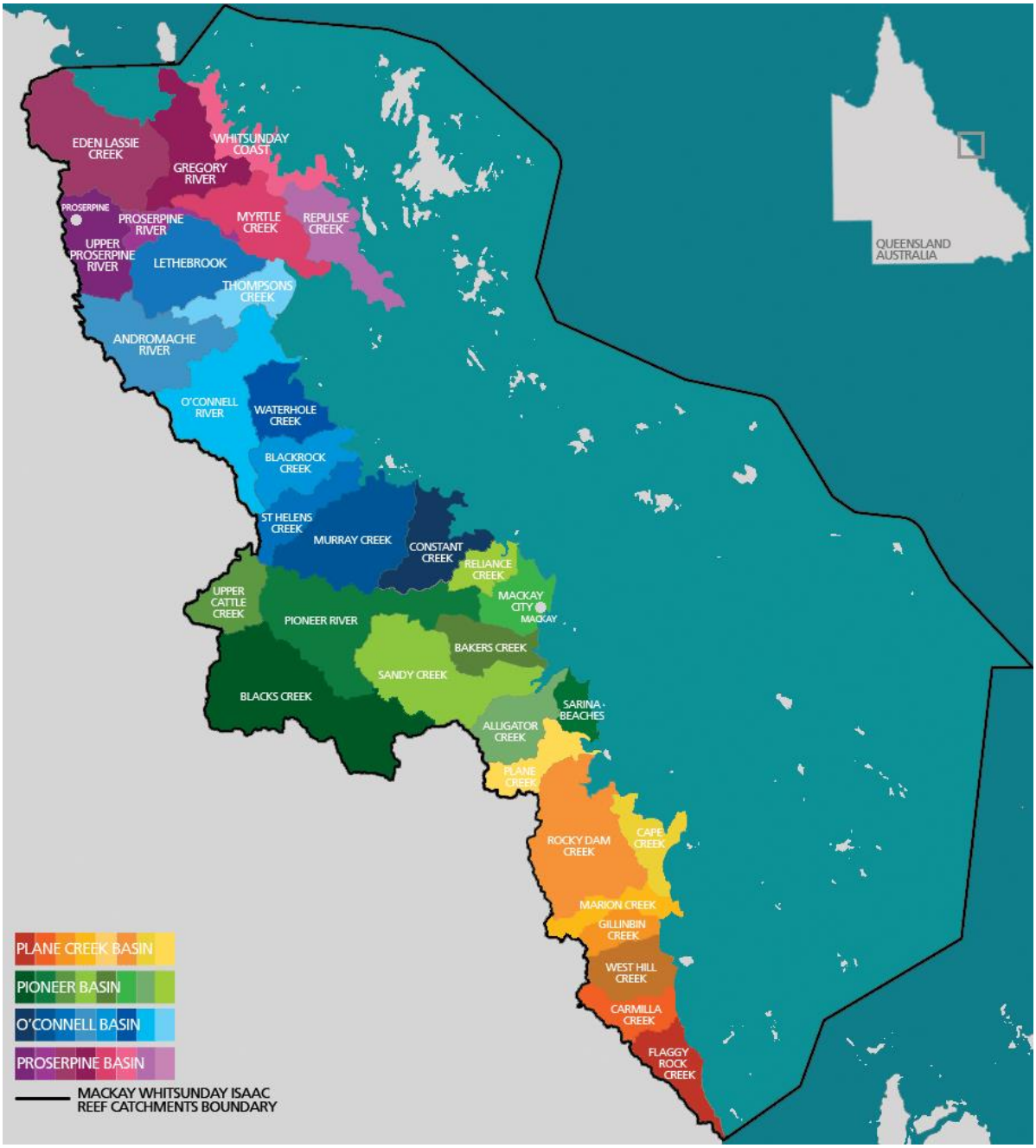

Figure 1. Map of the four catchments and sub-catchments in the Mackay Whitsunday region.

Figure 2. Conceptual diagram showing the range of pressures that threaten the GBR in the Mackay Whitsunday region (source: Mackay-Whitsunday-Isaac Healthy Rivers to Reef Partnership).

For Indigenous people who identify with this Country, the land and sea are rich with cultural heritage and provides them with their identity and opportunities for traditional practices. The Indigenous community in the Mackay, Whitsunday and Isaac region are 'saltwater people', with a strong connection to coastal and island natural resources. The Traditional Owner Reference Group (TORG) is made up of representatives from Yuwibara, Koinmerburra, Barada Barna, Wiri, Ngaro, Gia and Juru groups within the boundaries of the Reef Catchments NRM region.

2.3 The Mackay Whitsunday Water Quality Program

Within the Mackay Whitsunday region, Plane Creek and Pioneer catchments have been identified as the priority catchments for investment under the RTP. Of greatest concern is the DIN and pesticide loads for these two catchments and consequently these are the focus pollutants for the MWWQP. The focal point of the on-ground actions will be to induce on farm practice changes which achieve a long-term reduction pollutant loads leaving the catchments. The target load reductions for the program are shown in

Table 1. The targets relate to the modelled long-term average pollutant load at the end of the catchment.

As noted above, $22.7 Million has been allocated by the Partnership to the MWWQP.

Table 1. Target pollutants and load reductions for the MWWQP.

Target Pollutants	Target end of program pollutant load reduction
Dissolved inorganic nitrogen (DIN)	26 tonnes/year
Pesticides	215Kg /year

2.4 Process to set up the Program

In October 2019, GBRF opened a competitive process calling for expressions of interests (EOI) from delivery partners/organisations to deliver on ground projects, which will result in improved water quality outcomes. Prospective projects were initially short-listed based on the following, selection criteria:

i) the cost effectiveness of the project in contributing towards improving Reef water quality
ii) the capability of the delivery provider to implement the project and
iii) the effectiveness of the proposed approach in delivering the water quality outcomes.

A planning process was implemented to identify any potential gaps in the program, overlaps or synergies between projects or cross-cutting requirements to develop new linkages/partnerships between delivery providers which would lead to enhancing water quality outcomes and the overall program functionality.

In parallel to identifying prospective projects and planning the MWWQP, GBRF issued a separate request for proposal (RFP) for professional services in two positions, Program Manager and Regional Partnership Coordinator, to manage the program locally.

The process and timeline from requesting EOIs/RFPs to the finalisation of the program plan and commencement of on ground projects is summarised in Figure 3.

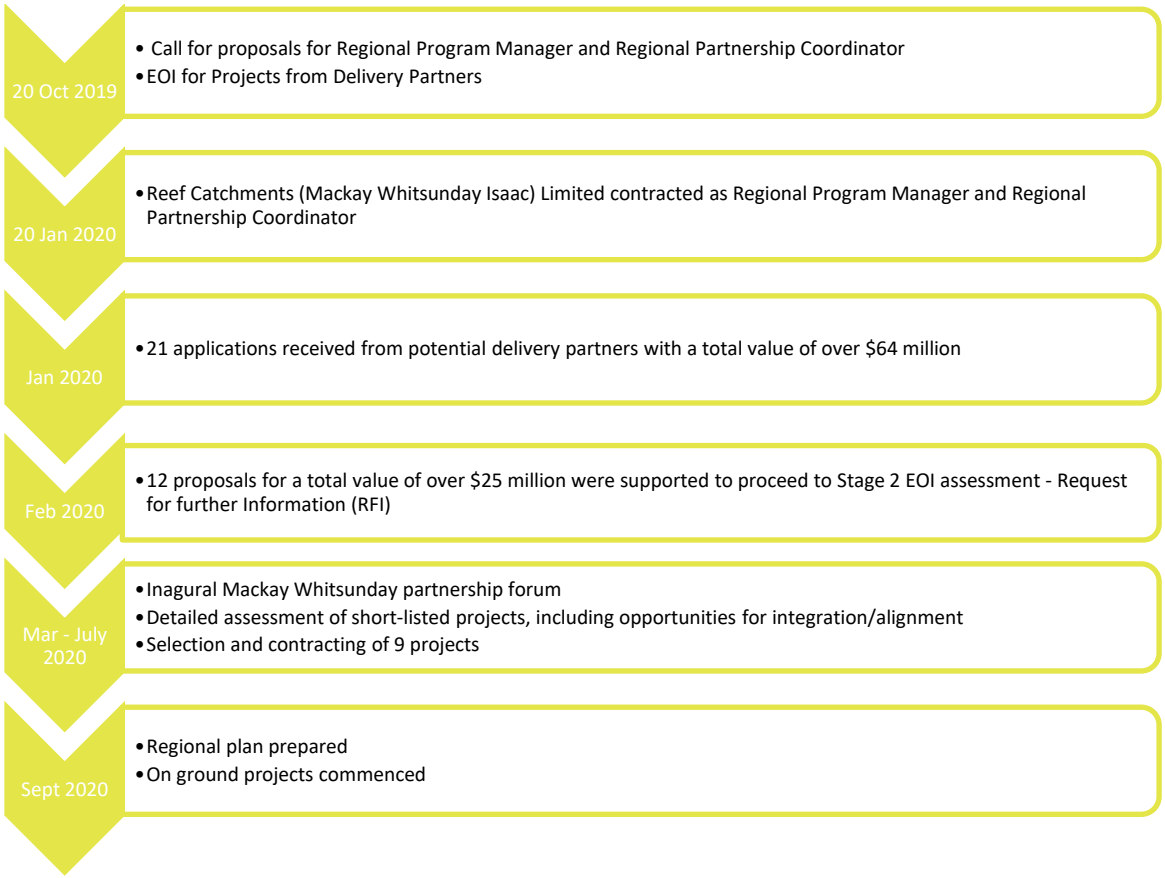

Figure 3. Schematic representation of the schedule and key outcomes from the initial EOI screening to the commencement of on ground projects.

3. The Mackay Whitsunday Water Quality Program key documents

This regional plan establishes the strategies and activities that will be implemented by the Mackay Whitsunday water quality program. This document along with a supporting Communications Plan and Monitoring and Evaluation Plan provide the framework for the management and integration of projects, tracking progress, evaluating the program, and for communicating and engaging with key stakeholders (Figure 4).

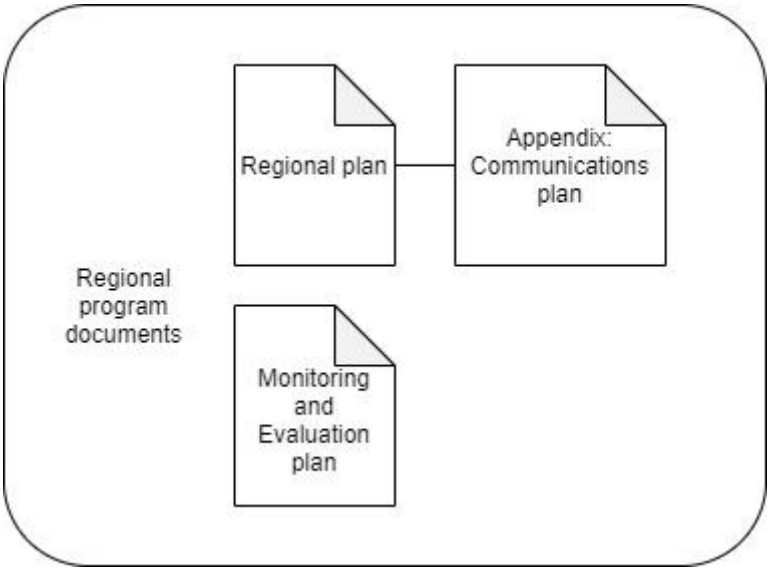

Figure 4. The founding documents of the Mackay Whitsunday water quality program

4. Objective and Scope of the MWWQP

Regional priorities for investment have been guided by the priorities set out in the Reef 2050 Long-Term Sustainability Plan, Reef 2050 WQIP and informed by an investment prioritisation report by Alluvium Consulting and supporting documentation for these plans and reports. These have determined the primary objective and scope for each of the RTP regional water quality programs.

4.1 Primary Objective

The primary objective of the Reef Trust regional programs is to achieve an enduring reduction in the long-term end-of-catchment pollutant loads. For the Mackay Whitsunday region, the program targets a load reduction of 26 tonne DIN and 215 kg pesticide from the Plane Creek and Pioneer catchments over a four-year program working with the sugarcane industry. (For pesticides, it is likely the water quality target will be shifted from the current loads-based metric to a metric based on toxicity and risk to aquatic life. It is expected this alternate approach will better demonstrate improvements in pesticide management.)

4.2 Scope

The scope of the MWWQP is to improve land management practices and stewardship, both as a means of achieving the target reductions in pollutant loads, as well as to provide a basis for sustaining these outcomes. In scope is:

- introducing new solutions and innovative models for increasing knowledge in water quality issues and system change
- providing extension support and financial incentives to adopt improved practices
- demonstrating potential of adopting improved farming practices to enhance productivity and/or profitability
- promoting collaboration including key stakeholder and peer to peer learning across the industry
- improve understanding of behavioural and social indicators influencing adoption and community engagement to facilitate long term sustainability.

Out of scope: Graziers within the Plane and Pioneer catchments and landholders of the O'Connell and Proserpine Catchments within the Mackay-Whitsunday region.

5. Program Governance

The program governance is a four-level system (Figure 5) with GBRF at the upper level overseeing its planning, implementation and management. GBRF leads the Program Steering Committee and the Technical Advisory Group (Level 2), and contracts Reef Catchments in the roles of Regional Partnership Coordinator and Program Manager (Level 3), to manage the program at the ground level on a day to day basis. Reef Catchments has further linkages to Traditional Owners and Cane Regional Working Groups. The delivery providers implementing on-ground projects (Level 4) with growers are overseen by Reef Catchments and contracted by GBRF.

The GBRF will ensure that the MWWQP remains focussed on delivering the contractually agreed water quality outcomes through regular revision and reporting requirements for Reef Catchments at the regional level and delivery providers at the project level. Regular meetings between the Program Steering Committee, which includes GBRF, Reef Catchments, the Australian Government, and Industry, provide an additional review process for tracking project delivery. Similarly, GBRF can call on the Technical Advisory Group and other invited experts to provide advice on technical issues.

The Regional Program Manager and Partnership Coordinator responsibilities are to develop and implement the MWWQP, through the framework of the regional plan, communication plan and monitoring and evaluation plan. The Regional Program Manager and Partnership Coordinator will lead day to day management, oversight and coordination of the MWWQP and provide support to participating growers and delivery providers. The role of the Program Manager focuses on ensuring the delivery of the program by managing the implementation of projects, tracking project deliverables, designing the M&E plan and synthetising progress towards targets. The Partnership Coordinator has a strong role in coordinating engagement, promoting community support for the program, developing networks, assessing technical advice and needs, and managing project communications.

The Delivery Providers will implement the water quality projects that make up the MWWQP (Figure 5). They will liaise directly with the growers to enable and achieve the water quality improvements of the program. The Partnership Coordinator and Delivery Providers will have a close working relationship focused on collaboration and communication. This is essential to avoid grower fatigue, to identify data and training gaps and needs across the program, and to ensure consistency in data collection, sharing of information and reporting.

The program will leverage from a dynamic relationship with the Cane Regional Working Group, (which includes representatives from regional productivity service organisations, private industry consultants, Department of Agriculture and Fisheries, CANEGROWERS, milling companies and Sugar Research Australia) to promote the MWWQP and maintain regional participation and engagement with sugar cane industry led water quality improvement practices.

As the GBRF establishes, implements and manages all regional programs it ensures the integration of the MWWQP with other water quality improvement activities under the Partnership. One of the approaches identified in the Reef Trust Program's Annual Work Plan for 2019/20 was to develop Traditional Owner-owner led water quality improvements.

Currently, the sugar industry in the Mackay Whitsunday region does not have a strong, established, working relationship and link to Traditional Owners, however, the appetite is there to develop this link. Opportunities to build the link include working with the regional Traditional Owner Reference Group to advance elements of its strategic plan. Considerable work is required, and is occurring, to establish those ties which need to be long term based i.e. well beyond the lifespan of the program.

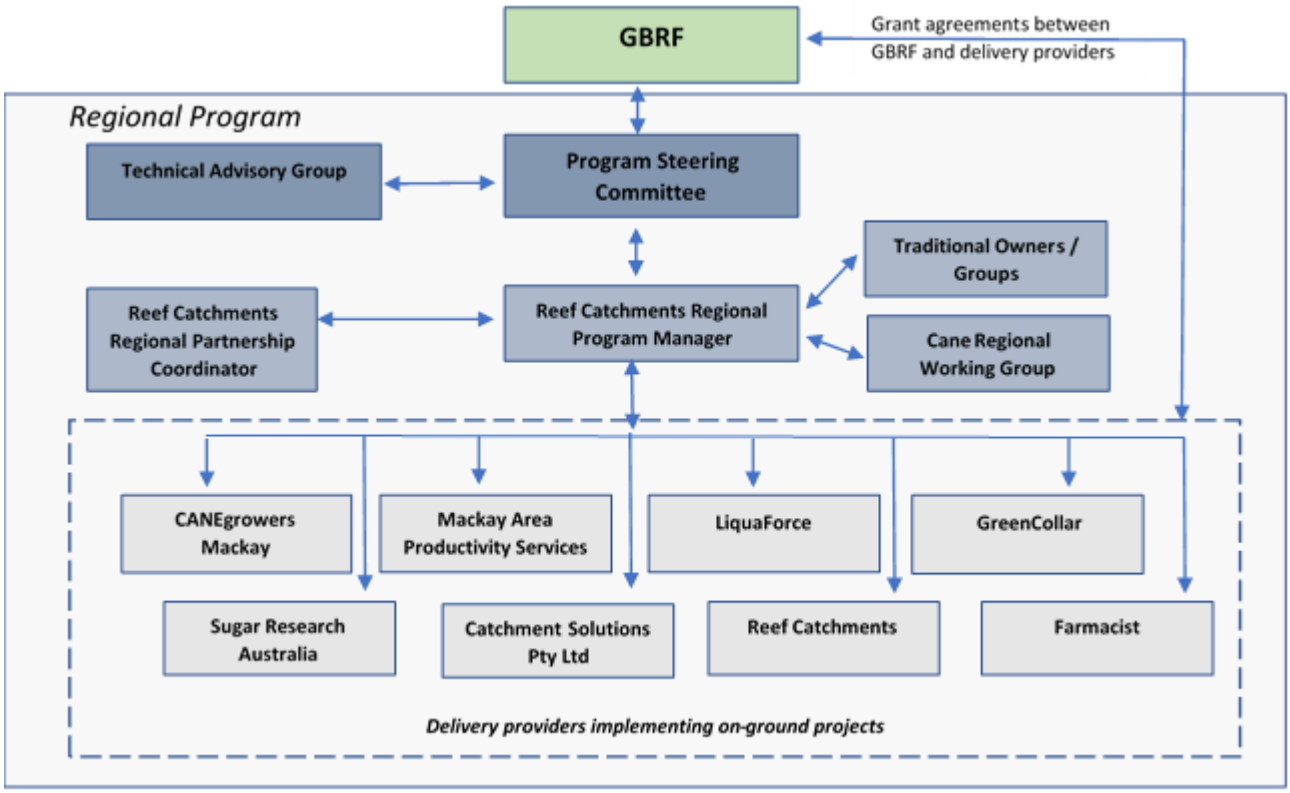

Figure 5. Governance arrangements within the MWWQP

6. Program Linkages

To retain the solid foundation of and build upon past programs for the MWWQP, it is extremely important to maintain and develop linkages to relevant programs within and outside the region. For the Mackay Whitsunday region, the linkages between various programs to the MWWQP are shown in Figure 6.

Critical to the success of the MWWQP is to retain and further develop the engagement of cane growers within the region. Without their participation, the inclusion of tailored, proven and innovative solutions incorporated into the MWWQP to meet water quality targets would be to no avail. One of the keys to the success of past water quality programs has been linking with productivity service organisations or private companies providing extension support to growers and this will continue in the MWWQP.

It is also essential to build on the experience and lessons learned from previous water quality programs to fill gaps, avoid pitfalls and prevent duplication. As outlined in Figure 6, retaining, maintaining and developing linkages to all programs requires regular communication. This allows for information from within and outside the region to be received by the MWWQP and enables a quick response to issues or potential opportunities as they arise and before the issue becomes critical or the opportunity is lost.

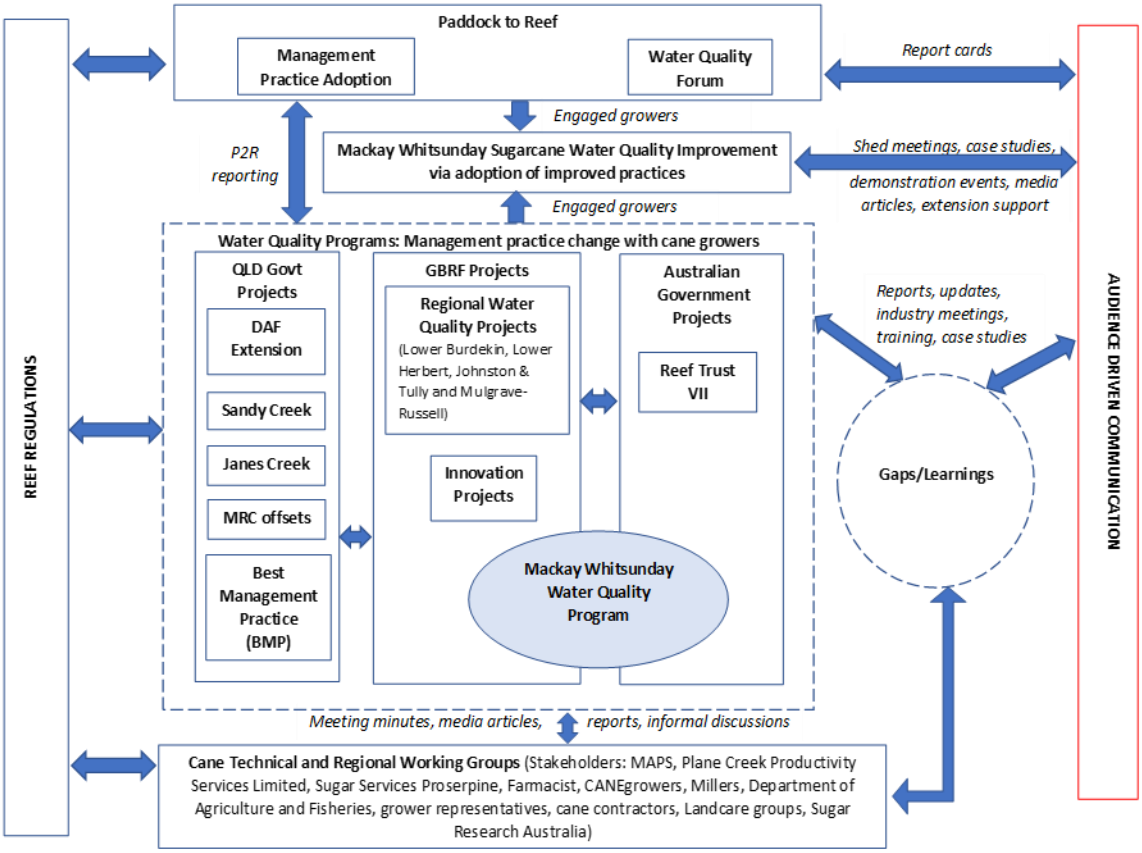

Figure 6. Key linkages between the Mackay Whitsunday Water Quality Program and related initiatives

7. Structure of the Mackay Whitsunday Water Quality Program

The overarching approach applied in implementing the mix of projects within the MWWQP was to ensure they included an expansion in the scope of proven, tailored and innovative solutions, as the 2017 Scientific Consensus statement identified as being essential to meet the Reef 2050 WQIP targets by 2025.

7.1 The 4 Tier Structure of the Project Delivery System

The MWWQP can be summarised as a 4 - tier system (Figure 7). The project's activities can be separated into four groups based on their relationship with proven methods and practices and innovative approaches.

At the lower tier are activities involved in developing pesticide and DIN management plans. The second-tier activities include EM mapping and variable rate applicators, improving spray rig or irrigation equipment and demonstration/workshops. The third-tier activities involve newer technology such as remote sensing yield mapping, pesticide decision support tool and App to predict crop requirements based on weather data. The fourth-tier activities apply technology or processes still being fully developed for the sugar industry, such as data recording software, behavioural science and reef credits.

It is expected that the 4-tier approach to investment through the MWWQP will enhance and accelerate adoption of improved practices through promoting pre-existing activities and by introducing 'new' activities into the region. The figure details service providers with their individual project approach. To promote collaboration and holistic farm management systems across projects within the MWWQP, Reef Catchments has grouped projects with commonalities

based on their focus area (i.e. DIN, pesticide or irrigation and the technology pathway leading to the water quality outcomes) and will ensure that potential for complementarity and synergies between projects is maximised (Figure 8).

For instance, growers can be engaged in multiple projects, either simultaneously or temporally separated. The key requirement is that, as much as possible, each project is able to account for its water quality outcome and avoid overlapping. This means a grower shouldn't be involved in two exact DIN projects offered by different delivery providers as no additionality in load reduction can be accounted.

However, a grower can be involved in two projects examining two different pollutants. In consultation with GBRF and Reef Catchments, delivery providers will work out the best approach to distinguish the load savings when potential overlaps between projects are identified. Collaboration between delivery providers can maximise the water quality outcomes from the MWWQP. Most of the MWWQP delivery providers have been successfully working collaboratively within the region for many years and a high level of cooperation between groups already exists. Key to ensuring that cross collaboration continues will be maintaining the communication networks between delivery providers throughout the duration of the program.

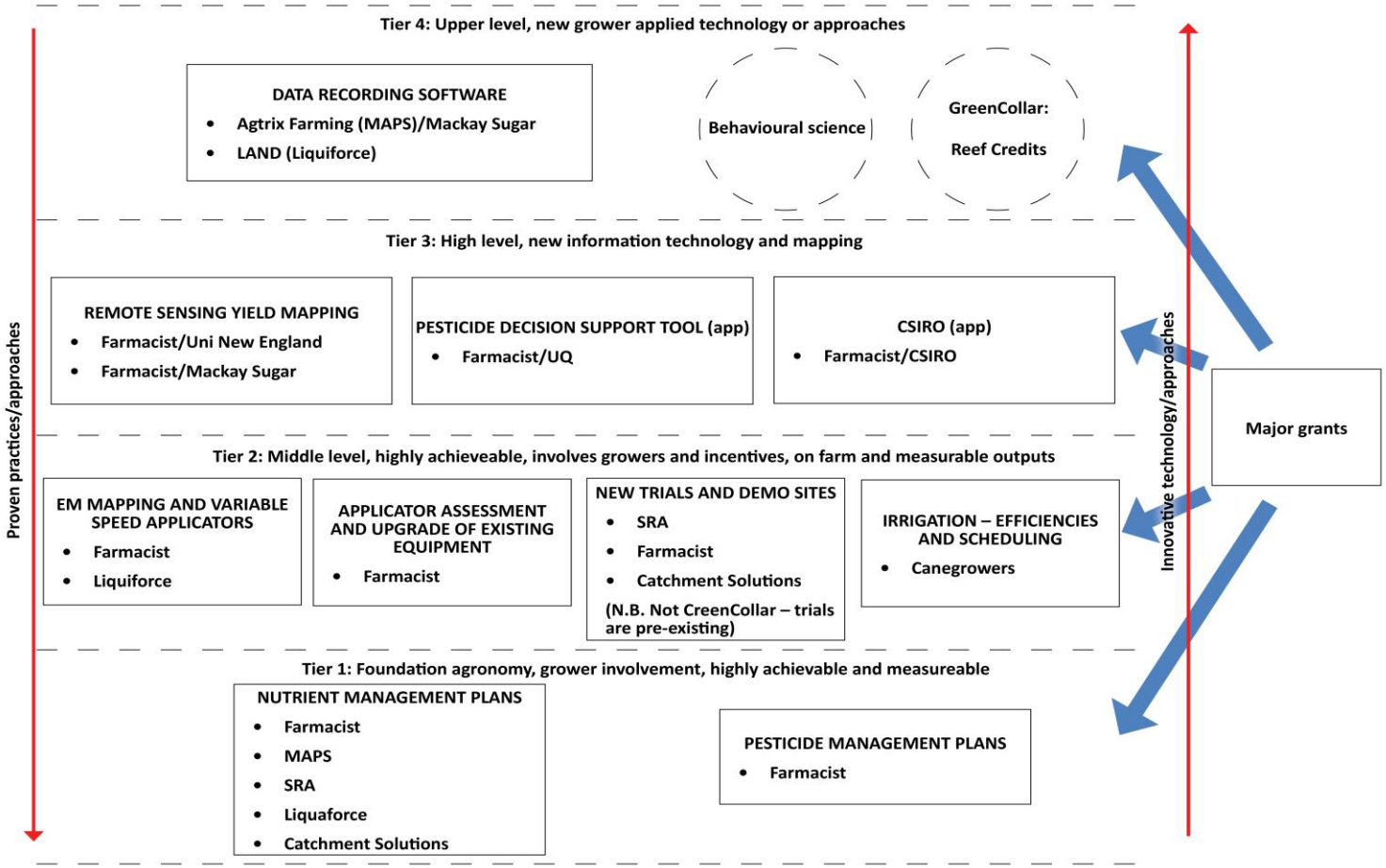

Figure 7. Four-tiered approach to the MWWQP

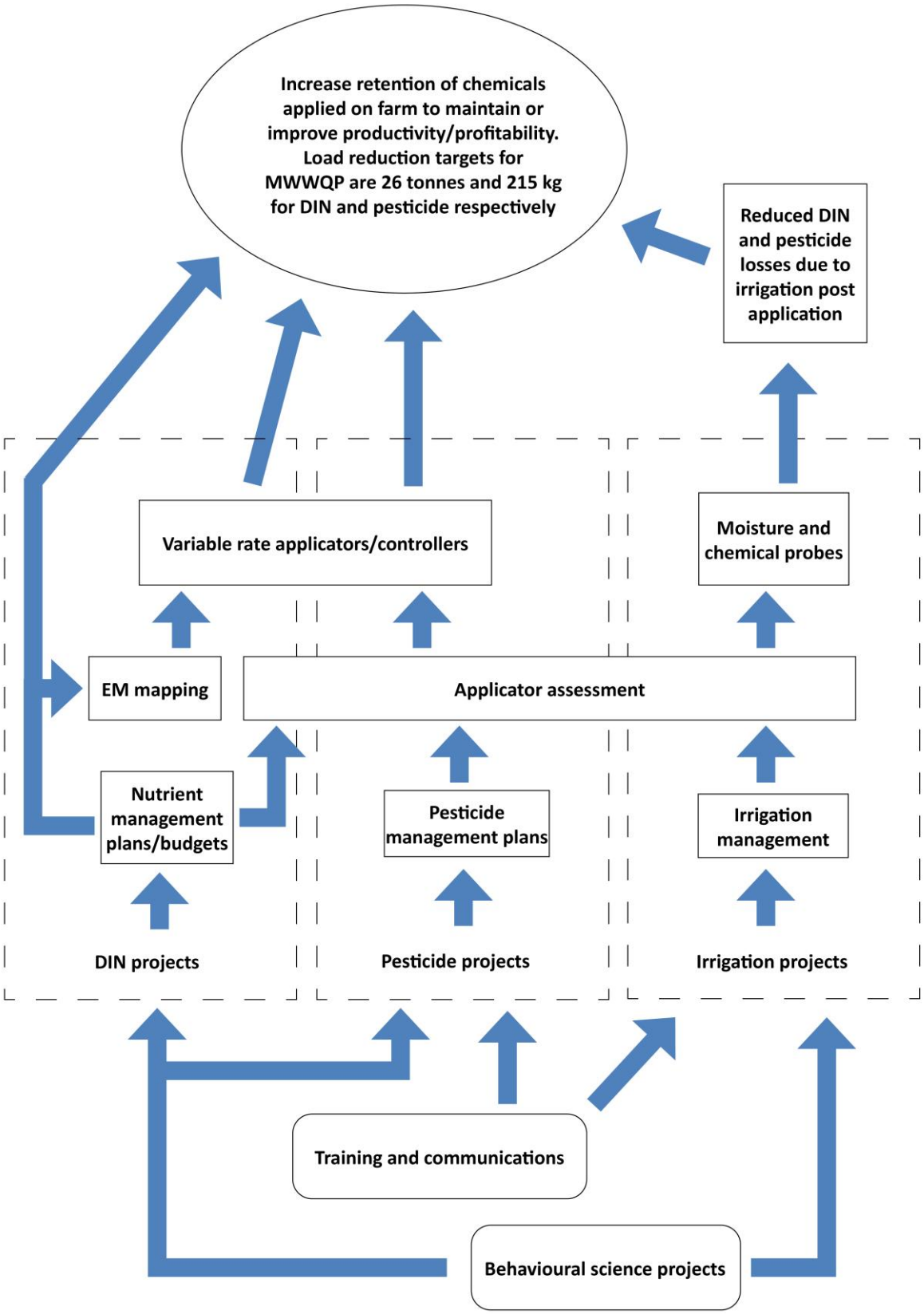

Figure 8. Generalised schematic diagram of the project types and processes within leading to load reductions in DIN and pesticide.

7.2 The composition of focus areas and funding within the MWWQP

The focus areas and funding level for the initial round of projects is detailed in Table 2.

Table 2. The focus areas of projects within the MWWQP.

Focus area	Funding allocation ($million)
DIN	9.6
Pesticide	4.4
Irrigation	1.2
Major Grants*	2.5
Total	17.7

**Small grants are also available to growers, they are embedded within the delivery provider projects.*

Several of the MWWQP projects focussing on DIN reduction also have a minor pesticide reduction component. Due to the difficulty in separating the cost component of each of these parameters, this has not been included in the above information.

8. Program Design

8.1 Developing the Program Logic for the Mackay Whitsunday Water Quality Program

The program builds upon the foundational activities of previous and current water quality programs and incorporates new, influential approaches/activities into the region. These may include innovation from newly developed technology or proven approaches not yet widely applied. The intermediate outcomes from the program will flow from grower engagement and include the direct uptake of improved practices to reduce pesticide and DIN loads but also to identify barriers to practice change, key learnings communicated within the industry, improved regional capacity and skills and enduring economic drivers for practice change. On completion of the MWWQP, and the other regional partnership programs, the ultimate goal is to ensure a legacy of increased stewardship and land management across the Great Barrier Reef region.

To monitor the progress of any program, the design has to have measurable parameters embedded within it. For the MWWQP, and for many previous water quality programs, delivery provider project data is captured through Paddock to Reef benchmarking. It is one of the influence activities built into the MWWQP which enables tracking of projects against milestone targets.

8.2 Program logic

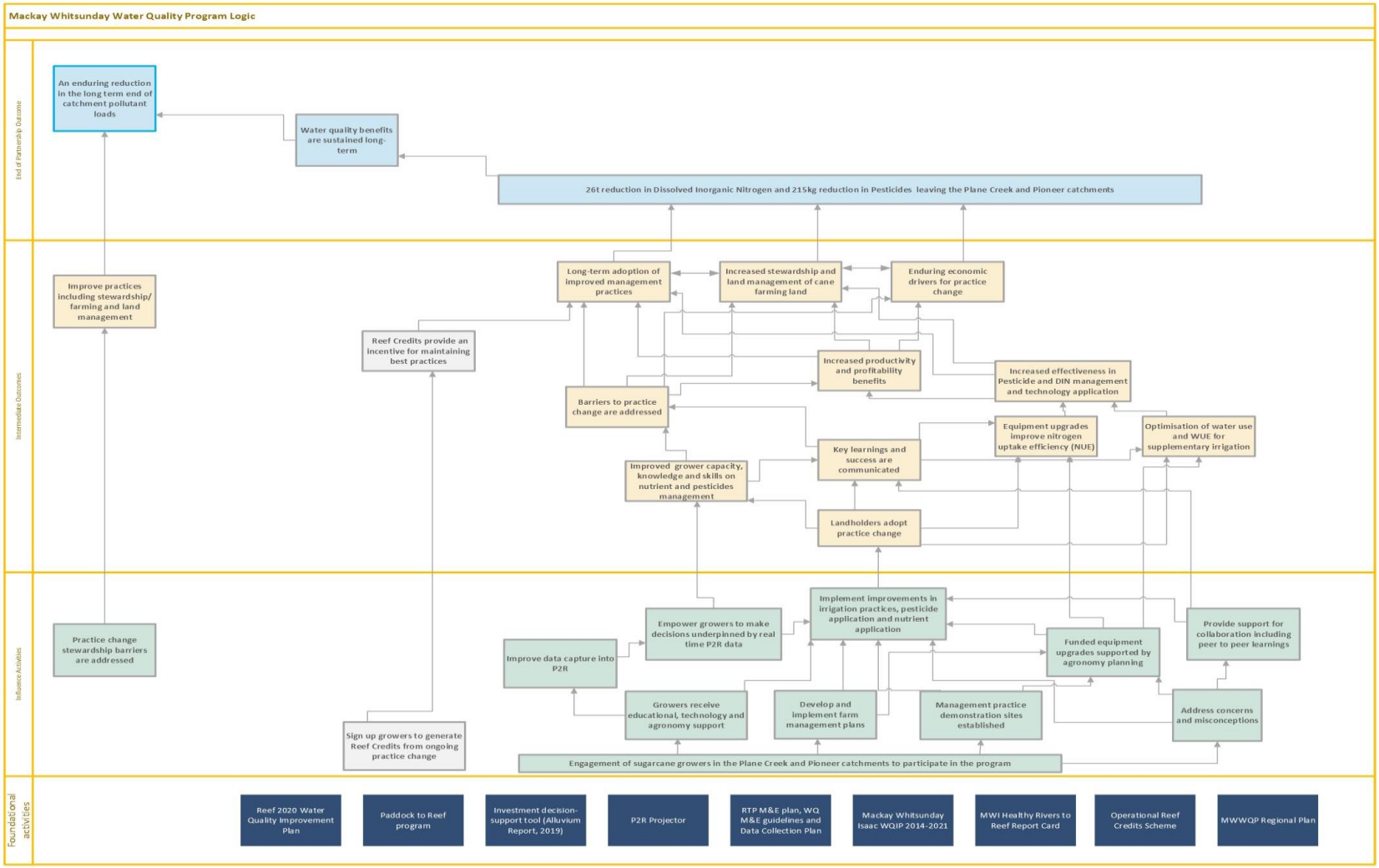

Figure 9. Program logic for MWWQP.

8.3 Budget

A total of $22.7 million has been allocated to the program by the Partnership. A breakdown of the proposed funding split is shown in Table 3.

Table 3. Overall program budget

Program Manager and Partnership Coordinator (Reef Catchments)	$ 2,250,100
Technical Advice	$ 454,000
Cross-project support (training, events etc.)	$ 200,000
Initial on-ground projects	$17,774,400
Contingency	$ 2,021,500
Total	**$22,700,000**

Approximately $2 million is reserved as a contingency. A significant portion of this is expected to be invested in actions to drive behaviour change to improve land use practices. The approach to delivering this work is yet to be determined. The balance of the contingency funding is expected to be made available for further on ground projects. Again, the approach to releasing this funding is still to be determined.

8.4 Program activities

On-ground activities undertaken as part of the program will include:

- Customised, detailed farm pesticide or nutrient management plans
- Engagement with pesticide reseller companies to improve knowledge and skills of pesticide management
- Provision of incentive funding for practice change to improve water quality
- Customised precision agriculture management plans for nutrient application
- Improving irrigation practices to improve the placement of nutrients and pesticides in the soil to minimise losses from water runoff
- Education and support to landholders through forums, workshops and on farm agronomy services, fostering and promoting uptake in nutrient and pesticide management practices
- Data collation and sharing to provide real time measurement of progress towards achievement of targets
- Better understanding of barriers to change through behavioural science to improve grower uptake
- “Hands on” demonstrations for growers.

For further details on activities linked to particular projects, refer to Table 4 and Appendix 13 – Portfolio of Projects to be delivered under the MWWQP.

Table 4. Summary of contracted delivery providers and projects.

Mackay Whitsunday Water Quality Projects				
Delivery Provider	**Focus area for MWWQP**	**Pollutant**		**Activities/Focus area**
		Major	**Minor**	
CANEGROWERS	Irrigation	DIN		Improving uptake of nutrients through irrigation. Examines Nitrogen Use Efficiencies (NUE), soil probe analysis (chemical and moisture) and irrigation scheduling to improve water quality.
Catchment Solutions	Project Catalyst Expansion	DIN	Pesticide	Applying Project Catalyst field trial research which has proven to improve water quality to a broader grower audience. Variety of improved practices implemented.
Farmacist	Precision Agriculture	DIN	Pesticide	Precision agriculture – EM mapping, variable rate application, yield mapping, nutrient management plans
	Bluewater Project 2	Pesticide	-	Improved application, decision making tools regarding pesticides (active ingredients, solubility, toxicity) App development & training. Field demonstrations, pesticide management plans.
LiquaForce	LAND	DIN	-	Precision agriculture and data recording using the software LAND, EM mapping and variable rate liquid nutrient application and nutrient management plans.
Mackay Area Productivity Services (MAPS)	DIN and data recording	DIN	Pesticide	Nutrient management plans, data recording through Agtrix Farming software. Improved fallow management, fallow cover crops and fixing nitrogen.
Reef Catchments	Major Grant Incentives	DIN	Pesticide	Major grant incentives – cash incentives - Requires 50% co contribution from growers N.B: Growers engaged in CANEGROWERS' Irrigation project will not be eligible for incentives under this project as they will already be accessing a substantial grant as part of the irrigation project
Sugar Research Australia (SRA)	Extension methodologies	DIN	Pesticide	Demonstration sites with in-field water monitoring, field days, training workshops and Imidacloprid applicator assessments.
GreenCollar	Reef Credits	DIN	-	Concept similar to Carbon credits, through placing a value on reducing pollutant loads and creating a tradable market for outcomes. Credits can be purchased to support environment and sustainability. Growers would benefit financially from making a practice change which would make a quantifiable reduction in pollutant load and equates to a certain number of reef credits
Potential Cross Regional Reef Projects				
Delivery Service Provider	**Project**	**Pollutants**		**Activities/Focus area**
		Major	**Minor**	
Yet to be determined	Behavioural Science	DIN	Pesticide	Understand, consider and apply behavioural science techniques to increase adoption by growers and to establish a stronger grower 'voice' in the community to actively

				communicate the good industry stories and progress to improving water quality outcomes.

In the MWWQP, the DIN focus area has multiple delivery providers offering projects to reduce DIN loads, however they have differing approaches. By having multiple delivery providers available to growers, it ensures that the growers are able to select their preferred, and trusted, organisation to work with, which in turn improves the programs potential to reach its water quality outcomes.

The Regional Partnership Coordinator will work with the delivery providers to address potential grower fatigue through facilitation of combined shed meetings and presentations. Coordination will significantly decrease the risk of an individual grower being targeted by multiple delivery providers to participate in their project.

The success of each project will be closely monitored and evaluated throughout the program. The overseeing of each project's progress and learnings by the Program Manager and Partnership Coordinator will identify positive outcomes and potential issues as they arise. This will provide a fast, proactive response where positive outcomes are promoted across the MWWQP and an adaptive management approach where issues need to be addressed.

Past investment in the sector has primarily involved financial assistance to growers to subsidise their cost to transition to new farming practices associated with improving water quality. For instance, modifying fertiliser or chemical applicators to ensure proper placement underground.

More recently, water quality project investment has focussed on providing growers with greater support from agronomists and extension officers to assist them improve their practices and less allocated to providing financial incentives.

The key to the success of the MWWQP will be combining extension support with incentives to promote improved farming practices which leads to an improved and sustained water quality.

There have been significant learnings from previous and current investment programs, key amongst them being that no single approach will achieve enduring change. The program projects are based upon proven methodologies that have recorded water quality improvement outcomes. Previous funding has demonstrated that incentive programs are ineffective unless delivered in conjunction with experienced and knowledgeable agronomy planning and advice. It will be important to match the skills and experience of the consultant to the advice required on farm to achieve practice change and to gain grower confidence. This will be addressed by identifying synergies between funded projects and through a collaboration of delivery providers supported by the regional plan.

Cane farms are first and foremost commercial enterprises that must generate sufficient annual profit to support the small business owners (farmers and extended family members) economically, service bank liabilities and provide enough cashflow to invest in and maintain capital equipment. Participation in water quality programs which involve practice and/or equipment change is a business decision where risk vs reward must be assessed on a farm by farm basis.

Specific types of activity, primarily aimed at improving land management practices and stewardship, are described further below.

8.5 Activity 1 Nutrient Management

In the Mackay Whitsunday region, fertiliser management has been examined intensely since the development of the Six Easy Step (6ES) Nutrient Recommendations for sugarcane approximately 13 years ago. During that period, newer practices have developed. Precision agriculture has for instance enabled variable rates of fertiliser to be applied within a paddock, matched to soil or productivity maps. Consequently, poorer soils supporting lower yields receive less fertiliser. Less

fertiliser applied reduces the amount to be lost into waterways thereby improving water quality. For the grower, the benefit is a reduction in production costs.

In the past, several barriers to the adoption of precision agriculture in fertiliser management have occurred. Primarily, these have involved a lack of support to demonstrate to growers the linkages between the soil or productivity maps to the fertiliser requirements of cane. By providing that support to growers, it will overcome those barriers.

An important inclusion into the support of growers is to provide information involving soil chemistry and factors that influence the availability of nutrients to the cane plant. This will improve grower's skills to assess soil test results and relate it back to fertiliser management. For the development of fertiliser budgets for the grower's farm, further agronomic support may be required.

The example above demonstrates that for a grower to adopt one new practice, in this case precision agriculture, it requires conducting multiple supporting activities. The projects of the MWWQP provide multiple layers of support required to promote adoption.

There is a broad need within the Mackay Whitsunday region to assist growers with understanding fertiliser requirements of cane, soil parameters influencing nutrient availability etc. which influence fertiliser management plans or budgets. Delivery providers, who already have strong working relationships with growers, will be providing the one on one agronomic assistance to develop growers understanding of fertiliser management budgets and all have tools which assist growers recording their on-farm practices. All of these activities will assist growers by taking gradual steps towards implementing the practice changes that will contribute to improved water quality within the Plane and Pioneer catchments.

8.6 Activity 2 Pesticide Management

Proper pesticide management involves ensuring that pesticides are applied at the correct concentration, using optimised equipment, at the right time and often followed up with subsequent activities, such as irrigation, to ensure correct placement. Consequently, conducting projects to improve pesticide management will also require addressing each of these parameters.

Through the Paddock to Reef program there has been an increase in water sampling and analysis associated with water quality projects. Communication of results that identify causality between on farm practices and water quality is reported through Reef Quality Report Cards. Details of the water sampling and the chemicals monitored as part of the Reef Water Quality Report Cards is available here.

An important gap in grower knowledge was identified through the Sandy Creek Project, funded by the Queensland Department of Environment and Science. This was that growers are aware of the chemical product names and label specifications but may be unaware of its active ingredient and were therefore unable to relate water quality results to those chemicals applied on their own farm.

The pesticide management activities will include:

- optimise the application efficiency of chemicals on farm – assessments of spray rigs, spray nozzles etc
- optimise the placement of chemicals – correct depth, soil coverage etc.
- minimise on farm application to required areas
- provide knowledge to growers through field demonstrations and water sample results, workshops, apps regarding chemicals and their active ingredients, chemical toxicity, current regional report card findings and the 2050 WQ Guidelines etc to assist them with their decision-making process regarding pesticides.

A component of the MWWQP pesticide projects will involve assessing grower's chemical applicators to improve effectiveness and efficiency, which will be supported with information to assist grower's selection of pesticides. Pesticide chemistry is complex and through demonstrations, workshops and the development of support tools, growers will be better equipped to make decisions. This will be underpinned by better access to timely analysis results through data sharing from the MWWQP Monitoring and Evaluation Plan.

8.7 Activity 3 – Irrigation

Irrigation is well understood to improve productivity in cane. However, the use of irrigation in cane within the Mackay Whitsunday region has been declining with increasing water and electricity costs. Coinciding with this decline has been a warmer climate, reduced rainfall, extended periods between rain events and consequently, lower cane yields.

Where yield decreases but applied nutrient levels remain the same, hypothetically, an excess of nutrients remain in the soil and are available to be lost from the system. Through applying irrigation efficiently, load reductions in DIN could be achieved by promoting more cane growth and increased production costs offset by higher productivity.

Similarly, irrigation can be applied soon after the application of chemicals to the soil to minimise losses due to ammonia volatisation (atmosphere) or surface runoff following a significant rain event. Unfortunately, neither the reduction in nutrient or pesticide loads due to irrigation have been experimentally calculated for the Mackay Whitsunday region.

One of the MWWQP activities is to examine irrigation as an additional approach to achieving improved water quality outcomes. It firstly promotes an increase in productivity and profitability to the growers and therefore minimises their uncertainty/risk to participate in an irrigation project and increases the likelihood for practice change. It provides assistance to growers participating in the project to improve irrigation efficiencies on their farms, assistance with developing irrigation scheduling to increase yield and the two combined maximise the benefit/cost of irrigating. At a higher level, these benefits will be demonstrated to the broader cane farming community in Mackay Whitsunday. If the activity validates load reductions in DIN and pesticides due to irrigation, the environmental benefits will be realised. It may also overcome the current barriers preventing growers applying irrigation and improve productivity in the region.

8.8 Activity 4 Grower Incentives

Past regional water quality programs and projects have provided participating growers access to significant financial incentives to alter on farm practices to promote a positive water quality outcome. However, the offer of incentives does not guarantee increased adoption. It has to be accompanied with continued agronomic assistance/support, sometimes well beyond the duration of the water quality program to prevent disadoption. Grower incentives are a means to accelerate practice change by addressing the key barrier to change, which is cost.

Delivery providers have included budget for small grants (up to $3,000) as an incentive for growers to engage in agronomy support by providing some financial agility. The focus of small grant incentives for growers participating in the MWWQP is to provide a rapid practice improvement step which starts the grower on the path towards a change in practice. Once that small step is achieved, the agronomic support from the project delivery partners will ensure that the growers continue on the path to adoption. Delays in gaining that initial step can cause growers to quickly lose interest in a program, potentially making them less likely to adopt the improved practice during the course of the program.

A larger grower incentive grant (up to $20,000 per grower) is also to be offered within the MWWQP. However, the number of grants are limited, and will require a material grower cash co-contribution and will facilitate a tangible and sustainable water quality improvement outcome.

This approach recognises that water quality improvement through practice change and agronomy advice, teamed with incentives is a good and desired mix. Where appropriate, co contributions from program participants will increase ownership of the practice with an increased chance of successful long-term adoption.

8.9 Activities that involve Traditional Owners

Traditional owner engagement and participation in the MWWQP will be in accordance with the GBRF Traditional Owner initiatives, and the Mackay Whitsunday Isaac TORG Strategic Plan. Engagement will be primarily through communication opportunities of the program. Traditional owner procurement will be encouraged. The TORG are identified as regional stakeholders in the MWWQP, and for the Yuwibarra Peoples, native title over the Pioneer and Plane catchments has recently been recognised.

8.10 Innovation activities

From the $201 million the RTP has invested in water quality, $10 million has been allocated towards projects focussed on innovation and system change. The MWWQP will make appropriate linkages to projects under the innovation program. Piloting innovative technologies and approaches is expected to lead to new practices being available for farming, land management and stewardship. It is also intended to lead to changes in how farmers make decisions, how extension officers provide support services, and how funders choose to invest. This will lead to improved practices (improved land management pathway) and contribute to innovative solutions for systems change in water quality. Innovation projects being trialled and/or relevant to connect with the MWWQP include:

- Modifying machinery to plant multi-species crops in sugarcane farms for improved soil health and Reef water quality – led by Farmacist
- Reducing herbicide use on sugarcane farms with precise robotic weed control – led by James Cook University
- INCENTIV8 - A rapid assessment visualisation tool for incentivising irrigation stewardship – led by James Cook University
- Turning wetland ecological and hydrological data capture into positive wetland and water quality management – led by the Department of Environment and Science

Further, a number of initiatives exploring new sources of funding for water quality improvement activities will also be relevant for the region. More details on the RTP Innovation program can be found here.

8.11 Early Investment activities

This first funding released under the Partnership occurred in early 2019 via a round of water quality grants, focused on projects that would maintain or build on-ground delivery capacity throughout the Reef catchments. Around $20 million was committed to projects under this workstream. Eleven projects were contracted to reduce pollution from fine sediment, DIN, and pesticides within moderate, high, and very high priority Reef catchments. Some of these projects have contributed to the Water Quality target in the Mackay-Whitsunday region (Table 5).

8.12 Future opportunities

The Australian and Queensland Governments have invested significantly in water quality improvement programs across the Mackay Whitsunday region since approximately 2008. It is anticipated new opportunities may be available through Reef Trust and the Queensland Government.

Future opportunities to include new activities into the program will be possible through funding reserves allocated in the budget as contingency funds. The process for identifying, evaluating and releasing the contingency funds will be determined in due course.

Table 5. Mackay-Whitsunday DIN and Pesticide load reductions expected to be achieved at the end of the Program.

Delivery Provider	Project Name	End of project load reduction	
		DIN (tonnes)	Pesticide (kg)
Several	Early Investment workstream	13.4 *	11.1 *
Farmacist	A point of difference	9.8	15
Farmacist	Bluewater 2		215
MAPS	Nutrient management Plans -Agritrix	4.7	
Liquaforce	Local Area Nutrient Datahub	3.2	
GreenCollar	Reef Credits Project	TBD	
Canegrowers	Mackay Irrigation Project	3.9	
SRA	Cane to Creek	7.4	67
Catchment Solutions	Catalyst Broader Adoption Program	7.5	
Reef Catchments	Major Grants	4.5	77
	TOTAL	*54.4*	*385.1*

**preliminary estimate used for the purpose of tracking water quality targets for the RTP Water Quality Program*

9. Communication and Engagement

9.1 Summary

Collaboration and coordination within a program hinges on effective and timely communication. The MWWQP Communication and Engagement Plan is an Appendix to this Regional Plan. Its goal is to support the delivery of the MWWQP through maximising program outcomes from identifying synergies and eliminating gaps in communication. A key component to the MWWQP is supporting growers to adopt new practices. Achieving successful engagement requires effective communication. The adoption of practices with improved water quality outcomes focus on maximising retention of nutrients and chemicals on farm which will positively impact productivity and profitability. The CANEGROWER's Irrigation Project is a good example of maximising retention by increasing uptake in cane through higher productivity. This important message of maximising retention on farm is to be communicated throughout the duration of the program and disseminated across multiple groups i.e. growers, delivery providers, industry and government organisations and will support cane growers in the region.

Communication can flow across all spheres but needs to be managed by the GBRF and Reef Catchments within the MWWQP. Communication will be managed through the following influences:

i. The regional area of influence: contains all groups directly involved with the MWWQP. To maximise the outputs of the MWWQP, the communication within the sphere is

managed by GBRF and Reef Catchments. To assist this, communication plans from all delivery providers will form the communication foundation for the entire program and form part of the MWWQP Communication and Engagement Plan. This will enable synergies or communication gaps to be identified and supported through unallocated cross cutting funds.

ii. The Intra-regional area of influence: contains cane industry groups, Queensland Government Departments, Landcare groups, regional water quality programs (including grazing), local media, local community and council. Within regional industry related groups, the information will identify industry concerns/issues as they arise and address them immediately. Lessons can also be learned from other water quality programs such as grazing. By having those communication networks established across different industries GBRF and Reef Catchments could identify effective engagement strategies for the cane industry.

iii. Out of region: this sphere captures those organisations/groups outside of the Mackay Whitsunday region which could provide valuable information for the MWWQP. In particular, the RTP Regional Programs and regional delivery providers could raise issues or promote projects/practices appropriate for the MWWQP. These could be incorporated into the program through contingency funds. Similarly, the State or Federal Governments could introduce new funding areas which would complement the activities of the MWWQP.

The benefits of having a strong communication and engagement network is that the positive messages of the MWWQP can be readily promoted whilst informed decision can be made to meet identified needs and gaps. Collaboration is a key component to a smooth, efficiently run program. Ensuring all stakeholders are collaborating throughout the entirety of the project enables alignments and efficiencies with existing local activities and also throughout project activities to maximise outcomes. For more details, please refer to the MWWQP Communication and Engagement Plan.

9.2 Regional Forum

The regional forum will be held annually. The purpose of the annual forum is to provide a platform for communication and engagement for the MWWQP, including funding, contractual and governance arrangements and to enable regional stakeholders to contribute to the Annual Regional Program Plan. It will showcase program achievements and identify regional champions to promote program practice change adoption.

On 5 March 2020 Reef Catchments held the inaugural GBRF MWWQP Regional Forum. Through collaborative, open, honest and informative discussion regional stakeholders have contributed to the development of the regional program and this plan by identifying barriers to change, regional knowledge gaps and metrics of success. The MWWQP recognises that barriers to change, though complex, must be considered and addressed to achieve enduring water quality outcomes.

The key takeaway message from the inaugural regional forum was that the regional program and plan must represent a holistic solution that includes agronomy, irrigation and behavioural change supported by an incentives program. From inception the program has looked to take advantage of synergies across projects and foster collaboration, to present a cohesive program with enduring positive outcomes for the Mackay Whitsunday region and the Great Barrier Reef. Input from the regional forum was a key driver of the RFI process.

9.3 Communication Plan

The aspirations of the MWWQP Communication and Engagement Plan (co-designed at the regional Forum) include:

- A clear message and common understanding of targets
- Broader engagement through sharing of relevant and quality information
- Positive messaging leading to acknowledgement by the broader community
- Promotion of Traditional Owner participation
- Cost effectiveness through delivery providers undertaking joint presentations to grower meetings
- Recognise and capitalise upon the value of grower peer to peer activities, such as shed meetings. Where practical, value add to other events and forums in the region
- Recognise champions
- Improve social licence for the industry
- Integrated presentation of program projects to growers, for example delivery providers giving joint presentations at shed meetings.

The MWWQP Communication and Engagement Plan has been developed to:

- Support, promote and enhance the activities of the MWWQP program which will ensure the water quality targets are achieved
- Provide a structure for the delivery provider's communication plans to align and enable synergy across projects.

The MWWQP Communication and Engagement Plan is structured into 6 key communication goals being:

- Enhance and accelerate the adoption and retention of practice change
- Develop a better understanding of the communication barriers inhibiting change
- Overcoming the barriers, concerns and misconceptions
- Improve regional capacity and skills
- Communicate key success and learnings from the MWWQP across the region
- Increase Traditional Owner involvement in water quality

The 6 key communication goals address the 'Why and How' fundamentals. The plan will be continually evolving, and progress will be tracked through the MWWQP Activity Timeline, a living document to track project communications activities, audience, status of actions and the channels utilised for the life of the project. In addition, a Communications and Engagement Monitoring Register, will be maintained and is designed to record communication activities qualitatively and quantitatively to monitor and evaluate the effectiveness of the plan.

10. Monitoring and Evaluation

A Monitoring and Evaluation plan (M&E plan) has been prepared which describes the framework to monitor and evaluate the MWWQP against its objectives under the RTP and contractual requirements. The M&E Plan provides an extensive framework which integrates the individual M&E plans of the delivery provider projects.

Within the project management process, oversight of how a project is progressing towards outcomes is essential to ensure its goals, and those of the program, are being reached. Regular monitoring and evaluation of projects assists identifying and addressing issues as they arise. This part of the project management process makes certain that a project remains under control, i.e. within the boundaries originally defined and tracking towards targets within timeframes and budgets.

M & E Guidelines for the Partnership have been prepared which set out key data collection requirements and processes. For each project under the MWWQP, delivery partners are required to develop individual project M&E Plans that algin with the MWWQP M&E Plan and the RTP M&E Plan. The hierarchy of plans is shown in Figure 10.

Throughout regional programs the Queensland Government Paddock to Reef Integrated Monitoring, Modelling and Reporting Program is the tool and framework adopted to collect, collate and analyse data. This program has evolved with changing technologies and changing on farm practices and continues to be a pivotal data collection, modelling and reporting mechanism. Paddock to Reef will be pivotal to the monitoring and evaluation of the MWWQP.

Data is to be collected in accordance with the RTP Data Collection Plan which provides detail on:

- the timing and method for capturing each data element
- the timing and method for reporting them to GBRF
- examples of each of the data elements.

Reporting will occur throughout the life of a program and will be fit for purpose, but importantly it is needed to close out specific project components and achieve the desired reduction on end of catchment pollutant loads. Annual evaluation will be coordinated by the Regional Partnership Coordinator with the input of GBRF and will involve all delivery providers and the Regional Program Manager. The intention of the annual evaluations will be to review the existing monitoring data and reflect on opportunities for program improvement, streamlining or to identify and address arising issues.

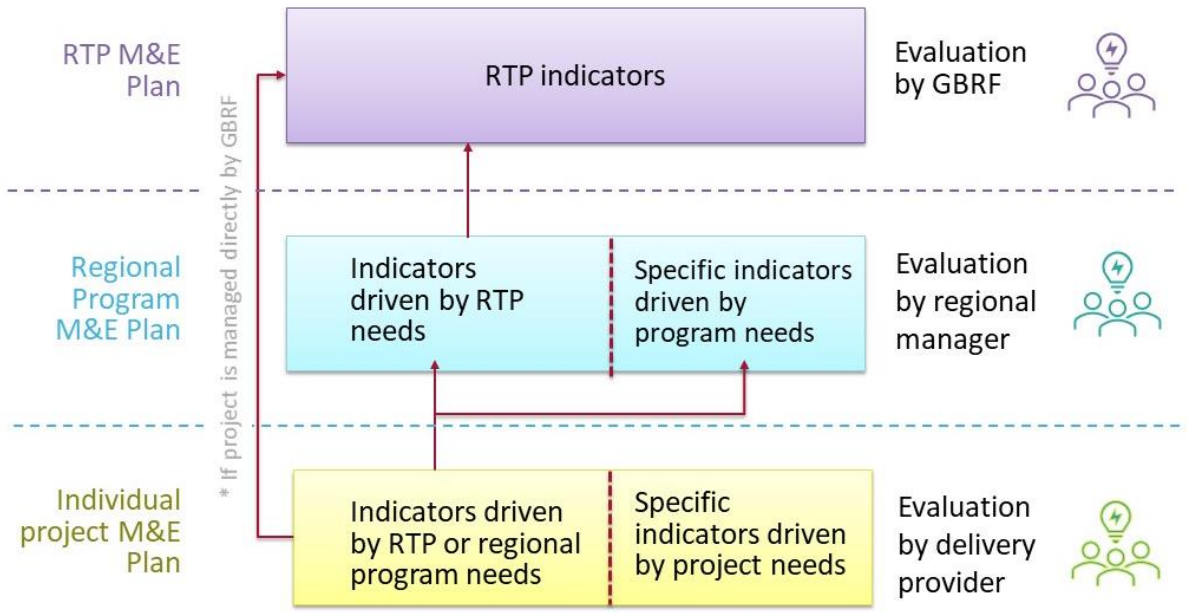

Figure 10. Hierarchy of M&E planning in the MWWQP

11. Work plan

The 2020-2021 MWWQP Work Plan is developed and reviewed on an annual basis. The work plan will facilitate coordination of activities and identification of synergies across the entire

program. It will be a living document and updated to accommodate unscheduled events. Regular meetings with delivery providers, industry groups and growers will facilitate the annual planning and will identify the most appropriate schedule to gain the greatest engagement across the program.

Table 5. Generic gantt chart for the MWWQP Work Plan.

Activity	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Industry wide activity - Harvesting												
Industry wide activity - Planting												
Industry wide activity - Vacation period												
Program Manager and Regional Coordinators meeting with GBRF												
Steering Committee Meeting												
Technical Advisory Group Meeting – Scheduled on needs basis												
Group Meetings with Delivery Providers												
Project P2R reporting -												
Reporting to GBRF												
Industry meetings – Regional Cane Working Group												
Industry shed meetings												
Quarterly communication articles												
Website update												

12.Risk Management Register

A Risk Management Register is being managed by Reef Catchments in consultation with the Steering Committee as a living document.

13.Appendixes

13.1 Portfolio of Projects

Project 1 Information	
Title: A point of difference – Refining farm nutrient management strategies	
Proponent: Farmacist	
Contractors/collaborators: University of New England, CSIRO, Mackay Sugar, Wilmar agricultural services	
Budget: $2,792,312	
Target Pollutant/s: DIN (primary) and pesticide (secondary)	
# Growers engaged: 120	# Hectares: 12,000
Duration: 4 years	
Project Summary and Activities	
This project will provide a pathway and a framework for enhanced economic and environmental sustainability in the sugarcane sector. The objective of the project is to fast track the delivery of essential base data and an extension program designed to have adoption of refined nutrient and chemical management to levels beyond regulations.	
- EM mapping - Variable rate applicators - Nutrient management plans - Yield mapping – satellite imagery and harvester technology - CSIRO *Whatif* Nitrogen management Ap development and testing	
End of Program Goals/Outcomes	**Estimate**
Primary pollutant outcome: DIN load reduction	9,800 kg
Secondary pollutant outcome: Pesticide load reduction	15 kg/year

Project 2 Information	
Title: Project Bluewater 2 (Pesticide management)	
Proponent: Farmacist	
Contractors/collaborators: CSIRO, TropWATER, DES and University of Queensland	
Budget: $4,421,714	
Target Pollutant/s: Pesticide	
# Growers engaged: 165	# Hectares: 21,450
Duration: 4 years	
Project Summary and Activities	
This project will build on the early learnings, momentum and success of the pilot Project Bluewater 1 by reducing pesticide loads, and will expand its footprint to cover an additional 21,450 hectares of cane land in the Plane Creek and Pioneer River catchments. This expanded proposal includes tailored pesticide management plans, equipment calibration and upgrades, end of field water sampling of blocks and demonstration trial sites, and a cooperative, interactive learning approach. Extension activities will foster reduced pesticide use and selection of lower risk pesticides.	
- Spray rig assessment and upgrade of minor equipment through small grant - Pesticide Ap – grower tool to assist selection of pesticide - Pesticide management plans tailored to each grower engaged - Demonstration sites and end of field water sampling/analysis	
End of Program Goals/Outcomes	**Estimate**
Primary outcome: Pesticide load reduction and selection of lower risk pesticides at end of project	215 kg/year
Secondary outcome: Improved grower knowledge of pesticides, active ingredients and alternative chemicals	

Project 3 Information	
Title: Nutrient management Plans and Agtrix Farming software support	
Proponent: Mackay Agricultural Productivity Services Limited	
Contractors/collaborators: NA	
Budget: $1,124,000	
Target Pollutant/s: Dissolved Inorganic Nitrogen	
# Growers engaged: 80	# Hectares: 4,268
Duration: 4 years	
Project Summary and Activities	
This project will increase the number of growers that have adopted improved property specific nutrient management plans which contribute to reduce dissolved inorganic nitrogen and pesticides loads. This will be achieved by providing detailed one-on one agronomic advice that can be applied and recorded practically with a real focus on improving the regional water quality.	
- Nutrient management plans and farm budgets - Facilitate data recording by growers using Agtrix Farming software - Assist growers undertaking fallow legume plantings - Small grant incentives for modifications or improvements to fertilizer applicators	
End of Program Goals/Outcomes	**Estimate**
Primary outcome: DIN load reduction	4,700 kg
Secondary outcome: Increase growers conducting nutrient management plans through Agtrix Farming software	-

Project 4 Information	
Title: The Local Area Nutrient Datahub (LAND)	
Proponent: LiquaForce	
Contractors/collaborators: TropCrop, Dirrawan Consulting Group, Drone Training Solutions, Hybrid Wireless, Catchment Solutions, Rowell Legal, New Wave Capital	
Budget: $1,240,000	
Target Pollutant/s: Dissolved Inorganic Nitrogen	
# Growers engaged: 30	# Hectares: 4,000
Duration: 4 years	
Project Activities	
This project will deliver a paradigm shift in the level of actionable insight and accessibility of key agronomic information for growers of all levels of digital maturity, resulting in significant farm productivity gains and water quality outcomes. Growers will have farm, soil, nutrient and performance data at their fingertips via the LAND Grower App, and will receive agronomic support including 34ptimize34 nutrient management plans, opportunities for industry-leading dissolved inorganic nitrogen reduction and advice on sustainable farm management.	
- LAND system software to assist growers with recording and development of nutrient management plans and farm budgets - EM mapping and variable rate nutrient application - Development of nutrient management plans and budgets for engaged growers - Drone imagery – data captured for relevant farm areas - End of paddock water quality sampling/analysis – selected sites	
End of Program Goals/Outcomes	**Estimate**
Primary outcome: DIN load reduction	3,200 kg
Secondary outcome: Broad scale application of precision agriculture and new technology in MW region.	-

Project 5 Information	
Title: Reef Credits	
Proponent: GreenCollar	
Contractors/collaborators:	
Budget: $600,000	
Target Pollutant/s: Dissolved Inorganic Nitrogen	
# Growers engaged:	# Hectares:
Duration: 2 years	
Project Summary and Activities	
This project will support the implementation of an innovative, market-based solution to value the work undertaken by farmers to enhance productive enterprise while caring for the environment. A Reef Credit represents a quantifiable volume of nutrient, pesticide or sediment prevented from entering the Great Barrier Reef. Farmers in the Mackay-Whitsunday Region will generate Reef Credits that will be purchased by this project.	
End of Program Goals/Outcomes	**Estimate**
Primary outcome: DIN load reduction	TBC
Secondary outcome:	
Potential outcome:	

Project 6 Information	
Title: Mackay Irrigation Project	
Proponent: CANEGROWERS	
Contractors/collaborators: Suncrop, MAPS, DNRME/DES, Agritech, SQR and QCGO	
Budget: $1,200,000	
Target Pollutant/s: Dissolved Inorganic Nitrogen (DIN)	
# Growers engaged: 27	# Hectares: 4,500
Duration: 4 years	
Project Summary and Activities	
This project will assist growers to optimize energy consumption and water use efficiency to increase productivity, profitability and to mitigate nutrient and chemical losses with improved irrigation management strategies. This will be achieved with the introduction of real time data from moisture and soil health probes and crop growth modelling platforms. Irrigation systems will be audited to improve energy and performance efficiencies.	
- Irrigation pump and equipment assessment - Improving cost effectiveness of irrigation through scheduling software, IrrigWeb, on farm - Characterisation of field soil condition - Moisture and chemical probe data recording	
End of Program Goals/Outcomes	**Estimate**
Primary outcome: DIN load reduction	3,900 kg
Secondary outcome: Quantify the potential DIN load reductions through timely and accurate irrigation application for the Mackay/Whitsunday region	

Project 7 Information		
Title: Cane to Creek		
Proponent: Sugar Research Australia		
Contractors/collaborators:		
Budget: $2,112,354		
Target Pollutant/s: Dissolved Inorganic Nitrogen (DIN) and pesticide		
# Growers engaged: # Hectares: N.B: Due to potential overlap of growers engaging in several activities it is difficult to estimate the total number of grower and hectares engaged in this project.		
Duration: 3 years		
Project Summary and Activities	**# Growers**	**# Ha**
Cane to Creek project will build on the early learnings and accelerate the adoption of improved nutrient and pesticide management strategies that contribute to the achievement of the stated dissolved inorganic nitrogen and pesticide load reduction targets.		
- Demonstration practices: DIN, herbicides and Imidacloprid sites	9	-
- Demonstrations, workshops, meetings and training	Up to 40-45 per event	-
- In-field assessments of liquid Imidacloprid applicators	40	4,000
- Cane yield measurements for Year 1 demonstration sites	3	-
End of Program Goals/Outcomes	**Estimate**	
Primary outcome: DIN load reduction	7,400 kg	
Secondary outcome: Pesticide	67 kg/year	
Potential outcome:		

Project 8 Information	
Title: Project Catalyst Broader Adoption Program	
Proponent: Catchment Solutions	
Contractors/collaborators: WWF-Australia, Nutrient Ag Solutions, MAPS, KK Creative Content, Flow Motion Media, Red Hot Blue	
Budget: $1,778,617	
Target Pollutant/s:	
# Growers engaged: 34	# Hectares: 5,100
Duration: 4 years	
Project Summary and Activities	
This project will improve nutrient and chemical management and supports the uptake of tested methods and farm management practices with sugarcane growers in the Mackay/Sarina region, who have not previously been active in the innovation or early adoption category. Ongoing agronomic support will also be provided to growers to facilitate continuous improvement.	
- Practice change applied from successful Project Catalyst trials - Water quality monitoring x 14 - Communications: 34 case studies; 2 x practice fact sheets; 2 x grower stories; quarterly news letters (16 total) and 1 video documentary/year (4 total) - Workshops/Shed meetings: 2 shed meetings/year (8 total); annual Project Catalyst Forum	
End of Program Goals/Outcomes	**Estimate**
Primary pollutant outcome: DIN load reduction	7,500 kg
Secondary pollutant outcome: Pesticide load reduction	-
Tertiary pollutant outcome: Sediment load reduction (additional to MWWQP focus)	219 tonnes
Wider application of Project Catalyst findings in region – expansion of Catalyst grower numbers	

Project 9 Information	
Title: Major grants	
Proponent: Reef Catchments	
Contractors/collaborators:	
Budget: $2,500,000	
Target Pollutant/s: DIN and pesticides	
# Growers engaged: Up to 140	# Hectares:
Duration: 4 years	
Project Summary and Activities	
This project will support enduring sugar cane farming practice change in the Pioneer and Plane Creek catchments that will improve water quality in the Great Barrier Reef lagoon through the reduction of dissolved inorganic nitrogen (DIN) and Pesticide loads. This support will be provided by administration of a pool of major grant funds to be made available for growers working with the MWWQP delivery providers receiving program agronomy advice and support.	
- With the collaboration of delivery providers, GBRF and Paddock to Reef, select additional grower projects based on water quality outcome cost effectiveness to be supported by a major grant - With the collaboration of delivery providers manage and pilot the grant projects over the first 12-month	
End of Program Goals/Outcomes	**Estimate**
Primary outcome: DIN load reduction	4,500 kg
Secondary outcome: Pesticide	77.7 kg