FINAL REPORT

Scaling Next Generation Water Markets in Northern Australia

A.7.2122001

Authors: Civic Ledger and Acclimate Partners

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Research for **sustainable** and **inclusive** development in **northern Australia**













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Acronyms

ACCC	Australian Competition and Consumer Commission
ASEAN	Association of Southeast Asian Nations
CLWSS	Central Lockyer Water Supply Scheme
CRCNA	Cooperative Research Centre for Developing Northern Australia
DEPW	Department of Environment, Parks and Water (Northern Territory)
DRDMW	Department of Regional Development, Mining and Water (Queensland)
DWER	Department of Water and Environmental Regulation (Western Australia)
FNQ	Far North Queensland
GL	Gigalitre
MDB	Murray-Darling Basin
MDWSS	Mareeba-Dimbulah Water Supply Scheme
ML	Megalitre
NAILSMA	Northern Australian Indigenous Land and Sea Management Alliance
NRM	Natural Resource Management
NWI	National Water Initiative
RIWI	Rights in Water and Irrigation (Act 1914, WA)
ROL	Resource Operations Licence (Queensland)
TRaCK	Tropical Rivers and Coastal Knowledge
WAR	Water Allocations Register (Queensland)
WRMU	Water Resource Management Unit (Western Australia)
WRS	Water Resource Scheme

Project Participants

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Abstract

Water is essential to the future of northern Australia: for farmers, communities, Traditional Owners, and investors. Yet, the information that underpins water management is fragmented, unreliable, and often trapped in spreadsheets. This makes it hard to know how much water is available, who holds the rights, how much is being used, and how much is being traded. Without clear and trustworthy answers to these four questions, it is difficult for farmers to plan, for investors to commit, and for governments to manage water fairly.

This report presents the findings of a research project that explored how digital technology can help fix this problem and build better water markets across northern Australia covering Queensland, the Northern Territory, and Western Australia.

The core finding is straightforward: before a modern water market can work properly, the water accounting must be right. Every litre needs to be tracked accurately, in real time, so that everyone – farmers, water managers, regulators, and investors – is working from the same trusted set of facts. The report calls this having 'one source of truth' for water.

To test this idea in practice, the project worked with Seqwater, Queensland's bulk water authority, to replace their manual spreadsheet-based accounting system with a modern digital platform called Water Ledger. The results were significant. Producing quarterly regulatory reports dropped from three weeks of work to under ten minutes. Processing bulk meter readings dropped from six weeks to under five minutes. Customers gained real-time visibility of their water accounts for the first time.

The report also examines what good water governance looks like at a local level, reviews how water management rules differ across the three jurisdictions of northern Australia and considers how place-based decision-making involving local communities, Traditional Owners, and industry can support fairer and more effective water markets.

The key message for decision-makers is this: invest in getting water accounting right first. Modern water markets built on accurate, transparent, and auditable water information will attract investment, reduce disputes, support grower confidence, and position northern Australia as a leader in water management rather than repeating the problems seen in the Murray-Darling Basin.

Executive Summary

Part 1: The Opportunity and the Problem

Northern Australia holds some of the most significant untapped water resources in the world. Irrigated agriculture across Queensland, the Northern Territory, and Western Australia supports thousands of farming businesses, underpins regional economies and communities, and represents a major opportunity for growth including into the rapidly expanding markets of Southeast Asia. The Australian Government has committed over $200 million to water infrastructure in the north precisely because secure and tradeable water is central to realising that opportunity.

Yet water markets across the north remain thin, fragmented, and difficult to trust. The information systems that govern water – the records of who holds rights, how much water has been allocated, how much has been used, and what has been traded – are still largely managed through spreadsheets, manual processes, and siloed databases that do not talk to each other. Water facts are delayed, disputed, and inconsistently recorded across jurisdictions. Trades that should take days take months. Prices are discovered by word of mouth. Investors cannot easily verify what they are buying. Growers cannot always see their own account balances in real time. This is not a technology problem alone rather it is also a governance and institutional problem that technology can help solve, but only if the foundations are built in the right order.

Part 2: What This Project Set Out to Do

This project, Scaling Next Generation Water Markets in Northern Australia (A.7.2122001), funded by the Cooperative Research Centre for Developing Northern Australia (CRCNA) was established to find a practical path forward. It was guided by one overarching question: how can investor confidence be enhanced through a grower-led digital transformation of northern Australia's emerging water markets?

The work was organised around three connected streams. The first examined what growers, communities, and investors need to trust and participate in water markets. The second explored what governance structures suited to the region's diverse hydrology, cultural contexts, and communities would support fair and effective water markets. The third tested whether a digital water accounting platform could be deployed in real operational conditions to provide the trusted, shared water information that markets depend on.

This report builds on a substantial body of prior work. Readers are directed to the published project outputs that inform and complement these findings: the foundational MDWSS Pilot Report Improving Water Markets and Trading through New Digital Technologies (A.7.1920043, 2020). This published report establishes the evidentiary foundation on which this report builds.

Part 3: The Central Argument

Water accounting must be right before water markets can work.

When these three gates (Table 1) are passed, a water market built on top of that accounting system will amplify trustworthiness. When they are not passed, it will amplify errors.

This may seem obvious, but the history of the Murray-Darling Basin demonstrates what happens when the sequence is reversed when trading infrastructure is expanded before the underlying accounting is accurate, timely, and auditable. Disputes multiply. Prices become unreliable. Trust erodes. Northern Australia could avoid that path by getting the foundations right first.

What does 'getting the foundations right' mean in practice? This report proposes three tests – three gates (Table 1) – that a water accounting system must pass before it is ready to support an active water market.

- First, water accounts must reconcile cleanly across consecutive periods: every opening balance, allocation, transfer, and usage figure must net correctly to the closing balance, without error.
- Second, allocation announcements and meter readings must be processed and published within agreed timeframes, so that all participants – growers, regulators, and Water Operators – are working from the same current picture, at the same time.
- Third, every proposed trade must be automatically checked against the applicable Water Plan rules before it is listed, so that regulatory compliance is built into the system rather than resolved after a dispute.

Table 1: The Three Gates that Inform the Water Market Operating Standard

Gate	What Success Looks Like	Why this Matters
Clean reconciliations for consecutive water accounting periods	Opening balances, allocations, transfers and usage net to closing balances without error	Establishes evidence that accounting is correct and repeatable
Service levels met for allocation announcements, meter reading uploads and water account statements	Allocation announcements and meter reads processed within agreed timeframes and reported per compliance guidelines	Builds trust, addresses perceived market manipulation, and shortens billing, compliance and settlement cycles
Rules engine operating within or across trading zones	Every trade automatically checked against Water Plan rules with clear reason codes before listing	Ensures rules execute before the trade, not after the dispute - compliance by design

Part 4: What Good Governance Looks Like

Technology alone cannot deliver better water markets. The institutions, rules, and relationships that govern water must also be fit for purpose and in northern Australia, that means governance that is genuinely adapted to local conditions rather than imported from the Murray-Darling Basin.

This project's research into place-based governance identified several principles that matter consistently across the region. Water is connected to place: it moves within catchments and schemes defined by physical geography, and governance arrangements that respect those boundaries tend to produce better outcomes than those that do not. Local knowledge including the ecological, cultural, and historical knowledge held by Traditional Owners and long-established farming communities is a resource that water governance must actively incorporate, not simply consult. A more detailed discussion of the governance model, stakeholder engagement and the original grower-led Water Ledger implementation is provided in the earlier CRCNA project report, **Improving Water Markets and Trading through New Digital Technologies: Final Report (Project A.7.1920043)**.

Decision-making works better when the people most affected by water allocation choices have a genuine role in shaping the rules that govern them. Within this project, the proposed Placelink® governance framework complements the Water Ledger platform by providing a mechanism for stakeholder participation and incorporating local and Traditional Owner knowledge into governance and planning processes, while Water Ledger provides the trusted water accounting information to support those decisions.

Across Queensland, the Northern Territory, and Western Australia, the project mapped how water planning, allocation, and trading currently work and where the differences lie. Queensland's entitlement-based system, with annual allocation announcements and established trading zones, is the most developed of the three jurisdictions. The Northern Territory's licence-based approach carries greater uncertainty around water security, particularly regarding the perpetuity of allocations. Western Australia's licence and permit system, organised around Water Resource Management Units, operates differently again. These differences are real and must be respected in any design for a common digital infrastructure, but they are not obstacles to sharing a common accounting architecture.

The governance conclusion is the same as the technical one: invest in the foundations. Establish the institutional arrangements, the decision rights, the data standards, and the community relationships that will allow water markets to function fairly and efficiently and do it before the trading infrastructure is expanded.

Part 5: What Was Tested and What Was Found

The project's most significant practical contribution is a live pilot of a Water Operator-grade water accounting system, delivered with Seqwater – Queensland's bulk water authority – across two water supply schemes in the Lockyer Valley: the Central Lockyer Valley Water Supply Scheme and the Lower Lockyer Valley Water Supply Scheme. These schemes together serve approximately 500 irrigation and commercial customers and were chosen for their complexity, including multiple allocation types, priority groups, forward draw arrangements, and variable pricing structures.

Although the project initially proposed a grower-led pilot in the Mareeba–Dimbulah Water Supply Scheme (MDWSS) on the Atherton Tablelands in Far North Queensland (A.7.1920043: 2020)., stakeholder engagement and implementation constraints meant a live operational pilot was instead undertaken with Seqwater in southeast Queensland. As the Water Operator responsible for statutory water accounting, Seqwater provided the opportunity to test the platform under real regulatory conditions while remaining within the same Queensland legislative framework. The lessons, terminology mappings and technical architecture developed through the pilot are intended to support future implementation across northern Australian irrigation schemes.

Prior to the pilot, Seqwater managed water accounting through a network of interconnected Excel spreadsheets maintained by experienced staff. There were no real-time account balances available to customers. Regulatory reporting was manual and labour-intensive. The system carried significant risks around version control, formula errors, and audit traceability.

The results of replacing that system with the Water Ledger platform were substantial and measurable, as set out in Table 2 below.

Table 2: Seqwater Pilot - Before and After

Task	Before	After
Quarterly regulatory reporting	One FTE for three weeks to compile six regulatory reports	Less than ten minutes with regulator-format export
Quarterly bulk meter reads	Six weeks to enter reads and issue statements mid-quarter	Less than five minutes with real-time account updates
Customer visibility and audit	No real-time view; higher risk of overuse	Instant audit log visible to Seqwater and customers via shared public ledger

These are not incremental improvements. They represent a step-change in how a Water Operator manages its core accounting obligations and they were achieved under real regulatory conditions, with real customers, on real water data. This pilot provides the operational proof that the approach works.

Alongside the Seqwater pilot, the project also completed detailed design work at the) MDWSS producing rule packs, data standards, and terminology mappings that directly informed the Seqwater implementation and that remain available for adoption by the Atherton Tablelands or other northern schemes when conditions allow.

Part 6: Key Findings

The project's research objectives were to inform the understanding of the governance and market mechanisms for the efficient and effective functioning of water trading and the water marketplace, based on a mix of conventional and next generation digital technologies including blockchain and smart contracts. The four workstreams addressed confidence in emerging water markets; place-based governance models; a proof of concept of Placelink®; and adoption and scale-up of Water Ledger. The findings of these four workstreams is detailed below in Table 3.

Footnote: Placelink® is a proposed digital governance and investment platform developed by Acclimate Partners (formerly Inclusive Growth Partners) to support place-based, multi-stakeholder decision-making. Within this project it complements the Water Ledger platform by facilitating collaborative governance, while Water Ledger provides the trusted water accounting infrastructure.

Table 3: Project Findings

Findings	Description
Finding 1: Water accounting integrity is the non-negotiable precondition for water market development.	The evidence from the Seqwater pilot, the MDWSS design work, and the analysis of Murray-Darling Basin market failures all point to the same conclusion. A water market built on inaccurate or untimely accounting will produce wrong prices, rising disputes, and eroding trust. The sequence cannot be reversed: accounting first, markets second.
Finding 2: The Water Ledger platform delivers Water Operator-grade accounting at a fraction of the legacy cost.	The Seqwater pilot produced measurable, audited results under real regulatory conditions. Quarterly regulatory reporting was reduced from three staff-weeks to under ten minutes. Bulk meter read processing was reduced from six weeks to under five minutes. Customer account visibility moved from zero to real-time. These results are replicable across other schemes using the terminology mapping and rule pack architecture already developed in this project.
Finding 3: Water Plan rules can be encoded into a digital platform without creating technology debt.	A persistent concern among Water Operators and regulators has been that digital water accounting systems will become outdated as Water Plans are reviewed and rules amended. This project demonstrates that rule packs can be separated from the platform's core code, making them updatable without rebuilding the system. This removes a significant barrier to adoption.
Finding 4: Jurisdictional differences across the north are real but not an obstacle to a shared digital infrastructure.	Queensland, the Northern Territory, and Western Australia each have distinct legal instruments, planning frameworks, and trading arrangements. This project's terminology mapping work shows that these differences can be accommodated within a common accounting architecture that preserves local rules while enabling shared, machine-readable data standards across jurisdictions.
Finding 5: Place-based governance, grounded in local knowledge and community participation, is essential to fair and durable water markets in the north.	Top-down governance models that do not account for local hydrology, cultural values, and community relationships will struggle to build the trust that water markets require. Traditional Owner knowledge and consent must be embedded in governance design, not treated as a consultation requirement to be satisfied after decisions have been made.

Findings	Description
Finding 6: Northern Australia is at a genuine inflection point.	The water reforms applied to the Murray-Darling Basin do not automatically extend to the north, but the risks they were designed to address – market manipulation, information asymmetry, compliance failures, and inequitable access – are present in embryonic form in northern water markets today. The north now has the evidence, the technology, and the institutional momentum to make better choices than the Basin made. Acting on this window of opportunity will be significantly less costly than remediation after the fact.

The below Figure 1 sets out the various scenarios that framed the vision across three themes: regulation and planning, compliance and water users. It explores the baseline state, the future state and the role of Water Ledger and Placelink® would play under such scenarios.

	REGULATION AND PLANNING MACRO OPTIMIZATION VIA ALLOCATIONS WITH INTEGRATED OUTCOMES	COMPLIANCE ENABLER OF REAL TIME ACCOUNTS, AUTOMATED TRADING AND COMPLIANCE	WATER USERS MICRO OPTIMIZATION VIA TRADE OF UNDERUTILIZED WATER
Framing the Vision	*What if government could have clear line of sight into the economic, social and environmental outcomes in the places where water is allocated?*	*What if water operators and users could comply with regulations, have a real time view of use, and in future trade across beneficial user types?*	*What if entitlement holders could easily trade underutilized water, while linking operating objectives with broader social and environmental priorities?*
Baseline State	▪ Water planning every 10-years with water licences generally fully allocated ▪ Feedback on allocations and outcome performance is not easily accessible across departments ▪ No water trading between different beneficial user types e.g., mining water trading with agriculture water ▪ Opportunity for integrated planning with recognition of social and environmental outcomes from sustainable use of economic water	▪ Water accounting information is held in spreadsheets or legacy information systems and not integrated with government systems ▪ Manual business process workflows are used by water operators to manage water use ▪ End-of-quarter regulatory compliance reporting process takes around three weeks to complete ▪ Up to 6 weeks to prepare and process billing ▪ Lag between water account balances and use	▪ Water accounting and allocation announcements managed by water operators ▪ 3-month cycle for meter reading and billing ▪ Trading of temporary allocations are paper-based and require approval by water operators ▪ Transfer of permanent entitlements are undertaken by third parties e.g., Titles Office, then new customer information provided to water operators for processing
Future State	▪ Higher frequency planning activities enabled by technology using a place-based insights ▪ Water plans linked with economic, social and environmental outcomes at the community level ▪ Flexible water planning that enables maximum benefit of available water optimised in planning with feedback to planners on use and benefits achieved ▪ Sustainable yield integrated and traded across economic, cultural and environmental users	▪ Validated environmental and social performance of water allocations at the beneficial user level ▪ Modernised back-office water accounting systems and water operator compliance with State Government requirements ▪ Real time views of water accounts ▪ In-built automated compliance rules and reporting for water operator ▪ Highly-automated compliance reporting for ROL holder reducing from three weeks to 10 minutes	▪ Real time view on water accounts including allocations, available balance, status of trades ▪ Increased allocation efficiency through trade of underutilized water allocation ▪ Integrated application of water towards economic, social and environmental outcomes ▪ Aligned public and private sector activities around shared objectives in economic, environmental and social domains, and increased trust in trades with greater transparency on sustainability activities
Water Ledger™	▪ Increased transparency of water accounting ▪ Secure access to water accounting information ▪ Water allocations cannot be double-counted ▪ All transactions have an audit trail ▪ Water plan performance reports for better decision making	▪ Realtime water accounting data and water market information ▪ End of quarter regulatory compliance reporting completed in under 10 minutes ▪ System integration via open APIs	▪ Online and real-time water accounting ▪ Transparent water account balances ▪ Meter read declarations – both manual and smart meter IP address integration ▪ Shifting paper-based trading process to in-platform with government interoperability
Placelink®	▪ Multi-stakeholder planning and investment alignment across beneficial users and government ▪ Validation of sustainable use towards environmental and social outcomes ▪ Visibility of trade-offs and cross benefits in economic, social and environmental outcomes	▪ Verification of sustainability practices, linking activities with real assets against an evidence-based theory of change, ▪ Validation of environmental and social performance at the beneficial user level	▪ Place specific priorities and governance ▪ Sustainability activities linked with operating outcomes and reporting, demonstrating social and environmental outcomes from economic use ▪ Water use proposals linked with real assets and evidence-based practice to support target outcomes

Figure 1: Four Workstreams in Practice

Strategic Recommendations

Five priority recommendations follow from the findings of this project as set out in Table 4 below. They are sequenced deliberately: each recommendation creates the conditions for those that follow. For a more detailed discussion, refer to the report's Strategic Recommendations section.

Table 4: Project Recommendations

Recommendations	Context
Recommendation 1: Establish a Water Operator Accounting Standard for Northern Australia.	State and territory water agencies, coordinated by CRCNA, should develop and publish a minimum standard for Water Operator-grade water accounting across the north's regulated irrigation schemes, based on the three-gates framework in this report. Lead owner: DRDMW, DEPW, and DWER jointly. Timeline: standard drafted within twelve months, adopted within eighteen months.
Recommendation 2: Fund and deliver a staged rollout of Water Operator-grade accounting across northern schemes.	A funded program should deploy the Water Ledger platform across additional regulated schemes, beginning with the Atherton Tablelands. Each deployment should publish before-and-after results. Lead owner: Civic Ledger, with CRCNA as coordinator. Timeline: Atherton Tablelands deployment commenced within twelve months; full northern rollout in years two and three.
Recommendation 3: Establish a cross-jurisdictional water market governance framework for the north.	The National Water Grid Authority, working with the three state and territory water agencies, should develop a collaborative governance framework defining shared data standards, terminology mappings, and interoperability requirements. Traditional Owner bodies must be co-designers. Lead owner: National Water Grid Authority. Timeline: framework published within twenty-four months.
Recommendation 4: Design and deliver a grower-led water market education and capability program.	FNQ Growers and equivalent industry bodies, with support from Acclimate Partners and CRCNA, should design and deliver a structured education program for growers, Traditional Owner groups, and small water users across the north. Lead owner: FNQ Growers and equivalent industry bodies. Timeline: piloted in year one; expanded across the north in years two and three.
Recommendation 5: Adopt and publicly report a monitoring and evaluation framework for northern Australia's water market development.	CRCNA should formally adopt the six performance indicators established in this report – settlement time, dispute rate, announcement timeliness, platform adoption, regulatory reporting time, and user sentiment – as the basis for a mandatory, publicly reported monitoring framework. Lead owner: CRCNA. Timeline: framework adopted within six months; first annual report published within eighteen months.

Introduction

Northern Australia's prospects for growth rest on reliable water allocations, clear and predictable rules, and water market information that communities and investors can trust. This project sets out a practical pathway to next generation water markets anchored in accurate water accounting, transparent trading, and place-based governance. At its core is a simple proposition: confidence improves when everyone can answer four questions with evidence rather than opinion. How much water is available? Who holds the water rights? How much water is being taken? How much water is being shared? When those answers are accurate, timely, and defensible, participation increases, prices reflect real conditions, and investment decisions improve.

The evidence base for this project has two parts. Design work and stakeholder engagement in the MDWSS on the Atherton Tablelands clarified market requirements, mapped rules, and identified the information that Water Operators, regulators, growers, and communities need. Although that work did not proceed to a live pilot, it shaped the rule packs and data standards used to guide the live water accounting system pilot with Seqwater in the Lockyer and Central Lockyer Water Supply Scheme. That pilot tested these settings under real-world operational conditions and provided measured results on reporting time, meter data ingestion, and customer transparency. Together, these two activities provide both design intent and operational proof.

This report is written for policy leaders, regulators, Water Operators, growers, and investors who must plan upgrades, set rules, or commit capital. It explains why opening and closing water account balances must be established to Water Operator-grade before water market infrastructure is expanded, and shows how a shared model of rights, accounts, trades, and take can be configured to local conditions without losing comparability across regions and without creating technology debt as Water Plans are reviewed and rules are amended.

Scope and Method

The research focuses on Queensland, the Northern Territory, and Western Australia, with particular attention to regulated irrigation schemes and adjacent catchments where planning instruments, metering, and registers already exist. The approach combines desktop research, stakeholder interviews and workshops, and the delivery of a live Water Operator-grade water accounting system pilot.

First Nations knowledge and consent processes are respected throughout. Where cultural information is sensitive, reporting is aggregated and governed by agreement. The report does not replace legal advice or water planning processes; it provides design guidance, rule packs, templates, and standards that can be adopted by regulators and Water Operators regardless of jurisdiction.

How this Report is Organised

The report proceeds from context to action across five phases of work, followed by the strategic recommendations.

- Section 1 establishes the current state of water resource management across the north: the legal instruments, key actors, jurisdictional products, and how cultural and environmental values are recognised in policy and market design.
- Section 2 maps the principal water market actors and stakeholder groups: their roles, the data they hold, and how they connect to the monitoring and evaluation framework.
- Section 3 examines how water sharing plans are made, compares the operating model across the three jurisdictions, and identifies practical improvements including the partnership models that support operating model change.

- Section 4 sets out the place-based governance model: what it means in practice, what the research and international benchmarks show, and why it matters for water market design in the north.
- Section 5 presents the Seqwater Water Ledger pilot in full: the problem, the solution, the implementation, the results, and the lessons for scaling across northern Australia.
- The last section tables the project's strategic recommendations.

Context for Northern Australia

The Economic and Policy Setting

Northern Australia has strong growth potential based on abundant water resources. Irrigated agriculture is a key driver that can add significant economic activity and resilience to regional communities and deliver high returns to investors. The Australian Government's 2015 White Paper on Developing Northern Australia identified water resources and enabling infrastructure as foundational priorities. It committed to identifying and investing in new and existing water infrastructure, expanding trade and investment, improving Indigenous economic development, and improving governance and regulation to support growth while accounting for environmental and social considerations.

Research by Rolfe, Windle and Whitten (2012) identifies the ingredients of successful agricultural ventures in the region: secure water supply through reliable access and clear water rights; appropriate soil management; diversification; access to profitable markets; skilled workforces; effective partnerships; and adoption of new technologies. Water security underpins all of these. The CRCNA's investment goal requiring transparent water markets and strong governance to unlock the ASEAN opportunity reflects this analysis directly.

Why Water Information Must Be Treated as Public Value Infrastructure

Government information systems have modernised, yet many still fragment the story of water into separate truths held by different agencies, operators, and registers. Rights are recorded in one place, allocations in another, meter reads in a third, and trades in a fourth. None of these systems talks reliably to the others. The result is that the most basic questions – how much water is available, who holds it, how much is being used – cannot be answered accurately, quickly, or consistently.

This project takes a different position. Water accounting information should be treated as public value infrastructure: a shared, trusted resource that government, Water Operators, industry, and communities co-produce and that publicly consistent indicators for managing water demand flow from. When this infrastructure is in place, information asymmetry is eliminated, time to real-time insight is shortened, and confidence for growers and investors is supported.

The four questions that frame this project – how much water is available, who holds the rights, how much is being taken, how much is being shared – are not technical questions. They are governance questions. Answering them accurately and publicly is the foundation of a trustworthy water market.

The Murray-Darling Basin: A Cautionary Parallel

Australia's water market in the Murray-Darling Basin is the world's only large-scale system of water trading, estimated to be worth AUD$3-5 billion per annum. Despite this scale, its full potential has not been realised because of fragmented governance, information asymmetry, inconsistent terminology, and a system that was built for water management but not for efficient trading.

The ACCC's Inquiry into Murray-Darling Basin water markets found significant deficiencies in the governance and regulatory settings for water trading. Market manipulation, opaque price discovery, high transaction costs, and inadequate oversight of brokers and intermediaries were among the identified problems. Critically, the Inquiry did not fully address the connection between Water Operator accounting capabilities and water market performance – a gap this project addresses directly.

Northern Australia is not subject to the Water Reform Act amendments that apply to the Basin. But the risks those reforms were designed to address – manipulation, opacity, compliance failure, inequitable access – are present in embryonic form in northern markets today. The north has the

opportunity to design its markets correctly from the outset, rather than remediate them after the problems have taken hold.

1: Current State of Water Resource Management in Northern Australia

Introduction

This section establishes the baseline for northern Australia's water market governance. It identifies the principal legislation and planning instruments across the three jurisdictions, maps the key actors and their functions, explains how water and cultural values are recognised in policy and market design, and draws out the implications for platform configuration and workstream design.

National Context Outside the Murray-Darling Basin

Australia's water markets policy framework is led by Commonwealth objectives that promote efficient and transparent trading while protecting environmental and cultural values. The National Water Initiative (NWI) provides the overarching national framework, underpinning the design choices to be made by Queensland, the Northern Territory, and Western Australia for their emerging and place-based water markets.

Jurisdictional Frameworks

Queensland

Queensland operates a mature, rules-based regime built around statutory water plans, water management protocols, operations manuals, and the Water Act 2000 and Water Regulation 2016. Water – both supplemented and unsupplemented – is unbundled in many plan areas into tradeable water allocations, with seasonal water assignments and relocations possible for some licences subject to plan rules and impact tests. Registration occurs on the Water Allocations Register (WAR), managed by the Department of Regional Development, Manufacturing and Water (DRDMW).

Northern Territory

The Northern Territory enables trading within declared water allocation plan areas and is progressing whole-of-government reforms through a Territory Water Strategy that prioritises safe drinking water, sustainable development, good governance, and protection of environmental and cultural values. Entitlements are granted on a first-in-first-served basis and are typically time-limited rather than perpetual creating different investment risk signals and market design challenges than in Queensland.

Western Australia

Western Australia manages access under the Rights in Water and Irrigation Act 1914, with licensing focused on proclaimed areas and trading occurring within defined Water Resource Management Units (WRMUs). Concepts align nationally through equivalent terms so that leases, permanent trades, and allocation trades can be compared across jurisdictions, even where products remain bundled.

Key Actors and Their Functions

Water governance in the north is shared across Commonwealth and state or territory governments, scheme operators, and communities, supported by market and civil institutional instruments. Table 5 summarises roles and the artefacts each actor relies on.

Table 5: Principal Actors and Core Functions

Actor	Core Function	Typical Instruments or Artefacts
Commonwealth water policy agencies	Set national policy goals underpinning trading efficiency and transparency across jurisdictions outside the MDB	National policy guidance on market purposes and products
Queensland DRDMW and scheme operators (Sunwater, Seqwater)	Prepare and administer water plans, protocols and manuals; operate schemes; allocate, account and enforce	Water plans, protocols, operations manuals, ROLs, Water Allocations Register
NT Department of Environment, Parks and Water Security	Make water allocation plans, issue licences, deliver the Territory Water Strategy, and report on outcomes	Water Act instruments and Territory Water Strategy priorities
WA Department of Water and Environmental Regulation	Licence and regulate take and trades within proclaimed areas and management units	RIWI Act licences and plans, WRMU rules and operational trading policies
Private irrigator networks and bulk operators	Distribute water, manage customer accounts, implement trading and seasonal assignments within scheme rules	Distribution and operations licences, scheme rules, account and billing systems
Indigenous organisations and Traditional Owner bodies	Represent cultural authority, contribute to planning and governance, advocate for Indigenous interests in access and markets	Engagement in plan processes and governance forums, cultural values and aspirations
NRM groups and environmental NGOs	Co-design and implement water management initiatives, support sustainable practices and monitoring	Regional plans, partnerships and project agreements

Jurisdictional Products and Terms

Table 6: Jurisdictional Products and Terms at a Glance

Topic	Queensland	Northern Territory	Western Australia
Core legal instruments	Water Act 2000, water plans, water management protocols, operations manuals	Water Act 1992, declared Water Allocation Plans and trading guidelines	RIWI Act 1914, plans and policies for WRMUs
Permanent dealings	Transfer of water allocation title and leases recorded on the WAR	Licence entitlement transfers where plan and licence allow	Licence entitlement transfers within the relevant WRMU via DWER processes
Temporary dealings	Seasonal water assignment: rules differ between supplemented	Temporary licence trades where plan guidelines permit	Temporary transfers within a WRMU where policy allows

Topic	Queensland	Northern Territory	Western Australia
	and unsupplemented plan areas		
Registration or approval	WAR registration for permanent dealings and leases; assignments per plan or protocol	Water Controller approvals within plan settings	DWER approvals within WRMU and plan settings

How Water and Cultural Values Are Recognised

Evidence from the Tropical Rivers and Coastal Knowledge (TRaCK) network and the Northern Australian Indigenous Land and Sea Management Alliance (NAILSMA) stakeholder study shows broad support for government as regulator, strong expectations that markets sit under robust water plans, and an emphasis on protecting customary and ecological values. The findings also show support for Indigenous involvement across planning, management, and market participation, and for preserving culturally significant catchments and aquifers while pursuing development.

These values frame water market rules on trade scope, allocation protections, and the design of place-based governance in northern Australia. They are not supplementary considerations – they are foundational requirements for durable water markets in the region.

Baseline Implications for Water Market Design

The baseline established in this phase points to three implications for scaling next-generation water markets across the north.

- First, regulatory maturity varies significantly across jurisdictions, so platform configuration must reflect local plan rules, licence tenures, and trading constraints particularly in the Northern Territory, where time-limited water entitlements create different investment risk signals.
- Second, actor capacity and technology are uneven, with manual spreadsheet-based accounting still common in scheme operations, which limits transparency and increases trading compliance risk.
- Third, stakeholder expectations emphasise legitimacy, Indigenous participation, and protection of cultural and environmental values, meaning governance and trading features must be demonstrably subsidiary to robust plans.

2: Understanding Key Water Market Actors and Stakeholder Groups

Introduction

This section identifies the organisations and networks that shape water governance and market behaviour in northern Australia. It maps who the actors are, what decisions they make, what data they hold, and how their roles connect to the adoption pathway and the monitoring and evaluation framework in later phases.

Actor Classes and Roles

Water governance in the north is distributed across six principal actor classes (see Table 7 below). Government agencies and regulators set statutory plans, licence conditions, and trading permissions. Water Operators and account administrators run day-to-day allocations, account management, announcements, and regulatory reporting under their respective Operator Licences. Grower organisations influence rules and adoption through advocacy and coordinated practice. Indigenous organisations bring cultural authority and have defined roles in planning and governance. Natural resource management groups and environmental NGOs partner on sustainable practice, monitoring, and policy reform. Brokers and other intermediaries connect buyers and sellers and affect market performance through price discoverability, liquidity, and data quality.

Table 7: Principal Actors and Data They Hold

Actor	Core Functions	Typical Artefacts and Data
Commonwealth and state or territory water agencies	Make or approve plans and licences, set trading permissions, oversee compliance	Plans and strategies, licences, approvals, compliance reports
Water Operators and account administrators	Operate plans and schemes, allocate water, maintain accounts, issue announcements, approve trades, report to regulators	Allocation statements, account balances, meter readings, reconciliation logs, pricing and billing, regulatory reports
Growers and private irrigator networks	Represent users, coordinate infrastructure and operations, inform rule design	Member registers, operational rules, scheme performance data
Indigenous organisations and Traditional Owner bodies	Contribute to planning and governance, articulate cultural objectives and indicators	Submissions, cultural values statements, monitoring protocols
Natural resource management groups	Partner on sustainable practice, data collection and projects across regions	Regional plans, project datasets, practice guidelines
Brokers and other intermediaries	Match orders, submit trades, provide market data to participants and operators	Trade capture records, confirmations, settlement files

Actor Data Map

Understanding which actor holds which datasets, how often those datasets are updated, and how they connect to the monitoring indicators is essential for designing a water accounting and market information system that works across the full institutional landscape. Table 8 maps these relationships.

Table 8: Actor Data Map

Actor Class	Datasets Held	Update Cadence	Indicator Links
Water Operators	Allocation announcements, account balances, meter reads, reconciliation logs, trade approvals, billing and payments, compliance reports	Operations daily; accounts quarterly; water year annually	Participation, approval time, announcement timeliness, reporting time
Brokers and intermediaries	Order books, trade capture, confirmations, prices, spreads, market trends	Daily	Liquidity, dispute rate
Traditional Owner bodies	Cultural objectives, indicator methods, permissions	Quarterly	Cultural outcomes
NRM partners	Environmental indicators and method notes	Quarterly	Environmental outcomes
Government agencies	Plans, approvals, compliance reports	As issued	Compliance context

Case Vignettes: Grower Networks in Practice

Queensland's private irrigator networks demonstrate how organised grower bodies support information flows and adoption in ways that matter for water market design. The Fairbairn Irrigation Network, Bundaberg Regional Irrigators Group, Lockyer Irrigator Network, and Burdekin Productivity Services all illustrate how member organisations coordinate practice and advocacy in ways that support or constrain market participation.

In Western Australia, the Ord Irrigation Cooperative in the Kimberley demonstrates a northern cooperative model where a grower-owned body manages water delivery and scheme operations. It shows how a user-owned operator can supply operational data and governance signals that inform platform configuration and oversight and how place-based ownership structures can strengthen accountability in water market design.

3: Identifying Operating Model Improvements

Introduction

This section examines how water resource planning and market operations work across northern Australia and identifies practical improvements to the operating model. It moves from the shared planning process through jurisdiction-specific approaches to licensing, bulk water operations, and partnership models that influence trading and delivery.

How Water Sharing Plans Are Made

Water sharing plans are developed through a collaborative, government-led process that combines stakeholder engagement and technical analysis. The process moves through initial scoping, stakeholder consultation, hydrological and environmental modelling, plan drafting, public exhibition, finalisation, and implementation through licensing, compliance, and ongoing review. Table 9 sets out the key steps.

Table 9: Water Sharing Plan Process

Step	Description
Initial water planning	Government scopes objectives, boundaries and stakeholders for a water plan
Stakeholder engagement	Consultation and negotiation with Indigenous communities, agencies, environmental groups and irrigators to surface values and options
Technical analysis	Hydrological modelling, environmental assessments and climate change analysis inform water availability and ecological values
Drafting the water plan	Clear rules are set for environmental, domestic, agricultural, industrial, Indigenous and other uses
Public exhibition	The draft water plan is exhibited for submissions and feedback
Finalisation	The water plan is approved by the State Government with changes reflecting submissions
Implementation	Licensing, compliance and ongoing engagement are used to deliver and operate the water plan

Jurisdictional Summaries

Queensland

Queensland allocates water through state-granted water entitlements owned in perpetuity, specifying how much can be taken from a resource, supported by water plans reviewed on a ten-year cycle. The allocation process sets water sharing rules, issues water entitlements, announces annual availability, decides on applications for unallocated water through expression of interest processes, and allows trading, with monitoring and public reporting to ensure sustainable use.

Queensland's Resource Operations Licence (ROL) framework authorises Water Operators to interfere with water and distribute it to entitlement holders. ROL holders include Sunwater (which operates multiple bulk supply schemes including Burdekin Haughton, Mareeba-Dimbulah, and Lower Mary), Seqwater (operating seven supplemented water supply schemes in south-east

Queensland), and Cotton Australia, among others. These operators are responsible for water accounting, billing, and compliance reporting under their ROL obligations.

Northern Territory

The Northern Territory develops water allocation plans through the Department of Environment, Parks and Water Security, allocating entitlements via licences or permits on a first-in-first-served basis, balancing availability, user needs, and environmental sustainability under the Water Act 1992 and Water Regulations 2018. Water allocations are not owned in perpetuity generally for ten years only creating uncertainty about water security compared with other jurisdictions.

The Territory's whole-of-government Water Strategy prioritises safe drinking water, sustainable development, efficiency, good governance, environmental and cultural protection, and climate resilience. ROL holders in the NT include the Power and Water Corporation, and the Town Councils of Katherine, Alice Springs, and Darwin.

Western Australia

Western Australia manages allocation through licences and permits under the Rights in Water and Irrigation Act 1914. The Department of Water and Environmental Regulation assesses applications within Water Resource Management Units (WRMUs), with trading more likely as systems approach full allocation. The Ord River Surface Water Plan, with a 101 GL storage, sets reliability at full allocations in 95 years out of 100, and a Kimberley regional plan is under development.

Jurisdictional Comparison

Table 10: Allocation and Trading at a Glance

Aspect	Queensland	Northern Territory	Western Australia
Planning authority	DRDMW with stakeholder consultation and ten-year reviews	Department of Environment, Parks and Water Security with consultative plans	DWER manages licences and WRMUs
Allocation model	Entitlements with annual announcements and trading, monitoring and reporting	Licences or permits based on availability, needs and sustainability	Licences and permits, generally “first-come, first serve” basis with priority to existing users
Perpetuity of rights	In perpetuity	Time-limited (typically ten years), creating investment uncertainty	Not perpetual in all cases; subject to plan and licence conditions
Trading boundaries	Within and between zones, subject to plan rules	Within declared plan areas where plan guidelines permit	Within WRMUs that align with basins or aquifers

Partnerships that Support Operating Model Improvements

Indigenous partnerships blend Traditional Owner knowledge with contemporary land and water management to strengthen planning and engagement on Country. Examples include the Kuku Nyungkal People's management plan, Girringun Aboriginal Corporation submissions, and Bana Yarralji Bubu Inc. research partnerships, which collectively demonstrate the mechanisms available to include Traditional Owner governance in operating model design.

Government-irrigator partnerships support efficiency and compliance outcomes at scale. The Water for Profit program, delivered through CSIRO and universities, supports irrigators in the Murray-Darling Basin through on-farm assessments, training, and grants demonstrating the value of structured capability programs for market adoption. The Healthy Rivers to Reef Partnership demonstrates collaborative governance across government, industry, and community in Queensland's Great Barrier Reef catchment, a model relevant to the design of northern water market governance structures.

4: A Place-Based Governance Model

Introduction

This section examines what place-based governance means for water management in northern Australia and why it is the appropriate model for water markets in the region. It draws on peer-reviewed research, international benchmarks, and Queensland case studies to show how place-based approaches translate principles into operational practice.

What Place-Based Means in Practice

A place-based approach to water resources manages each region on its own terms by considering local environmental, social, and economic factors, and the interdependence of resources across the landscape. It emphasises engaging and empowering local stakeholders, making use of local and traditional knowledge, and coordinating actions across government and community to achieve sustainable outcomes. Table 11 sets out the core components.

Table 11: Core Components of Place-Based Water Governance

Component	What Place-Based Means in Practice
Integration of multiple water resources	Manage connected surface and groundwater so actions in one part of the system do not undermine outcomes elsewhere
Community involvement	Engage local communities to surface needs and perspectives and incorporate them in decisions
Local and traditional knowledge	Incorporate Indigenous knowledge systems and ecological science to ground decisions in place
Sustainable management practices	Plan for long-term environmental protection, economic development and community wellbeing
Coordination and collaboration	Align government tiers, private sector and communities to deliver integrated strategies
Stakeholder empowerment	Involve residents, businesses, nonprofits and agencies in planning and decisions
Shared vision and plan	Develop a vision and strategy that reflects community aspirations
Monitor, evaluate and adapt	Track progress and adjust based on evidence

What the Research Says

Peer-reviewed studies find that place-based water governance integrates environmental, economic, social, and cultural factors; strengthens engagement; and supports adaptive, participatory management at catchment scale. Success depends on political will, adequate resourcing, multi-level coordination, and active attention to equity and power asymmetries.

Research highlights that integrating scientific, Indigenous and local knowledge into place-based governance can strengthen collaboration and engagement, although implementation is often constrained by factors such as limited resources, institutional fragmentation and competing

stakeholder interests. Allouche, Middleton, and Gyawali (2019) identify catchments as a natural unit for governance and social cohesion, enabling adaptive and participatory management, but requiring political commitment and attention to justice and equity.

Australia's Landcare movement demonstrates this approach at national scale, mobilising communities with government, researchers, and industry to manage natural resources and influence policy – a model that has strong application in water governance design for the north.

Global Benchmarks

Table 12: Global Place-Based Governance Benchmarks

Program	Primary Goal	Core Actions	Relevance to the North
Room for the River, Netherlands	Reduce flood risk along the Rhine and tributaries	Create floodplains, remove levees, relocate infrastructure to increase flow capacity	Aligns land use with hydrology to reduce risk applicable to floodplain management in northern catchments
Working for Water, South Africa	Protect catchments by controlling invasive plants	Clear invasives, rehabilitate ecosystems, create local employment	Links ecological outcomes with social benefits relevant to Indigenous employment and land management
Stockholm Royal Seaport, Sweden	Reduce consumption and improve water quality in urban setting	Green roofs, rain gardens, stormwater harvesting	Demonstrates urban water sensitive design applicable to Darwin and other northern urban centres
Healthy Rivers to Reef, Australia	Improve Great Barrier Reef catchment health	Place-based management of land use impacts on water quality	Direct model for Queensland regional partnerships and catchment governance

Queensland Case Studies

The Fitzroy Partnership for River Health, established in 2013, brings together more than 30 organisations to monitor, evaluate, and report on river and catchment health in the Fitzroy Basin. It collects and analyses indicators covering water quality, fish populations, and vegetation, publishes results via an online dashboard, and reports improvements in runoff, habitats, and community awareness. It demonstrates the value of multi-organisational data collaboration in a catchment governance context.

The Healthy Rivers to Reef Partnership coordinates activities across the Great Barrier Reef catchment. It combines water quality monitoring, ecosystem restoration, and community engagement, supporting programs such as Reef Rescue to help thousands of farmers reduce nutrient and sediment runoff. Its governance, a steering committee and secretariat at Griffith University, funded by both governments, the private sector, and philanthropy provides a working model for the kind of cross-sector, place-based governance the north's water markets will require.

Why Place-Based Governance Matters for Water Markets

Catchments provide a natural hydrological unit that supports social cohesion and collaboration. Water can only move between predefined zones as determined by each Water Plan it is inherently place-bound. Governance arrangements that respect this geography and that integrate different knowledge systems will produce more durable and trusted water markets than those that do not.

For northern Australia, this means that water market design cannot be separated from community design. The governance frameworks that determine who get to participate, whose knowledge shapes the rules, and how disputes are resolved will be as important to market performance as the technology that records and executes trades. Place-based governance is not a constraint on market efficiency rather it is the precondition for it.

A Digital Infrastructure Layer for Place-Based Transformation

During the delivery of the project, Acclimate Partners (formerly Inclusive Growth Partners) proposed to design and develop a place-based governance model for multi-stakeholder decision making – Placelink® - a digital infrastructure investment and governance platform.

The objective of the pilot was to test the Placelink® methodology and technology platform design to support multi-beneficial water planning. Through this approach, the platform was intended to provide water planners with a structured framework for considering catchment-scale environmental, social, economic and Traditional Owner outcomes alongside water accounting information, enabling more informed and transparent planning decisions.

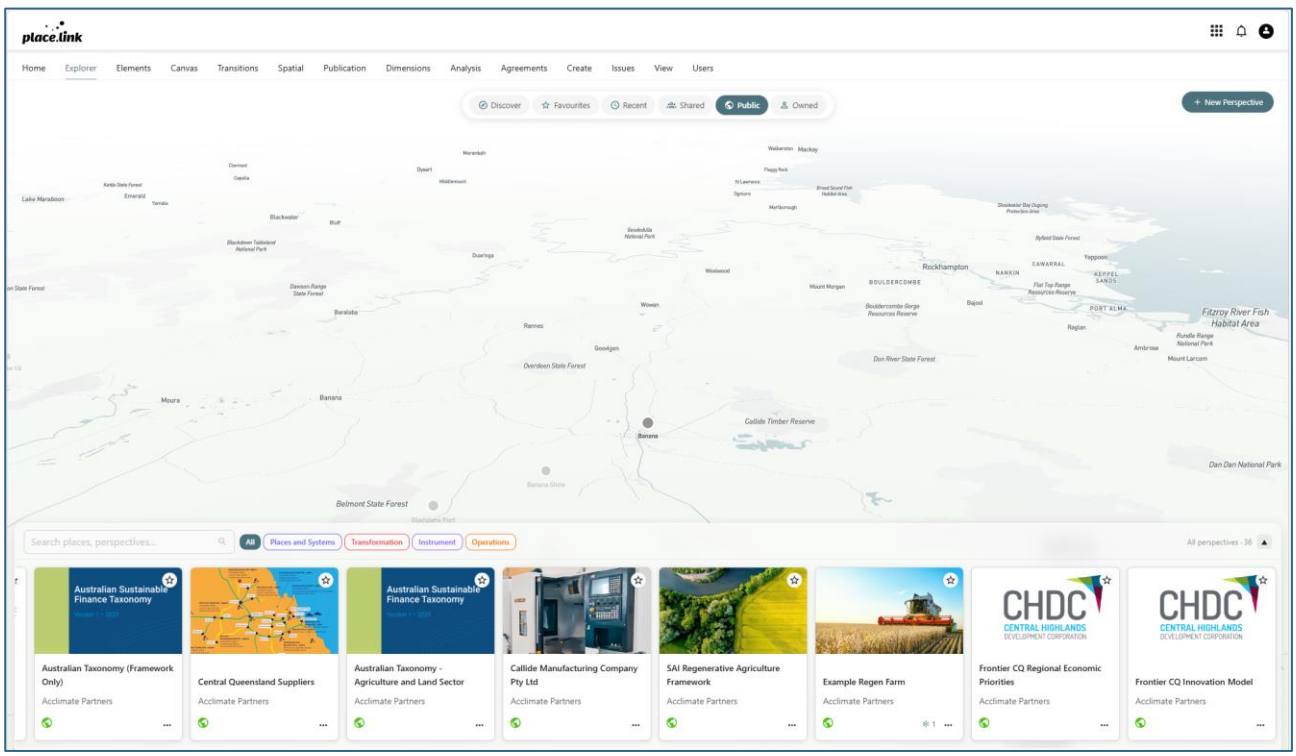


Figure 2: Placelink for Place-Based Transformation

5: Piloting Water Ledger with a Queensland Bulk Water Operator

Introduction

This section presents the Water Ledger water accounting system pilot delivered with Seqwater across two water supply schemes in the Lockyer Valley in southeast Queensland. It was the primary practical contribution of this project and the operational test of the project's central hypothesis: that water accounting must be accurate, timely, and defensible before water market digital infrastructure can be scaled across northern Australia.

The originally proposed pilot site was the Atherton Tablelands in Far North Queensland. Limited engagement with the Water Operator and regulator in that region during the project's delivery period meant that a southeastern Queensland pilot with Seqwater was pursued instead, with the understanding that the resulting system and learnings would be available to the Atherton Tablelands on completion, while remaining within the same Queensland statutory context.

Pilot Context: Seqwater and the Lockyer Valley Schemes

In September 2021, Seqwater selected Civic Ledger through WaterStart's Innovation Request for Proposal process to deliver a consistent, automated solution for managing irrigation water accounting. Seqwater, operating as the Queensland Bulk Water Supplier, supplies raw agricultural water to approximately 1,200 irrigation and commercial customers across seven supplemented water supply schemes in southeast Queensland.

The pilot was scoped around two schemes: the Central Lockyer Valley Water Supply Scheme and the Lower Lockyer Valley Water Supply Scheme, together serving approximately 500 customers. The Central Lockyer scheme is unique as Seqwater's only groundwater recharge scheme. These schemes were deliberately chosen for their complexity, to ensure that the resulting system could scale to additional schemes with minimal further development.

The complex scheme characteristics incorporated into the pilot included three allocation types (surface water, groundwater, and pipeline); four priority groups (high, two medium, and low reliability); additional authorisation types including stock watering, domestic allowances, high-flow water harvesting, and unsupplemented licences; forward draw arrangements allowing customers to draw against future allocations; permanent and temporary water trading; legacy contractual arrangements; and variable pricing structures including two-part, four-part, and fixed pricing tariffs.

Once the pilot commenced in late May 2022, WaterStart managed the Tripartite Agreement and governance. The pilot was successfully delivered in late 2023.

The Problem: Legacy Spreadsheet-Based Accounting

Seqwater's legacy water accounting methods relied on interconnected Excel spreadsheets editable by key personnel, with no controls or audit logs, requiring expert manual synthesis by the Customer and Irrigation Team. The specific characteristics of the legacy environment are set out below.

- Manual entry of allocation announcements into spreadsheets
- Manual ingestion of meter reads
- Reconciliation across multiple workbook versions
- Manual preparation of billing outputs
- Manual compilation of regulatory reports
- No direct visibility of water accounting data for customers

Control risks included version conflicts, formula errors, delayed detection of anomalies, and limited audit traceability. This increased the risk of errors and potential misuse, slowed responses to customer enquiries, and made compliance reporting largely manual and onerous. The system was no longer fit for purpose.

The Solution: Water Ledger Water Accounting System

The implementation followed a co-design model between Seqwater and Civic Ledger, proceeding through process mapping of legacy workflows, definition of the ledger object model, configuration of business rules, iterative build and internal testing, and user acceptance testing with scheme administrators.

The Water Ledger platform digitises core water accounting objects and events at protocol level. Water balances, water meters, offtakes, allocation classes, and transaction events are represented as native ledger objects – not merely database records, but structured, stateful entities governed by embedded rules that are digitally written into every litre of water. This is what the project calls dynamic water accounting, in contrast to the linear, retrospective nature of spreadsheet-based systems.

The core protocol-level objects in the water accounting system are:

- Account (representing the allocation holder)
- Allocation Class (defining water product characteristics)
- Water Balance (a stateful token linked to an account and class)
- Meter Object (representing the authorised offtake point)
- Allocation Announcement Event
- Usage Event (derived from validated meter reads) and
- Adjustment Event (for corrections or approved amendments)

Balances are derived deterministically from protocol-governed events. The core balance equation is Balance(t) = Balance(t-1) + Allocation − Usage + Adjustment. Because balances are derived from events rather than directly edited, the system prevents unauthorised state changes and provides verifiable audit history across all allocation movements.

Critically, the protocol rules are not hard coded into the platform's codebase. They are separated as configurable rule packs, allowing them to be updated as Water Plans are reviewed or amended without rebuilding the system. This architecture eliminates the 'technology debt' concern that has historically made Water Operators reluctant to invest in digital accounting systems.

Data Ingestion and Validation

Meter data enters the system through automated ingestion from telemetry systems (the future state, with IP addresses established but automation not yet initiated) or bulk manual upload (the current operational state). Validation rules applied at ingestion include range checks against historical usage, duplicate detection, account allocation sufficiency checks, and mandatory field validation. Exceptions are flagged for administrator review before ledger posting, enabling the Customer and Irrigation Team to take proactive action before breaches occur reducing instances of customers exceeding their water balance and facing potential reporting to the regulator.

Results

The results of the pilot are the most compelling evidence in this report. Table 13 presents the before-and-after comparison on the three key performance dimensions measured by Seqwater.

Table 13: Seqwater Pilot - Before and After

Task	Before (Legacy Spreadsheets)	After (Water Ledger Platform)
Quarterly regulatory reporting	One FTE for three weeks to compile six regulatory reports every quarter	Less than ten minutes with regulator-format export generated directly from the ledger
Quarterly bulk meter reads	Six weeks to enter reads and issue statements mid-quarter	Less than five minutes with real-time account updates; operator timing reached under two minutes
Customer visibility and audit	No real-time view of account balances; higher risk of overuse	Instant audit log visible to Seqwater and customers via shared public ledger view

These results were achieved under real regulatory conditions, on two complex schemes, with real customers and live water data. They are not projections or estimates – they are measured operational outcomes from a completed pilot.

Functional Features Confirmed

Table 14: Confirmed Functional Features

Feature Group	Description
Customer access and visibility	Customers, Seqwater and regulators can securely view allocation account data including current balances, usage, permanent transfers and seasonal assignments
Meter reads and balances	Customers can enter manual reads that update balances through self-assertion; Seqwater can bulk-import reads via automated or manual mechanisms with usage calculated and balances updated
Usage types	Different water use types (allocation, harvesting) can be recorded, with rules on whether they affect balances
Transfers	Permanent transfers and movements of wet water balances, including partial transfers, are recorded with positive and negative transactions between accounts
Allocation announcements	Water Operators can automate and apply allocation announcements at the start and during the year as a percentage of nominal volume, with balances resetting at year close

Terminology Mapping: Enabling Scale Across the North

A key output of the Seqwater pilot was the development of a terminology mapping framework that translates jurisdiction-specific Water Operator language into the Water Ledger platform's underlying data architecture.

This mapping is the technical foundation for scaling the platform across schemes and jurisdictions without requiring legal or regulatory harmonisation. Table 15 presents the key mappings developed during the pilot.

Table 15: Water Operator to Water Ledger Terminology

Water Operator Term	Source Definition	Water Ledger Term
Zone	Atomic geographic unit for water resources management (e.g., MVP, CLGW02)	Level 0 Water Resource System (WRS)
Scheme	Collection of zones (e.g., Central Lockyer Water Supply Scheme)	Level 1 WRS (See Figure 3)
Water Plan	Legislative instrument setting rules for a defined area (e.g., Moreton Water Plan)	Level 2 WRS
Resource Operations Licence (ROL)	Legal authority responsible for a scheme or zone under relevant legislation	Polestar Wallet
Allocation	Volume of physical water received by a water user in respect of an entitlement or licence	H2Water
Allocation announcement	Declaration defining how much water can be extracted against an entitlement in a given water year	Water Exchange Rate
Water use and category	Beneficial use and category such as agriculture, industrial, public water supply	Water Class and Water Class Category

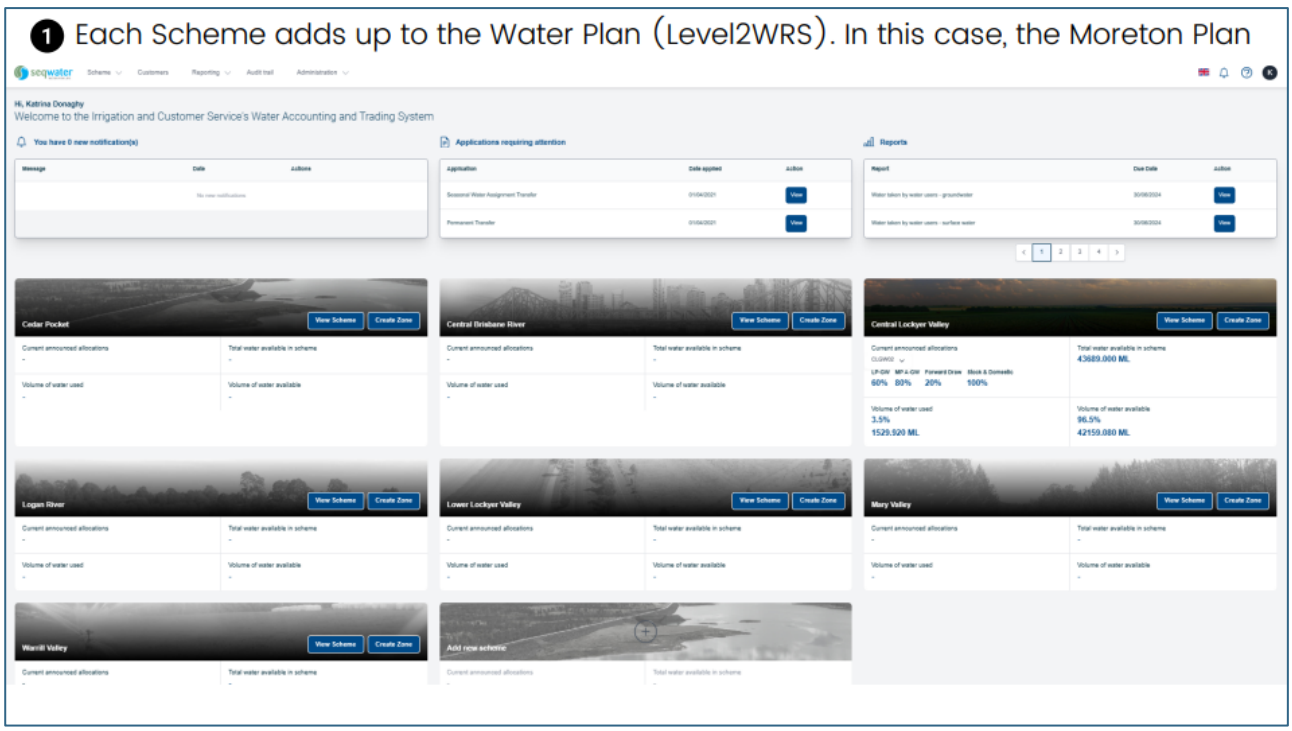


Figure 3: Scheme Level Water Accounting

This mapping framework creates a stable, machine-readable architecture that allows the Water Ledger platform to apply the same core workflows while honouring local rules, dates, loss factors, and priority classes. The result is faster configuration of new schemes, lower integration cost, simpler training for Water Operators, and frictionless onboarding of new irrigation customers.

When transactions and balances across multiple schemes are recorded against the same object model, regulators gain comparable indicators across jurisdictions – and customers can read their balances without needing scheme-specific jargon as shown in Figure 4 below.

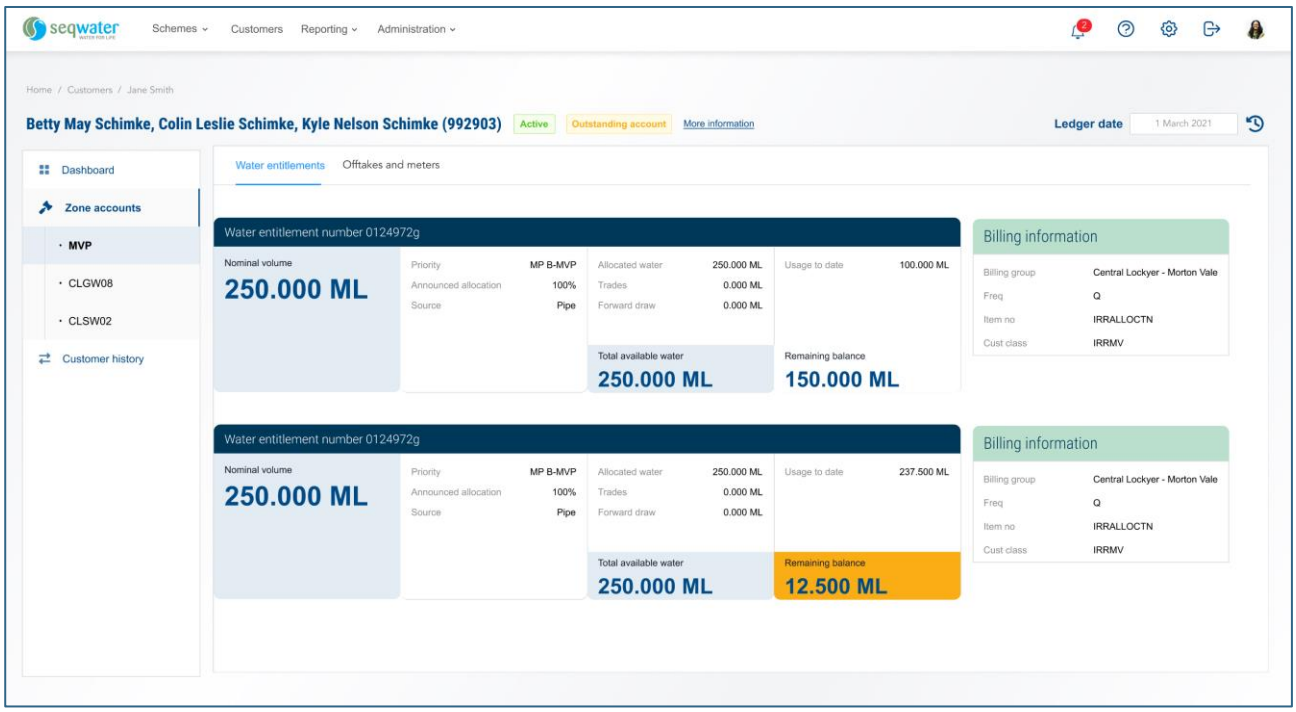


Figure 4: Customer Level Water Accounting

Why This Pilot Matters for the Whole North

The Seqwater pilot matters beyond southeast Queensland for three reasons.

First, it provides the operational proof not just design intent that a Water Operator-grade water accounting system can be deployed, adopted, and sustained under real regulatory conditions. The measurable results across reporting, meter reads, and customer visibility are replicable. The architecture and rule packs developed for Seqwater provide the foundation for the Atherton Tablelands and any other scheme in northern Australia that is ready to transition.

Second, it demonstrates that the connection between water accounting and water markets is real and direct. The Murray-Darling Basin experience shows that when Water Operator accounting is opaque and unreliable, water markets malfunction. The ACCC's Inquiry into the Basin's water markets did not fully address this connection. This pilot closes that gap. The question for northern Australia is whether it wants to replicate the Basin's approach by allowing markets to develop on top of inadequate accounting infrastructure or set a higher standard from the outset.

Third, it shows that the technology debt concern can be resolved. Water Plan rules are separated from the platform's core code, meaning they can be updated as plans are reviewed without rebuilding the system. This removes a persistent barrier to investment in water accounting technology across the sector.

Indicators for Transparency, Assurance and Adoption

The project proposes six indicators to track the performance and adoption of water accounting and market systems across the north. These indicators set out in Table 16 should be adopted as the basis for the monitoring framework as set out in the report's Strategic Recommendations.

Table 16: Indicators for Transparency, Assurance and Adoption

Indicator	Definition	Insight it Provides
Settlement time	Median days from trade capture to settlement	Speed and predictability of the market process
Dispute rate	Share of trades entering dispute states	Quality of pre-trade checks and rule clarity
Announcement timeliness	Time from water allocation announcement to publication	Discipline of operator processes and transparency; addresses perceived market manipulation
Adoption	Share of irrigators on the platform and their active use	Network strength and user confidence
Reporting time	Minutes to produce quarterly regulator reporting requirements	Efficiency and assurance gains from Water Operator-grade accounting
Sentiment	Net positive responses in quarterly surveys	User trust and experience across the water market

6: Strategic Recommendations

The following five strategic recommendations are drawn directly from the key findings presented in this report. Table 17 presents in order of dependency whereby each recommendation creates the conditions for those that follow. Together they form a staged program, not a parallel set of independent actions.

Table 17: Strategic Recommendations

Key Priority Actions for Sector Development	Action Owner and Key Partners	Pathways to Implementation and Timeline	Intended Industry Impacts
1. Establish a Water Operator Accounting Standard for Northern Australia Develop and publish a minimum standard for Water Operator-grade water accounting across the north's regulated irrigation schemes, based on the three-gates framework in this report. The standard must specify requirements for reconciliation accuracy, announcement timeliness, meter read processing, and automated pre-trade rule checking. This standard is the precondition for all subsequent water market development.	Owner: DRDMW, DEPW and DWER jointly Key partners: • CRCNA (cross-jurisdictional facilitation) • Civic Ledger (technical specification) • Water Operators across all three jurisdictions	Convene cross-jurisdictional working group within 6 months. Publish consultation draft within 12 months. Finalise and adopt standard within 18 months. 3-year implementation horizon for regulated schemes across the north. Draw on three-gates framework and Seqwater results as evidentiary basis.	Clear benchmark for Water Operator readiness that investors, regulators and growers can rely on. Reduces risk of replicating Murray-Darling Basin market failures. Supports GDP growth in irrigated agriculture by reducing investment uncertainty. Creates precondition for active, trusted water markets across the north.
2. Fund and Deliver a Staged Rollout of Water Operator-Grade Accounting Across Northern Schemes Using the Seqwater pilot as the proven foundation, develop a funded, staged program to deploy the Water Ledger platform across additional regulated	Owner: Civic Ledger (platform provider and delivery lead) Key partners: • Individual Water Operators (scheme-level owners)	Commence Atherton Tablelands scoping within 3 months. Deliver first northern deployment within 12–18 months.	Regulatory reporting reduced from 3 weeks to 10 minutes (replicating Seqwater results). Meter read processing from 6 weeks to under 5 minutes.

Key Priority Actions for Sector Development	Action Owner and Key Partners	Pathways to Implementation and Timeline	Intended Industry Impacts
irrigation schemes in northern Australia beginning with the Atherton Tablelands and extending progressively to schemes in the NT and WA.	• DRDMW, DEPW, DWER (regulatory counterparts) • CRCNA (program coordinator and part-funder) • FNQ Growers (grower engagement)	Publish before-and-after results for each deployment using the 6 indicators in this report. Full northern rollout: 3–5 years, subject to funding and Water Operator readiness.	Improved customer transparency and regulatory compliance. Attracts private investment by demonstrating accurate, auditable, real-time water accounts. Supports productivity growth and job creation in irrigated agriculture.
3. Establish a Cross-Jurisdictional Water Market Governance Framework for the North Develop a collaborative governance framework jointly owned by QLD, NT and WA defining shared data standards, terminology mappings, and interoperability requirements. The framework must respect jurisdictional differences while enabling a common digital infrastructure. The terminology mapping from this project provides the technical starting point. Traditional Owner bodies must be co-designers.	Owner: National Water Grid Authority Key partners: • DRDMW, DEPW and DWER (joint state and territory owners) • CRCNA (research facilitator) • Civic Ledger (technical contributor) • Water Operators across all three jurisdictions • Traditional Owner representative bodies (governance co-designers)	Initiate cross-jurisdictional governance design process within 6 months. Adopt terminology mapping from this project as working draft for data standards. Conduct structured consultation within 12 months. Publish framework within 24 months with provision for regular review as Water Plans are updated.	Creates institutional precondition for cross-scheme and cross-border water trading. Reduces duplication and cost in platform configuration across jurisdictions. Positions northern Australia as a coherent, investable water market jurisdiction. Supports Traditional Owner participation in governance and market design. Enables northern Australia to demonstrate best-practice governance to ASEAN trading partners.
4. Design and Deliver a Grower-Led Water Market Education and Capability Program Develop and deliver a structured education program for growers,	Owner: FNQ Growers and equivalent industry bodies Key partners: • Acclimate Partners (place-based engagement design)	Commence program design within 6 months in parallel with platform rollout. Pilot with FNQ Growers in the Atherton Tablelands in year 1.	Increases water market participation rates among growers and small water users. Addresses word-of-mouth price discovery problem identified in MDWSS pilot.

Key Priority Actions for Sector Development	Action Owner and Key Partners	Pathways to Implementation and Timeline	Intended Industry Impacts
Traditional Owner groups and small water users across the north. The program must be grower-led in design, use plain-English materials, and be delivered through trusted local channels. It must explicitly address the needs of smaller water users and Indigenous water holders, for whom information asymmetry is the primary barrier to participation.	• CRCNA (funder and coordinator) • State agricultural extension networks • NRM bodies (regional delivery) • Civic Ledger (platform training materials) • Traditional Owner land and sea councils (co-designers for Indigenous content)	Evaluate and refine after year 1. Expand to NT and WA in years 2-3, adapted to local conditions. Publish reach and feedback annually as part of monitoring framework.	Reduces information asymmetry that advantages well-resourced intermediaries. Supports equitable access for Traditional Owners and smaller growers. Builds community trust that underpins long-term market liquidity.
5. Adopt and Publicly Report a Monitoring and Evaluation Framework for Northern Australia's Water Market Development Formally adopt the six performance indicators in this report - settlement time, dispute rate, announcement timeliness, platform adoption, regulatory reporting time, and user sentiment - as the basis for a mandatory, publicly reported monitoring framework. Baseline measurements must be established at each scheme as it transitions to a Water Operator-grade accounting system.	Owner: CRCNA Key partners: • DRDMW, DEPW and DWER (primary reporting entities) • Individual Water Operators (data providers) • Civic Ledger (platform generating indicator data) • CRCNA research partners (independent analysis and verification) • National Water Grid Authority (Commonwealth oversight)	Adopt the 6 indicators and measurement definitions within 6 months. Establish baselines for each scheme as it comes onto the platform. Publish first annual monitoring report within 18 months covering all operational schemes. Expand reporting progressively as rollout proceeds. Make all monitoring data publicly accessible.	Creates public accountability in northern Australia's water market development for the first time. Provides investors and growers with confidence signals - settlement speed, dispute rates, adoption levels. Generates longitudinal evidence base for ongoing policy refinement and regulatory review. Demonstrates measurable returns on water market investment to CRCNA and government partners. Addresses Murray-Darling Basin lesson that opaque markets breed mistrust.

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