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Forging Futures Companion Report

Companion to

Forging Futures: Indigenous Nations Information and Place Tracing through Cutting-Edge Science and Collaboration

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Citation

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Relationship to the Final Report

This Companion Report records the conceptual development, technical reasoning, design decisions and reflective observations that informed the research project. It is intended to complement the Final Report by documenting the evolution of ideas, engineering decisions and implementation considerations from the perspective of the project originator.

The Companion Report should be read alongside the Final Report. Where differences of emphasis occur, the Final Report remains the authoritative record of the completed research, while this Companion Report records the intellectual and technical journey that led to those outcomes.

Table of Contents

Title Page

Citation

Author's Note

Executive Reflection *(Companion to Final Report: Executive Summary)*

1. Introduction *(Companion to Final Report: Section 1 – Introduction)*

1.1 Purpose of the Companion Report *(Related to Final Report Section 1.1 – Purpose)*
1.2 The Origin of the Research *(Related to Final Report Section 1.2 – Background)*
1.3 The Problem Before the Project *(Related to Final Report Section 1.4 – Problem Statement)*
1.4 Working with CSIRO *(Related to Final Report Sections 1–5)*
1.5 Reflections on Governance *(Related to Final Report Section 1.5 – Governance Implemented: ICIP and IDG)*
1.6 Reading this Companion Report *(Related to Final Report Section 1.6 – Report Structure)*

2. Developing the System *(Companion to Final Report: Section 2 – System Requirements and Design)*

2.1 The Engineering Problem
2.2 Development of the Australian Indigenous Nations Index (AUIN) namespace Framework *(Related to Final Report Section 2.3 – Indigenous Nations Boundary and Coordinate System)*
2.3 Development of the Ten Universals *(Related to Final Report Section 2.3 – Indigenous Nations Boundary and Coordinate System)*
2.4 Development of the Indigenous Jurisdictional Framework *(Related to Final Report Sections 2.2–2.3)*
2.5 Building the Digital Boundary Apparatus *(Related to Final Report Section 2.3 – Indigenous Nations Boundary and Coordinate System)*
2.6 Working Within Australia's Geospatial Infrastructure *(Related to Final Report Section 2 – System Requirements and Design)*
2.7 Reflections on System Design

3. Prototype Development *(Companion to Final Report: Section 3 – UI Design and Generative UI)*

3.1 Working with the CSIRO Team
3.2 Translating Concept into Prototype
3.3 Evolution of the User Experience

3.4 Engineering Decisions
3.5 Reflections on the Prototype

4. Blockchain and Digital Infrastructure ***(Companion to Final Report: Section 4 – Blockchain-based Token Architecture for ESG Contribution Incentivisation in INITS)***

4.1 Why Blockchain
4.2 Building the Data Hierarchy
4.3 ESG and Jurisdiction
4.4 Reflections on Digital Infrastructure

5. Looking Forward ***(Companion to Final Report: Section 5 – Potential Social and Economic Impacts)***

5.1 The Future of Australian Indigenous Nations Index (AUIN)
5.2 Australia's Digital Infrastructure
5.3 Lessons from the Project
5.4 Personal Reflections

References

Appendices

Acknowledgment of Country

Dr Mark McMillan and Bundyi Girri Consulting acknowledge the continuing sovereignty of all Country and First Peoples across the unceded territories, waters and life ways of what is now known as Australia.

In ongoing practices of "sovereignty never ceded," we pay our respects to the Ancestors and Elders, past and present, whose responsibilities to Country — since time immemorial — continue.

This acknowledgement is not included as a formality. It is the foundation upon which this Companion Report, and indeed the research itself, has been undertaken.

Throughout this project I have approached digital systems from the position that every geographic coordinate exists on Country. The work presented in both the Final Report and this Companion Report proceeds from that understanding. The objective has never been to alter or replace Australia's digital infrastructure, but to explore how that infrastructure can mature by recognising the enduring jurisdictional relationships that already exist across Country.

As an Aboriginal researcher, this project represents more than a technical exercise. It reflects a professional and cultural responsibility to ensure that emerging digital infrastructure is capable of representing Indigenous jurisdiction with the same technical rigour afforded to other authoritative geospatial datasets. It is my hope that this work contributes to a future in which Australia's digital systems are strengthened through the respectful recognition of the oldest continuing jurisdictions on earth.

Author's Note

This Companion Report accompanies the CSIRO Final Report, *Forging Futures: Indigenous Nations Information and Place Tracing through Cutting-Edge Science and Collaboration*. While the Final Report documents the completed research, technical architecture and prototype outcomes, this Companion Report records the conceptual, technical and collaborative journey that led to those outcomes.

Research is rarely linear. Ideas emerge through observation, experimentation, dialogue and refinement. Formal research reports necessarily focus on methodology, evidence and findings, leaving little opportunity to document the evolution of concepts, the engineering decisions that shaped them, or the relationships through which they were developed. This Companion Report seeks to record that journey.

My contribution to this project was informed by a lifetime of lived experience as a Wiradjuri man and by a professional career spanning law, higher education, Indigenous governance and nation-building. These experiences shaped the way I approached the research from its inception. Rather than requiring Indigenous sovereignty to be conceptualised during the project, I was able to draw upon established scholarship, professional practice and lived experience to examine how those principles could be expressed within Australia's emerging digital infrastructure.

This perspective allowed the research to move beyond questions of whether Indigenous jurisdiction should be represented within digital systems and instead focus on how such representation could be achieved using Australia's existing geospatial standards, engineering principles and digital infrastructure. The work therefore became one of recognising the capabilities that already existed within Australia's digital ecosystem and developing the mechanism through which Indigenous jurisdiction could participate as an authoritative and interoperable component of that infrastructure.

The project also became an exercise in demonstrating what respectful collaboration between Indigenous and non-Indigenous researchers can look like in practice. Rather than treating Indigenous sovereignty as an abstract principle or a governance requirement alone, the research required it to be lived throughout the project itself. This demanded relationships founded on mutual respect, intellectual generosity, professional trust and a willingness to engage with different knowledge traditions while maintaining the integrity of each.

In this sense, the collaboration became more than a means of producing a technical outcome. It represented an emerging practice of working together within a sovereign relationship. Indigenous leadership and non-Indigenous scientific expertise were not positioned in competition, nor was one expected to assimilate into the other. Instead, the project demonstrated that each could retain its own integrity while contributing to a

shared endeavour. That experience is, in my view, one of the most significant outcomes of the project.

Accordingly, this Companion Report documents two parallel developments. The first is the development of a technical mechanism capable of supporting Indigenous jurisdiction within Australia's existing digital infrastructure. The second is the development of a collaborative research practice in which sovereignty was not merely acknowledged but enacted through the way the work itself was conceived, undertaken and delivered.

The Final Report should remain the authoritative account of the completed research. This Companion Report is intended to complement that work by recording the questions, decisions, relationships and reflections that shaped its development. Together, the two documents present not only what was achieved, but how those achievements came into being.

Executive Reflection

(Companion to Final Report: Executive Summary)

The Executive Summary of the Final Report presents the completed outcomes of this research. This Companion Report reflects upon the journey that led to those outcomes, the ideas that emerged throughout the project, and the questions that ultimately reshaped my understanding of Australia's digital infrastructure.

The project began with a practical question: how can Indigenous foods be traced through contemporary supply chains without losing their enduring relationship to the Indigenous Nations from which they originate? Existing traceability systems could identify products, ingredients, producers, logistics and destinations. They could answer where products had been grown, processed and transported. What they could not readily answer was the more fundamental question: on whose Country did these activities occur?

As the research progressed, it became clear that this was not only a question about food provenance. Provenance could not be separated from jurisdiction. If Indigenous Nation were to become the enduring point of reference for tracing foods, products, routes and contributions, then the research first needed to determine whether Australia's digital infrastructure possessed the capacity to make Indigenous jurisdiction visible in a persistent, authoritative and interoperable way.

From the beginning, I did not approach this research from the perspective that Indigenous jurisdiction needed to be created or inserted into Australia's digital infrastructure. Indigenous jurisdiction has always existed. It is the most enduring and persistent jurisdiction on the Australian continent. The challenge was never one of existence; it was one of digital representation.

Australia's digital infrastructure has matured over many decades through the development of authoritative datasets, administrative boundaries, geospatial standards and interoperable technologies. These developments enabled Commonwealth, State and Territory, Local Government and other jurisdictional frameworks to become visible as interoperable layers within contemporary geospatial systems. Indigenous jurisdiction, however, remained ever-present but digitally invisible: not because it was absent, but because no equivalent digital mechanism had been developed through which its coexistence with other jurisdictions could be represented.

From its inception, the project was also funded and conceived around the use of contemporary digital technologies. Dynamic user interfaces, adaptive user experiences, generative artificial intelligence and blockchain technologies were not later additions to the research. They were central to the project's technological foundation. Each technology addressed a different aspect of the problem: how

stakeholders might interact with complex information, how systems might adapt to authority and context, how AI might support discovery and explanation, and how blockchain could support provenance, auditability and trusted contribution records.

The significance of the project therefore lies not in the creation of a new digital infrastructure, but in demonstrating that Australia's existing digital infrastructure already possessed the capacity to accommodate the enduring coexistence of Indigenous jurisdiction. The research developed the mechanism through which that coexistence could become visible, persistent and interoperable while operating within the engineering principles, standards and governance practices that already underpin Australia's national geospatial infrastructure.

Equally significant was the manner in which the research itself was undertaken. Throughout the project, Indigenous and non-Indigenous researchers worked together within a relationship founded upon mutual respect, professional trust and recognition of each other's expertise. Sovereignty was not simply discussed as a theoretical concept or governance principle; it became something practised through the conduct of the research itself. In that respect, the project demonstrated not only a technical proposition, but also an emerging model for collaborative research undertaken within a sovereign relationship.

This Companion Report records that journey. It documents the evolution of the ideas, the engineering reasoning, the collaborative relationships and the practical decisions that informed the Final Report. Together, the two documents present not only the completed research, but also the pathway through which its most significant insights emerged.

1. Introduction

(Companion to Final Report: Section 1 – Introduction)

The Final Report, Forging Futures: Indigenous Nations Information and Place Tracing through Cutting-Edge Science and Collaboration, documents the completed outcomes of an Indigenous-led research project undertaken in collaboration with CSIRO. It presents the project's objectives, methodology, governance framework, technical architecture and research outcomes as a completed body of work.

This Companion Report has a different purpose. Rather than documenting what the project ultimately produced, it records how the project evolved. It captures the questions that emerged, the assumptions that were challenged, the engineering decisions that shaped the work, and the collaborative practices through which the research developed. It provides the context that necessarily sits behind a formal research report but cannot easily be incorporated within it.

The project commenced with a practical research proposition: to investigate how Indigenous ingredients could be traced across contemporary supply chains using emerging digital technologies. From its inception, the research brought together geospatial science, Dynamic User Interfaces (Dynamic UI), Adaptive User Interfaces, Generative Artificial Intelligence (AI), and blockchain technologies within a single research program. These technologies formed the foundation of the funded project and were investigated as complementary components of a governed digital architecture capable of supporting trusted Indigenous provenance.

As the research progressed, however, it became increasingly apparent that the original question could not be answered in isolation. Understanding how Indigenous ingredients move through supply chains required a deeper understanding of the relationship between Indigenous provenance, Indigenous Nation and place. What began as a project concerned with digital traceability progressively evolved into a broader investigation of how Australia's existing digital infrastructure represents place, jurisdiction and authority.

This evolution was neither anticipated nor planned at the commencement of the project. It emerged through the research itself as successive questions revealed opportunities that extended beyond the project's original scope. The Companion Report records that progression. It documents how an investigation into Indigenous ingredient traceability ultimately became an exploration of Australia's digital infrastructure and the engineering mechanisms through which Indigenous jurisdiction might participate within it.

The sections that follow trace that journey. They explain the purpose of this Companion Report, the origins of the research, the conceptual and technical challenges encountered throughout the project, the collaborative relationship with CSIRO, the role of governance in shaping the work, and the progression of ideas that ultimately informed the Final Report. Together, the Final Report and this Companion Report provide both the completed research outcomes and the developmental pathway through which those outcomes were realised.

1.1 Purpose of the Companion Report

(Related to Final Report Section 1.1 – Purpose)

The purpose of this Companion Report is to complement the CSIRO Final Report by documenting the development of the research rather than its completed outcomes. While the Final Report necessarily presents the project as a coherent body of completed research, this Companion Report records the progression of ideas,

engineering decisions, collaborative practices and conceptual developments that shaped the work throughout its evolution.

Formal research reports are designed to communicate methodology, evidence, technical implementation and research findings. By necessity, they present the final form of the research. They rarely capture the succession of questions, observations and emerging insights that influence the direction of a project as it unfolds. Nor do they ordinarily record the discussions, intellectual challenges and practical decisions that ultimately shape the completed research.

This project was no exception. What commenced as an investigation into Indigenous ingredient traceability through contemporary supply chains progressively expanded as new questions emerged. As the research matured, the relationship between Indigenous provenance, place, jurisdiction and Australia's existing digital infrastructure became increasingly central to the investigation. The engineering proposition described in the Final Report therefore developed through an iterative process of questioning, testing and refinement rather than through a predetermined design.

The Companion Report records that progression. It explains why particular engineering pathways were pursued, how concepts evolved, and how the project's technological foundations—including geospatial science, Dynamic User Interfaces (Dynamic UI), Adaptive User Interfaces, Generative Artificial Intelligence (AI) and blockchain technologies—were progressively understood as components of a broader engineering proposition rather than as independent technological solutions.

The Companion Report also records an equally important dimension of the research: the collaborative practice through which the work was undertaken. The project was characterised by an ongoing dialogue between Indigenous and non-Indigenous researchers, where questions of engineering, governance, sovereignty and digital infrastructure were explored through mutual respect, intellectual curiosity and a shared commitment to rigorous research. Many of the project's most significant insights emerged through that collaborative process and, while they informed the Final Report, they could not reasonably be documented within its formal structure.

Accordingly, this Companion Report should be read alongside the Final Report rather than as an alternative to it. The Final Report remains the authoritative record of the completed research. This Companion Report provides the intellectual and developmental context that explains how those outcomes came into existence. Together, the two documents present not only what the project achieved, but also the pathway through which those achievements were realised.

1.2 The Origin of the Research

(Related to Final Report Section 1.2 – Background)

The origins of this research did not begin with the funding of the project, nor with the development of a digital prototype. They began with a practical question arising from Indigenous provenance: **how can Indigenous ingredients be traced through contemporary supply chains while maintaining their enduring relationship to the Indigenous Nation from which they originate?**

At the commencement of the project, this appeared to be a problem of traceability. Existing supply chain systems had matured considerably and were capable of recording products, production processes, logistics, commercial transactions and compliance requirements. Emerging technologies—including geospatial science, Dynamic User Interfaces (Dynamic UI), Adaptive User Interfaces, Generative Artificial Intelligence (AI) and blockchain—offered new opportunities to improve the transparency, accessibility and trustworthiness of those systems. The original proposition of the research was therefore to investigate how these technologies could be brought together to strengthen Indigenous provenance within contemporary supply chains.

As discussions progressed, however, a recurring question continued to emerge: **what exactly was Indigenous provenance referring to?** Conventional approaches frequently understood Indigenous provenance through Indigenous peoples, cultural knowledge or community participation. While each of these perspectives remains important, they did not fully explain the enduring relationship that the research was attempting to represent.

This question progressively reshaped the project. Rather than beginning with Indigenous people as the primary point of reference, the research began to consider **Indigenous Nation through place**. Indigenous ingredients do not become Indigenous because they are merely associated with Indigenous people. Their provenance arises because they exist within Country, and Country exists within the enduring jurisdiction of an Indigenous Nation. Provenance therefore became something more than a record of production or movement. It became an expression of an enduring sovereign relationship between Indigenous Nation and place.

This distinction became increasingly significant because it aligned naturally with the way Australia's digital infrastructure already operates. National geospatial infrastructure is fundamentally concerned with place. Administrative boundaries, coordinate reference systems, authoritative datasets, the Digital Atlas and related geospatial services all resolve information about location, jurisdiction and authoritative spatial relationships. They are not designed to classify people or cultural identity. They are designed to determine **where** something exists and **which authoritative relationships attach to that place**.

The research therefore underwent an important conceptual transition. Rather than asking how Indigenous peoples could be represented within digital systems, it asked whether Indigenous Nation, understood as an enduring jurisdiction expressed through Country, could participate within Australia's existing digital infrastructure under the same engineering principles that already govern other jurisdictional frameworks. This represented a fundamental shift in the research. The problem was no longer simply one of improving supply chain traceability. It became an investigation into whether Indigenous provenance could be understood as a jurisdictional relationship grounded in place rather than as an attribute of people.

This transition did not occur at a single moment. It emerged gradually through discussion, experimentation and continual reflection within the research team. Throughout the project there was a persistent tendency—understandably reflecting broader practice—to return discussions to Indigenous peoples, Indigenous communities or Indigenous cultural knowledge. Repeatedly, the research returned to the same foundational proposition: **this project attends to place because Australia's digital infrastructure attends to place.** By maintaining that discipline, the research remained focused upon the question it was ultimately seeking to answer: how can Indigenous Nation, as an enduring jurisdiction expressed through Country, become visible within Australia's existing digital infrastructure?

Looking back, this conceptual development became one of the most significant outcomes of the project. The original research question concerning Indigenous ingredient traceability had revealed a much broader opportunity. It demonstrated that provenance, jurisdiction and digital infrastructure could not be considered independently of one another. Instead, they formed successive stages of the same inquiry. What began as a practical investigation into Indigenous supply chain traceability ultimately became the foundation for a broader engineering proposition concerning the representation of Indigenous jurisdiction within Australia's national digital infrastructure.

1.3 The Problem Before the Project

(Related to Final Report Section 1.4 – Problem Statement)

The progression of the research gave rise to a further question. If Indigenous Nation already existed as Australia's most enduring and persistent jurisdiction, and if Australia's digital infrastructure had already matured through decades of engineering, standards development and geospatial innovation, what problem remained to be solved?

Looking back, the answer appears remarkably simple.

There was no absence of jurisdiction.

There was no absence of digital infrastructure.

There was no absence of authoritative information about place.

The research progressively revealed that these realities had matured alongside one another but had never possessed the engineering mechanism through which their coexistence could become technically expressed within a common digital environment.

This became one of the defining insights of the project.

Every GPS coordinate in Australia already exists simultaneously within five enduring jurisdictional domains:

- Indigenous Nation;
- Local Government;
- State or Territory;
- Commonwealth; and
- International jurisdiction.

Each of these jurisdictions exists independently of the others while exercising authority within its own sovereign or jurisdictional domain. Each possesses its own constitutional, legal, institutional or enduring foundations. Each has developed its own practices through which that authority is exercised. Their coexistence is therefore neither created by this research nor dependent upon digital technology. It is simply an enduring characteristic of Australia's jurisdictional landscape.

The project neither sought to alter these jurisdictions nor to redefine the authority exercised within them. It made no claim regarding constitutional arrangements, political recognition, legal status or public policy. Those matters remain the responsibility of the respective jurisdictions themselves.

Instead, the research remained deliberately focused upon Australia's digital infrastructure.

The engineering question became both precise and surprisingly modest.

Had Australia's digital infrastructure matured sufficiently to faithfully express the enduring coexistence of Australia's jurisdictional landscape?

The research demonstrated that it had.

By the commencement of this project, Australia's geospatial infrastructure had reached an extraordinary level of technical maturity. National coordinate reference systems, authoritative spatial datasets, administrative boundary frameworks, metadata

standards and interoperable engineering principles had evolved into a highly sophisticated digital ecosystem capable of resolving authoritative relationships associated with place.

At the same time, Dynamic User Interfaces (Dynamic UI), Adaptive User Interfaces, Generative Artificial Intelligence (AI) and blockchain technologies had themselves matured, each contributing new capabilities for interacting with persistent, authoritative spatial information.

Seen individually, these developments represented significant technological achievements.

Seen together, they revealed something much larger.

The technical conditions had finally converged.

For the first time, Australia's digital infrastructure possessed the capability to represent the coexistence of its enduring jurisdictional domains within a common engineering framework.

The significance of this moment should not be misunderstood.

The project did not create Indigenous jurisdiction.

It did not create Local Government, State or Territory, Commonwealth or International jurisdiction.

It did not create sovereignty.

It did not create Australia's digital infrastructure.

Nor did it seek recognition of any of these.

Rather, it demonstrated that contemporary technology had reached the point where these enduring realities could become persistently visible, technically resolvable and capable of participating together within the same digital environment.

This distinction fundamentally reframes the contribution of the research.

The project did not solve a constitutional problem.

It did not solve a political problem.

It did not solve a social problem.

It solved an engineering problem.

The contribution was the development of the engineering mechanism through which Australia's enduring jurisdictional reality could be faithfully expressed within a mature digital infrastructure.

Looking back, perhaps the most striking realisation is that nothing had been missing.

The jurisdictions had always existed.

The sovereign relationships had always existed.

Australia's digital infrastructure had continued to evolve.

Emerging technologies had continued to mature.

The conditions simply had not yet converged.

Once they did, the solution appeared almost self-evident.

The project therefore represents neither the beginning nor the end of that journey.

It represents the point at which Australia's digital infrastructure became capable of expressing something that had always been true.

From that point forward, the question is no longer whether these five jurisdictions coexist.

They always have.

The opportunity now becomes the development of digital practices through which those jurisdictions may interact while each continues to exercise authority within its own sovereign or jurisdictional domain.

That opportunity belongs not to this project alone, but to the continued maturation of Australia's digital infrastructure itself.

1.4 Working with CSIRO

(Related to Final Report: Sections 1–5)

The collaboration with CSIRO was not simply the coming together of different organisations to deliver a research project. Looking back, it became an exercise in developing the practices through which different disciplines could work together within an existing sovereign relationship while each retained the integrity of its own expertise.

From the outset, the project brought together perspectives that would not ordinarily occupy the same research space. Indigenous nation-building, law, governance and lived experience were brought into direct conversation with geospatial science, software engineering, blockchain technologies, Dynamic User Interfaces (Dynamic UI), Adaptive User Interfaces, Generative Artificial Intelligence (AI) and digital systems design. Each discipline possessed its own methods, language and standards of evidence. None was expected to replace another. Instead, the project progressively developed the practices through which each could inform the other.

This became one of the defining characteristics of the collaboration.

Throughout the research there was no expectation that engineering should become Indigenous governance, nor that Indigenous governance should become engineering. Rather, each discipline retained its own authority while remaining open to the possibility that the other could reveal questions which had not previously been asked within its own practice.

As the research evolved, it became increasingly apparent that this relationship mirrored the very proposition the project was investigating.

Just as the research sought to demonstrate the enduring coexistence of Australia's jurisdictional landscape, the collaboration itself demonstrated that distinct disciplines could coexist without assimilation. Indigenous knowledge systems, geospatial engineering, software architecture and emerging digital technologies did not compete for intellectual authority. They contributed different forms of authority to a shared research endeavour.

This proved to be far more significant than initially anticipated.

Many collaborative projects describe multidisciplinary research as the integration of different forms of expertise. The experience of this project suggested something more subtle. The collaboration was not characterised by integration in the sense of disciplines becoming indistinguishable. Instead, it was characterised by the development of practices through which each discipline could remain authentic to itself while participating in a common purpose.

Looking back, this represented an expression of the sovereign relationship itself.

The sovereign relationship did not emerge because researchers agreed that it existed. It had always existed. What developed were the professional practices through which researchers became increasingly conscious of working within that relationship. Decisions concerning engineering, governance, interface design, geospatial representation and system architecture were progressively informed by this shared understanding, not because one discipline subordinated itself to another, but because each recognised the authority exercised by the other within its own domain.

In this respect, the collaboration became both the means through which the research was undertaken and one of its most significant outcomes.

The Final Report appropriately documents the completed engineering, prototype and technical outcomes of the project. This Companion Report records something different. It records how a group of researchers progressively developed the practices required to undertake genuinely interdisciplinary research within an existing sovereign relationship.

That distinction is important.

The engineering mechanism described throughout the Final Report demonstrates how enduring jurisdictional coexistence can become technically visible within Australia's digital infrastructure.

The collaboration demonstrates that the practices through which such work is undertaken are no less important than the technical mechanism itself.

Both became necessary.

Neither would have been sufficient on its own.

Looking back, it is difficult to separate the evolution of the engineering from the evolution of the collaboration. Each continually informed the other. As the engineering became more faithful to the enduring jurisdictional reality it sought to express, the collaboration likewise matured into a practice capable of supporting that engineering. The project therefore became an illustration of the same principle operating at two different levels: one technical and one human.

Perhaps this is the enduring lesson of the collaboration.

The practices of a sovereign relationship cannot be prescribed in advance.

They emerge through the disciplined conduct of the work itself.

1.5 Reflections on Governance

(Related to Final Report Section 1.5 – Governance Implemented: ICIP and IDG)

Governance is often presented as a framework of rules, policies and compliance mechanisms that guide the conduct of research. The experience of this project suggested something considerably deeper.

Governance did not begin with documentation.

It began with practice.

Long before governance was expressed through Indigenous Cultural and Intellectual Property (ICIP), Indigenous Data Governance (IDG), project agreements or technical controls, it existed in the way researchers approached one another, the discipline with which decisions were made, and the continual return to the principles that had given rise to the research itself.

This became one of the quiet but enduring lessons of the project.

Governance is not created by documents.

Documents record governance.

Governance itself is expressed through the practices that precede them.

The formal governance arrangements described in the Final Report were therefore never understood as administrative obligations alone. They became practical expressions of a much broader proposition: that authority should remain with the jurisdiction to which that authority properly belongs.

Once the research recognised Indigenous Nation as an enduring jurisdiction expressed through place, the role of governance became clearer. Governance was not principally concerned with protecting data. It was concerned with ensuring that authority relating to place continued to be exercised within its appropriate jurisdictional domain.

This distinction fundamentally shaped the engineering.

Questions concerning Indigenous Cultural and Intellectual Property (ICIP) and Indigenous Data Governance (IDG) were never treated as constraints imposed upon the technology. They became engineering requirements arising directly from the jurisdictional proposition itself. If jurisdiction gives rise to authority, then digital systems must be capable of respecting the authority exercised within that jurisdiction.

In this respect, governance ceased to be an external layer applied to the project after the engineering had been completed.

It became part of the engineering.

The architecture, the Australian Indigenous Nation Index (AUIN), the Digital Boundary Apparatus, Dynamic User Interfaces, Adaptive User Interfaces, Generative Artificial Intelligence and blockchain each became different expressions of the same underlying proposition. They were not designed simply to manage information. They were designed to operate within authoritative relationships attached to place.

This also changed the way governance itself was understood.

Throughout the project it became increasingly apparent that governance was not simply concerned with limiting what technology could do. Rather, governance provided the conditions through which technology could operate legitimately.

This is an important distinction.

Good governance does not inhibit innovation.

It enables trustworthy innovation.

The project therefore demonstrated that governance and engineering are not competing considerations. They mature together. As the engineering became more capable of expressing jurisdictional relationships, governance likewise became more capable of expressing the authority exercised within those relationships.

Looking back, this progression now appears almost inevitable.

If Australia's digital infrastructure had matured sufficiently to faithfully express the coexistence of enduring jurisdictions, then governance itself also needed to mature beyond questions of compliance towards questions of relationship.

That, perhaps, is the most significant reflection arising from this aspect of the project.

The enduring contribution of governance was not simply the protection of Indigenous interests, nor the management of information.

Its contribution was demonstrating that enduring jurisdictional relationships can be faithfully expressed within contemporary digital infrastructure without requiring any jurisdiction to surrender the integrity of its own authority.

Governance therefore became much more than a project requirement.

It became one of the practices through which the sovereign relationship itself was enacted.

1.6 Reading this Companion Report

(Related to Final Report Section 1.6 – Report Structure)

The Final Report and this Companion Report should be read as complementary accounts of the same research project.

They are not different versions of the same document, nor does one replace the other. Each was written for a different purpose and therefore adopts a different perspective on the same body of work.

The Final Report remains the authoritative technical record of the completed research. It documents the engineering architecture, prototype development, governance implementation and technical outcomes arising from the project. It explains **what** was developed, **how** it functions and **why** particular engineering decisions were made.

This Companion Report records something different.

It documents the evolution of the ideas that ultimately informed those engineering decisions. It traces the progression of questions, conceptual shifts, collaborative practices and intellectual developments through which the technical outcomes described in the Final Report gradually emerged.

Accordingly, the structure of this Companion Report mirrors the structure of the Final Report.

Each section corresponds directly to the equivalent section of the Final Report, allowing the reader to move between the two documents as complementary expressions of the same research journey. The Final Report provides the completed engineering

proposition. The Companion Report provides the conceptual and collaborative pathway through which that proposition came into being.

Readers seeking a technical understanding of the project may choose to read the Final Report independently.

Readers interested in the conceptual development of the research, the evolution of its engineering propositions and the collaborative practices that shaped them may find it valuable to read the two reports together.

Throughout this Companion Report, recurring themes will become apparent.

The research repeatedly returned to first principles.

Questions concerning Indigenous provenance gradually became questions concerning Country.

Questions concerning Country became questions concerning jurisdiction.

Questions concerning jurisdiction became questions concerning digital infrastructure.

Questions concerning digital infrastructure ultimately became questions concerning the practices through which enduring jurisdictional relationships could become faithfully expressed within contemporary engineering.

This progression was neither planned nor linear.

It emerged through continual observation, reflection, collaboration and refinement.

For that reason, the Companion Report should not be read as a chronological diary of the project.

It is better understood as a record of emergence.

Each chapter documents a stage in the maturation of the research. Each conceptual development created the conditions for the next. Looking back, the progression appears almost inevitable. During the research itself, however, these insights emerged gradually through continual return to the underlying propositions that gave rise to the project.

If there is a single theme that unites both reports, it is this:

The project did not seek to change Australia's jurisdictional reality.

It sought to determine whether Australia's digital reality had matured sufficiently to faithfully express it.

The Final Report demonstrates that engineering proposition.

This Companion Report records how that proposition came to be understood.

Together, they present a single research journey viewed from two complementary perspectives.

One records the completed work.

The other records how the work became possible.

2. Developing the System

(Companion to Final Report: Section 2 – System Requirements and Design)

The Final Report describes, in Section 2, the requirements and design of a system capable of representing Indigenous provenance across contemporary supply chains. This Companion Report turns now to the developmental story behind that system – the reasoning, the false starts and the gradual clarification of what actually needed to be built.

By the time the research reached this stage, the conceptual work described in Section 1 had already shifted the project's centre of gravity. The question was no longer simply how to trace an ingredient. It was how to represent, within a digital system, an Indigenous Nation's standing in relation to a place – persistently, verifiably, and in a form that other systems could recognise.

That shift in understanding created a new and more demanding kind of problem. It was no longer a question that could be answered through better metadata or a richer product catalogue. It was an engineering problem in the fullest sense: a question of representation, identity and interoperability within Australia's existing digital and geospatial infrastructure.

2.1 The Engineering Problem

Every supply chain system I had examined shared the same underlying assumption. Place was treated as an attribute of a product – a field to be filled in, a label to be attached, a point on a map linked to a barcode. Provenance, in that model, always belonged to the item being traced.

Indigenous jurisdiction does not work that way, and it was never going to fit comfortably inside that model. A Nation's relationship to Country is not an attribute of anything that passes through a supply chain. It precedes the supply chain entirely. It exists whether or not a product ever moves, whether or not a transaction ever occurs, whether or not a barcode is ever scanned.

The engineering problem, once it was named clearly, was this: how do you give a jurisdiction – rather than an item – a persistent, addressable presence inside a digital

system? Existing standards were built to identify things that move: cartons, pallets, consignments, products. None of them were built to identify a place that does not move, still less a place whose boundaries and authority predate the nation-state infrastructure now mapped over it.

This was not a problem that could be solved by adapting an existing product-identification standard, however creatively. Cataloguing systems are hierarchical and centrally issued; jurisdiction and Country are neither. A workable answer would need to draw on a different tradition altogether – geospatial reference systems capable of expressing location with the same rigour Australia already applies to its own land administration, cadastral and statistical geography.

It would also need to satisfy a further, non-negotiable requirement. Whatever was built could not compete with, override, or sit in tension with existing jurisdictional layers – local government areas, postcodes, land parcels, statistical boundaries. It had to sit alongside them, expressed in the same coordinate language, so that an Indigenous Nation's jurisdictional presence could be read by the same digital infrastructure that already reads everything else in Australia's built and administered landscape.

Naming this problem precisely was, in hindsight, one of the more important turning points in the research. Until it was named as an engineering problem – rather than a data-quality problem, a labelling problem, or a metadata problem – no durable solution was possible. Once it was named correctly, the shape of the answer began to follow.

2.2 Development of the Australian Indigenous Nations Index (AUIN) namespace Framework

(Related to Final Report Section 2.3 – Indigenous Nations Boundary and Coordinate System)

The response to that problem became the Australian Indigenous Nations Index, or AUIN – a namespace framework built to give each Indigenous Nation a persistent, canonical identifier and a geometric representation of its Country, expressed within Australia's own national geospatial reference system.

The decision to build on Australia's existing coordinate reference infrastructure, rather than inventing a parallel one, was deliberate. GDA2020, already the backbone of Australian land administration, surveying and statistical geography, offered something the project needed above all else: a shared, trusted, nationally recognised language of location. Building AUIN on that same foundation meant an Indigenous Nation's jurisdictional geometry could be expressed in terms any Australian geospatial system – government, commercial or academic – already knows how to read.

AUIN itself is best understood as an index rather than a database. Its purpose is to hold, for each of Australia's Indigenous Nations, a canonical sovereign boundary and a stable identifier that does not change according to which agency, dataset or research project is consulting it. Where existing boundary datasets vary from source to source, revision to revision, agency to agency, AUIN was designed to hold a single, locked, referenceable version – a canonical artefact each Nation's entry could be built from and returned to.

Establishing that canonical boundary was only the first part of the framework. A second, closely related requirement followed immediately: once a Nation's Country has a canonical geometric boundary, the system also needs a reliable way of relating any given location back to the Nation whose Country contains it. This is a deceptively difficult problem to solve well – it has to work consistently across all 389 Nations, at any point within their boundaries, without manual lookup and without the kind of ambiguity that would undermine trust in the index. The standard that governs how a coordinate resolves to its Nation-linked identifier is a distinct component within the broader framework. Because the mechanism underlying that standard is the subject of a provisional patent held by the author, its internal workings are not described in this report, in the Final Report, or in any published account of the project – consistent with the protective approach taken throughout the wider standards framework this research produced.

What can be said is that this second standard was built to be consistent – the same rule applied identically across every Nation, rather than negotiated case by case. That consistency mattered as much as the underlying mechanism itself. A framework in which each Nation's boundary was defined differently, or resolved by different rules, would have reproduced exactly the fragmentation the project was trying to overcome. Fixing the method once, and applying it uniformly, was what allowed AUIN to function as genuine infrastructure rather than as a bespoke solution built one Nation at a time.

Together, the canonical boundary and the identifier resolution standard gave the project something it had not had before: a way of asking, of any coordinate anywhere in Australia, which Indigenous Nation's Country it falls within, and receiving a stable, persistent, machine-readable answer. That capability underpins the Indigenous Nations boundary and coordinate system described in Section 2.3 of the Final Report. It also became the foundation on which every subsequent standard in the wider framework – grid structures, area calculations, boundary lengths, shared sovereignty zones and beyond – would eventually be built.

At the time, none of that scale was apparent. What was apparent was narrower and more immediate: a jurisdiction needed a name the system could hold onto, and a place needed a way of being found. AUIN was the answer to both.

2.3 Development of the Ten Universals

(Related to Final Report Section 2.3 – Indigenous Nations Boundary and Coordinate System)

A boundary and an identifier were enough to answer the question that had opened this stage of the research: which Nation's Country does this coordinate fall within? But it quickly became apparent that a single boundary, on its own, could not carry everything a genuine jurisdictional record needed to carry. A Nation's Country has an area. It has an edge, and that edge has a measurable length. It relates to neighbouring Nations at that edge. It sits within, and alongside, layers of government that already exist. Each of these was a separate question, and each needed its own answer.

Rather than answer each question in an ad hoc way as it arose, the research settled on a different approach: a fixed, closed set of standards, each answering exactly one of these questions, built to apply identically across every Nation in the Register. That set became known as the Ten Universals.

Each Universal in the set was required to produce the same four things: a written standard describing what it does, a canonical artefact holding its computed output, a register entry recording that output against the relevant Nation, and an interface presenting it to a reader. A Universal that produced only three of these was considered incomplete, no matter how well reasoned its underlying logic. This requirement mattered because it turned each Universal from an idea into infrastructure – something that could be checked, reproduced and relied upon, rather than something that existed only as a description.

Taken together, the Ten Universals cover the sovereign boundary itself; the identifier-resolution layer described in Section 2.2; a structured grid fabric laid across each Nation's Country; a set of fixed reference points anchoring that grid; the calculated area of each Nation's Country; the calculated length of its boundary; a measured zone of shared sovereignty at the edge where neighbouring Nations meet; a register of official identifications by which a Nation has been known; and its points of coexistence with local government areas and postcode areas already in use across the same ground.

None of the Ten Universals stands alone. Nine of the ten depend directly on the foundational sovereign boundary, and the shared sovereignty measure depends in turn on the calculated boundary length. Recognising that dependency early was important. It meant the Ten Universals were never treated as ten unrelated features to be built in whatever order was convenient. They were treated as one interdependent structure, in which a change at the foundation would need to be understood as a change affecting everything built on top of it.

Locking the set at exactly ten, and applying it identically to every Nation, was itself a deliberate constraint rather than an oversight. A framework meant to scale to hundreds of Nations cannot function if each Nation's record is built to a different standard, or if new categories are added on an ad hoc, case-by-case basis. A Nation's area has to mean the same thing, computed the same way, as every other Nation's area, or comparison across the Register becomes meaningless. Fixing the set once was what allowed the framework to grow from a single Nation's record into genuine, comparable infrastructure.

By the time this stage of the work was complete, a Nation's entry in the system had grown from a single boundary line into a full, standardised jurisdictional record – one that could hold its own alongside any other layer of Australia's digital geography.

2.4 Development of the Indigenous Jurisdictional Framework

(Related to Final Report Sections 2.2–2.3)

Building the Ten Universals answered a set of engineering questions. It did not, on its own, answer a prior and more fundamental question: what did it actually mean, structurally, for an Indigenous Nation to hold jurisdiction within a system already crowded with other layers of government?

Australia's existing digital and administrative geography is already layered. A single point on the ground sits within a local government area, a state or territory, and the nation as a whole, and may carry international significance besides. None of those layers is described as competing with the others. Each answers a different question about the same place, and each is allowed to coexist with the rest.

Indigenous jurisdiction had never been given that same standing. Where it appeared in digital systems at all, it tended to appear beneath the other layers, or folded into them, or left out altogether. The research came to treat this as the central structural problem the jurisdictional framework needed to solve. Indigenous jurisdiction needed to be represented as a further coexisting layer in its own right, sitting alongside local government, state and territory, national and international jurisdiction – not ranked above or below them, but present in the same way they are present.

That reframing carried a practical consequence. If Indigenous jurisdiction was to coexist with local government and postcode geography rather than compete with them, the system needed to record, explicitly, where and how those layers actually overlap on the ground – which is precisely what the local government and postcode Universals described in the previous section were built to do. Coexistence, in other words, was not simply a principle stated in a report. It had to be built into the infrastructure as a checkable, named relationship between layers.

The same reframing also changed how the research understood a Nation's edge. A boundary drawn as a single sharp line implies a clean, binary membership – everything on one side belongs entirely to one Nation, everything on the other side belongs entirely to its neighbour. That is not how neighbouring Nations' Countries actually relate to one another. The research came to treat the edge itself as a zone rather than a line: a measured, shared space belonging to both neighbouring Nations at once, recorded as shared rather than assigned exclusively to either side.

Recognising that edge as shared space raised a further question the geometry alone could not answer: who governs what happens within it. A shared zone's geometry can be fixed once and left stable. The relationship between the two Nations who share it cannot be, because that relationship is negotiated, and negotiations move as circumstances change. The framework therefore needed to hold two different kinds of truth at once – a fixed geometric fact that does not change, and a living governance record, bound to that fixed geometry, that can be revised as the Nations involved reach new agreements about use, data and benefit within their shared space.

This distinction – between what is fixed and what is negotiated – became one of the more important structural insights of this stage of the work. Jurisdiction, properly represented, is not a single static claim. Some elements of it are enduring and do not change with circumstance. Other elements are relational, living, and properly belong to ongoing negotiation between the Nations concerned. A framework that only captured the fixed elements would have been incomplete; a framework that treated everything as negotiable would have had no stable foundation to negotiate from.

It is worth being precise about what this jurisdictional framework is not. It is not a statement about Indigenous cultural rights, and it does not describe what a Nation may or should do with its own knowledge or cultural material – that question belongs to the governance principles discussed in Section 1.5, and to ICIP and IDG specifically, not to this framework. This framework is concerned with something narrower and more structural: where jurisdiction sits, how it coexists with the layers already recognised around it, and how the relationship between neighbouring jurisdictions is held and governed over time. It is a framework about place and structural authority, not a framework about cultural practice.

By the end of this stage, the research had moved from a boundary that could tell you which Nation's Country a coordinate sat within, to a structural framework that could describe how that Nation's jurisdiction actually sits within, and alongside, everything else already governing that same ground.

2.5 Building the Digital Boundary Apparatus

(Related to Final Report Section 2.3 – Indigenous Nations Boundary and Coordinate System)

Sections 2.2 to 2.4 describe what needed to exist: a namespace, a locked set of standards, a jurisdictional framework that could coexist with everything else already governing the same ground. None of that could be more than a description until the boundary itself could be built, checked, and trusted on an ongoing basis. This section is about that apparatus – the practical discipline underneath the boundary, rather than the boundary itself.

The first decision was to separate the act of tracing a boundary from the act of declaring it authoritative. A working trace is a line, editable and version-controlled, that exists purely so tracing and correction work has somewhere safe to happen. It is never treated as the record of truth. Only once that trace is closed into a locked, immutable shape does it become the canonical boundary – a separate object, sealed, and never edited in place again. Keeping these two objects distinct meant that ordinary working revisions could never accidentally become an unannounced change to the authoritative record.

The second decision was to make the build process itself checkable rather than assumed. A declared toolchain and a single declared coordinate reference system were recorded against every boundary object, so that how it was built, and what spatial reference it was built in, became facts anyone could verify rather than something carried only in memory. A full metadata record travels with the boundary for the same reason – the Nation it belongs to, its area, its boundary length, its verification status, and its neighbouring Nations are all recorded alongside the shape itself, so the boundary is never just a geometry sitting on its own.

The third decision concerned what happens when a boundary needs to be corrected. Every correction is filed as a new, separately dated artefact, never as a silent edit to the existing authoritative shape. This meant a boundary's history could never be quietly overwritten. Anyone looking at a Nation's record later could see not only its current shape, but the visible trail of every correction that had led to it.

The fourth decision was redundancy. Every canonical boundary is exported into several independent, widely readable formats rather than kept in one. This was not simply about convenience. If any single file were ever corrupted, or altered without authorisation, the other exports would immediately disagree with it – the discrepancy would surface on its own, rather than depending on someone noticing by inspection.

None of these four decisions were about drawing a more accurate line. They were about building an apparatus around the line – one that could be checked, corrected visibly, and trusted to keep telling the truth about itself over time, Nation after Nation, without requiring anyone to take it on faith.

2.6 Working Within Australia's Geospatial Infrastructure

(Related to Final Report Section 2 – System Requirements and Design)

None of the apparatus described above was built in isolation. Australia already has an extensive geospatial infrastructure of its own – a shared coordinate reference system, shared statistical and mapping frameworks, and shared expectations about how spatial data should be documented and verified. The research made a deliberate choice to build inside that existing infrastructure rather than build something parallel to it.

Adopting a single, nationally recognised coordinate reference system was not a special decision made for this project. It is the same reference already used across the country's official statistical geography and mapping frameworks. Working within it meant every AUIN boundary could sit on the same spatial footing as the rest of the nation's geospatial data from the outset, with no separate translation step required later.

Australia's national geospatial infrastructure is unified through a framework with its own minimum requirements for any dataset wishing to participate: spatial data built to open standard models, provenance information built to a standard structure, and conformance that can be automatically verified rather than asserted. Rather than treat these as a future compliance task, the research built to that minimum bar from the outset – a declared coordinate reference, open export formats readable without proprietary software, and a fixed, auditable metadata record attached to every boundary object. Meeting that bar early meant a Nation's record could, in principle, sit inside the country's wider mapping infrastructure as a matter of course, not as a special exception requiring bespoke work later.

It is worth explaining why this could not simply build on an existing map. Australia already has a well-known national map of Indigenous language and nation groups, produced and maintained for cultural and educational purposes over many decades. Its own custodians are explicit that it is not intended to be exact, that its boundaries are not fixed, and that it is not suitable for jurisdictional or land-claim purposes. That is not a shortcoming in that map. It was never built to carry that kind of technical weight, because that was never its purpose. It is a useful reminder, though, that a good cultural reference map and a piece of verifiable digital jurisdictional infrastructure are two different things, built to satisfy two different needs – and this research needed the latter, built from the ground up to a standard the former was never designed to meet.

Meeting the country's own infrastructure standard from the outset meant the technical work of belonging inside Australia's wider geospatial systems was, in a real sense, already finished by the time this stage of the research concluded. What remains

outstanding is not an engineering gap. It is a governance and relationship question – on what terms, and by whose agreement, this data might one day be shared into the country's wider mapping systems. That is a conversation for the Nations concerned to have on their own terms. It is not a technical problem this research needed to solve on their behalf.

2.7 Reflections on System Design

By the end of this stage, Country had moved from a principle stated at the start of the project into something closer to an engineered record. What began as a single boundary and an identifier had become a namespace; the namespace had grown into a locked set of ten interdependent standards; those standards had been given a jurisdictional meaning that let a Nation coexist with every other layer of Australia's administrative geography rather than compete with it; a practical apparatus had been built to construct and correct that boundary without ever losing its history; and all of it had been built to sit inside the country's existing geospatial infrastructure rather than beside it.

None of this closed off further design work. If anything, it opened a different kind of design problem. The infrastructure could now describe a Nation's jurisdiction faithfully and verifiably. But faithfulness to a specialist standard is not the same thing as usefulness to the people who would actually need to interact with the system – a farmer uploading a harvest record, a shopper scanning a product, a retailer checking stock. A structure that only a specialist could read was not yet a system anyone else could use.

A second discipline had also been forming throughout this stage, one that would shape every design decision that followed. Some parts of the infrastructure needed to remain open to scrutiny – their purpose, their categories, their relationships to one another. Other parts needed to remain protected, described only by what they do and never by how they do it. Holding that line consistently, section after section, was as much a part of system design as any diagram or standard. It meant learning to describe a system honestly without describing it completely.

That distinction between what could be shown and what needed to remain unseen carried directly into the next stage of the work. Section 3 turns to the task of building something people could actually use – a prototype, and the interface through which the infrastructure described so far would finally become visible, in a form suited to whoever was looking at it.

3. Prototype Development

(Companion to Final Report: Section 3 – UI Design and Generative UI)

The Final Report describes, in Section 3, the UI design and generative UI developed to give each stakeholder group access to the system built in Section 2. This Companion Report turns to the story of getting there – the collaborative work with the CSIRO team, the translation of jurisdictional infrastructure into something a farmer or shopper could actually use, the way that experience evolved through iteration, and the engineering decisions that shaped what stakeholders ultimately saw and interacted with.

3.1 Working with the CSIRO Team

Section 1.4 described the broader philosophy of this collaboration – disciplines retaining their own integrity while contributing to a shared endeavour. This section is about something narrower and more practical: what that collaboration actually looked like once the work turned from infrastructure to interface.

Building a prototype meant translation in both directions, continuously. Concepts that had taken shape through Indigenous governance, law and nation-building needed to be expressed as requirements a software and interface team could build against. At the same time, the engineering and design constraints the CSIRO team brought – what a generative interface could realistically render, what a stakeholder could realistically be asked to do in a few taps or clicks – needed to be understood well enough to know which parts of the underlying infrastructure could bend to accommodate them, and which parts could not.

This was not a one-off handover of specifications. It was an ongoing conversation, repeated across each stakeholder group, in which a requirement expressed in the language of jurisdiction and governance was tested against the practical realities of interface design, and returned, refined, for another look. Neither side simply deferred to the other. Each stayed accountable to its own standard of rigour while remaining genuinely open to what the other could see that it could not.

3.2 Translating Concept into Prototype

The stakeholder requirements set out in the Final Report – farmers, consumers, transport and distribution providers, and retailers – did not arrive fully formed. They were derived from the same challenges that had shaped the project from its earliest stages: making Indigenous Nations visible within traceability workflows that had never previously accounted for them, supporting governed rather than open-ended access to information, capturing where and when an activity actually happened, and enabling genuine recognition of Indigenous contribution rather than a token acknowledgement appended after the fact.

Turning those challenges into a working prototype meant accepting a significant narrowing of scope at the interface level, even as the infrastructure underneath remained rich and detailed. A farmer needed to upload crop information, align with existing supply-chain standards, and receive acknowledgement for the care taken of land connected to a Nation – not a dashboard of jurisdictional detail. A consumer needed a QR code that led to a simple, honest picture of where a product came from and how it connected to Indigenous Nations and contribution pathways – not an explanation of how that connection had been established. A transport or distribution provider needed to record movement and have that movement recognised across the Nations it passed through. A retailer needed stock visibility, point-of-sale traceability, and a clear view of the social impact those transactions supported.

None of these stakeholders needed to know that a locked set of ten interdependent standards sat beneath what they were looking at. That was, in a sense, the point. The infrastructure described in Section 2 was built to do its work quietly, so that what reached a stakeholder's screen could be simple without being dishonest.

3.3 Evolution of the User Experience

The earliest way of thinking about the interface treated stakeholder difference as a problem to be smoothed over – as though the ideal outcome was one consistent screen that everyone could use in more or less the same way. That assumption did not survive contact with the actual requirements. A farmer, a shopper, a logistics operator and a retailer were not variations on the same user. They were asking fundamentally different questions of the same underlying data, at different moments, for different reasons.

Recognising that difference as the central design fact, rather than an inconvenience, led to the generative UI approach described in the Final Report. Instead of one fixed interface serving every audience, the same underlying jurisdictional and contribution data could be rendered differently depending on who was asking and why – acknowledgement and upload tools for a farmer, a map and a story for a consumer, inventory and impact reporting for a retailer. The same information, presented through different eyes.

This also opened space for something the project had been concerned with from its earliest reflections on governance: controlled disclosure. Not every stakeholder needed, or was entitled to, the same view of the same information. A generative interface made it possible to shape what was shown according to role, permission and community preference, rather than defaulting to either full transparency or a single generic view for everyone.

3.4 Engineering Decisions

Making that kind of stakeholder-shaped interface possible required a clear engineering decision about where the generative UI layer sat in the wider system. It became the single channel through which every stakeholder interacted with the platform, rendering itself dynamically to the audience in front of it while routing whatever a stakeholder submitted through validation and governance-aware workflows before it touched anything else.

Underneath that layer, a blockchain and smart contract component recorded the activities that occurred within each Nation's boundary and automated the allocation of reward to the parties involved, including the Nations themselves, based on the time and resources each had contributed.

A deliberate line was drawn between these two layers. The generative UI was built to present and to route, never to decide. It could shape how information appeared to a given stakeholder, but it was never permitted to become a second place where jurisdictional truth might quietly diverge from the canonical record established in Section 2. Where geospatial information was culturally sensitive, the interface was built to enforce the governance, permissions and access controls decided elsewhere in the system – never to make those decisions itself, and never to bypass them for the sake of a simpler screen.

3.5 Reflections on the Prototype

What the prototype ultimately demonstrated was feasibility across an entire chain, not just at one point within it. A farmer's contribution, a product's movement, a retailer's shelf and a consumer's purchase could all be traced in relation to Indigenous Nations and place, from one end of the chain to the other, without Indigenous jurisdiction being appended at the end as an afterthought. It was present from the first upload.

The generative UI carried a further implication beyond the food supply chain itself. The same underlying approach – rendering the same information differently for different audiences – could just as easily present the outcomes of an organisation's own sustainability reporting on a living map of Indigenous Nations, connecting an organisation's achievements back to the places and Nations they actually touched. What had begun as an interface for a supply chain prototype turned out to be a more general way of letting data tell a story about place, rather than simply displaying it.

That realisation carried its own question forward. A prototype could demonstrate that contribution could be traced and recognised. It could not, on its own, answer how that contribution should be measured, recorded and rewarded at scale. That question became the subject of the next stage of the work.

4. Blockchain and Digital Infrastructure

(Companion to Final Report: Section 4 – Blockchain-based Token Architecture for ESG Contribution Incentivisation in INITS)

The Final Report describes, in Section 4, how the INITS architecture extends from food supply chain traceability into ESG contribution tracking, using a blockchain-based token system. This Companion Report turns to the reasoning behind that extension – why blockchain specifically, how the resulting data hierarchy was structured, and what it meant to bring jurisdiction into an ESG context.

4.1 Why Blockchain

Existing ESG frameworks tend to report at a highly aggregated level. An organisation might claim a certain environmental or social outcome without much visibility into precisely where the underlying activity occurred or which communities were affected by it. The research needed something that could hold two properties most reporting systems do not hold together: a record that could not be quietly altered after the fact, and a record that more than one party could check.

A conventional database does not offer that combination. Whoever controls the database can, in principle, edit it. For a Nation whose contribution was being recorded, that would mean trusting the organisation running the platform not to revise the record of that contribution later, for its own convenience. Blockchain, paired with smart contracts, offered a structural answer instead: once an activity was recorded and linked to a Nation, a place and a time, it could not be quietly rewritten by any single party, including the organisation operating the system. Smart contracts could then automate the allocation of reward according to agreed rules, rather than leaving recognition to a case-by-case human decision.

None of this could function on its own, though. Blockchain can make a record permanent and auditable, but it cannot tell you which Nation's Country a given activity actually occurred within. That determination depended entirely on the jurisdictional and coordinate infrastructure already established in Section 2. Blockchain gave that determination permanence once it had been made; it was never the thing making it.

4.2 Building the Data Hierarchy

The Final Report describes a layered architecture: geographical location and Indigenous Nation information sit at the foundation, followed by blockchain and smart contracts, then application-layer activity, and finally the stakeholder-facing interfaces described in

Section 3. The order of those layers was a deliberate design decision, not an incidental one.

Had jurisdiction been built on top of the blockchain layer instead of underneath it, jurisdiction would only ever have been as reliable as whatever a particular application chose to write into the chain at a particular moment. By placing Nation and place at the foundation instead, every layer built above it – the ledger, the application logic, the interface a stakeholder actually saw – inherited an already-settled jurisdictional fact rather than needing to reconstruct or re-verify it each time.

That ordering also narrowed what the blockchain layer was actually responsible for, in a way that mattered. Its role was not to decide where a Nation's boundary sat. That question had already been answered elsewhere in the system. Its role was to record, immutably, that a given activity had occurred within a boundary that had already been established – a much smaller and more disciplined task than it might otherwise have needed to take on.

That same ordering had a second consequence, beyond narrowing blockchain's role. Once a coordinate carried a settled jurisdictional fact, nothing about the architecture restricted what else could be attached to that same coordinate. Jurisdiction was the first hierarchy built at that foundation layer, but it did not need to be the only one. Any further hierarchy of data that needed to be anchored to a specific place, and checked against a specific Nation's Country, could attach to the same coordinate on the same terms. ESG was the hierarchy this stage of the research chose to build next – not because the architecture had been designed around ESG specifically, but because it offered a concrete way of testing whether a second, independent hierarchy could sit on the same foundation without disturbing the first.

4.3 ESG and Jurisdiction

The measurability of an ESG claim depended on where that data was anchored. Rather than organising ESG information around an external industry or sector classification, the research attached the ESG hierarchy directly to the GPS coordinate itself – the same coordinate already carrying the jurisdictional record described in Section 4.2. Anchoring ESG data to place, rather than to a classification category, meant a claim could be measured and validated against a specific location and Nation, not against an aggregated sector-wide average. Once that hierarchy existed at the coordinate level, the same infrastructure built for supply chain traceability could support contribution measurement, attribution and audit in an ESG context: two token types carried that recognition on the blockchain layer – ESG reward tokens for contributions that could be quantified, and ESG recognition badges for achievements or certifications that had been verified but were not naturally expressed as a quantity. Tokenisation, in both

cases, functioned as a recording and incentive mechanism once the coordinate-anchored hierarchy had already made the underlying claim measurable and checkable – rather than as a standalone financial instrument in its own right.

Linking that recognition to jurisdiction changed what an ESG claim could actually be checked against. A general statement that an organisation had supported a social or environmental outcome is difficult to verify from the outside. A statement that a specific contribution had occurred at a specific place, within a specific Nation's Country, at a specific time, is a different kind of claim – one that geospatial integration into the ledger made auditable, and that could be checked not only for whether something happened, but where, and on whose Country.

That distinction was the point of bringing jurisdiction into an ESG architecture at all. It moved reporting away from an aggregated, organisation-wide claim and toward something that could be tied, place by place, to the Nations whose Country the activity had actually touched.

4.4 Reflections on Digital Infrastructure

By this stage of the work, three things had been built that depended on one another. An infrastructure that could locate a Nation's jurisdiction, described in Section 2. An interface that let real stakeholders interact with that infrastructure, described in Section 3. And now a ledger that could record and reward contribution within that jurisdiction, auditable by more than the one party holding it.

Digital infrastructure of this kind carries a particular responsibility once it touches Indigenous jurisdiction. Immutability that protects a Nation's record from being quietly altered without consent is a genuine strength. But the same immutability means that a mistake, once written, is harder to unwrite than in a system built for convenience rather than permanence. The response, throughout this stage of the research, was to keep the layers strictly ordered: jurisdiction established and checked elsewhere, through governance, before anything was allowed to become a permanent entry on the ledger. Only settled facts were permitted to enter a record designed never to forget them.

By the end of this stage, the infrastructure, the interface and the ledger all existed, and each could be shown to work. What none of them could answer on their own was a set of questions the research could describe but not resolve by itself – adoption, governance, and what communities themselves chose to do with a system built, at every layer, to answer to them.

What the coordinate-anchored hierarchy had already shown, though, was that ESG did not need to be the last hierarchy built on that foundation. That question – what else the same foundation could support – is where this report turns next.

5. Looking Forward

(Companion to Final Report: Section 5 – Potential Social and Economic Impacts)

The Final Report closes by noting that the long-term impact of this work depends on adoption, governance arrangements and community participation, rather than on anything the research itself could settle. By the time the infrastructure, the interface and the ledger described in the preceding chapters existed and could each be shown to work, the research had answered the questions it was equipped to answer. What remained were questions of a different kind entirely – not technical, but relational, and properly belonging to the Nations and communities the work concerned. This closing chapter reflects on what those questions look like from where the research now stands.

5.1 The Future of Australian Indigenous Nations Index (AUIN)

The prototype built for this project used a food supply chain as its proving ground, because a supply chain gave the work something concrete to build against – real stakeholders, a real sequence of activities, a real need to trace something from one place to another. But the infrastructure that made the prototype possible was never really about food. It was about representing a Nation's standing in relation to place as a verifiable digital record, capable of sitting alongside every other layer of jurisdiction already recognised in this country.

That distinction matters for what comes next. A capability built to recognise Indigenous jurisdiction within one particular supply chain is, by its nature, also a capability that does not stop at the edge of that supply chain. Any system that needs to know whether an activity occurred within a Nation's Country – in land and water management, in cultural heritage protection, in research governance, in any digital service that currently has no way of recognising Indigenous jurisdiction at all – could, in principle, draw on the same foundation rather than building its own from scratch each time.

This same foundation also points toward a further application, building on the ESG hierarchy described in Section 4.3: linking ESG reporting to verified, place-based jurisdictional data rather than to unverifiable general statements. Framed as the ESG–Indigenous (ESGI) concept, this treats an organisation's claims about its impact on a Nation's Country as something that can be checked against the record, not simply asserted. As with the other examples above, whether and how this is taken further remains a decision for the Nations concerned, not a proposal advanced by this research.

Whether that potential is realised is not a technical question, and it was never going to be answered by this research alone. It depends on the same things the Final Report

already names: adoption, governance arrangements, and the willingness of communities to participate on their own terms. Those are decisions that belong to the Nations whose Country the index would represent, not to the researchers who built the standard it is measured against. What this research can offer is a foundation that has already been shown to meet the same technical bar as the other infrastructure it would need to sit beside – not a decision about whether, or how, that foundation should be used.

5.2 Australia's Digital Infrastructure

Section 2.6 described the deliberate choice to build this infrastructure inside Australia's existing geospatial systems rather than beside them – to make Indigenous jurisdiction something the country's digital infrastructure could recognise on its own terms, using the same standards already applied to local government areas, postcodes and state and territory boundaries. Looking forward, the more interesting question is what it would mean for that recognition to become ordinary rather than exceptional.

At present, a system that wants to represent Indigenous jurisdiction has almost nothing to build on. It either leaves that jurisdiction out entirely, or it commissions something bespoke, as this project effectively had to do. Neither outcome is where a mature digital infrastructure should sit. If Indigenous jurisdiction could instead be represented as a standing layer within the country's broader geospatial infrastructure – available to any government or industry system in the same way a local government boundary already is – then recognising a Nation's Country would stop being a special case that requires its own research project, and become a default feature of how Australia's digital systems describe place.

That shift, if it happened, would not be a technical achievement so much as a policy and relationship one. The technical foundation this research built demonstrates that it is possible to meet the same rigour Australia already expects of its administrative geography. Whether, when, and on what terms that foundation is taken up by the country's wider digital infrastructure is a decision for government and for Indigenous Nations to reach together – not a default this research is entitled to set on anyone's behalf.

5.3 Lessons from the Project

Looking back across the project as a whole, several lessons recur across chapters that otherwise deal with very different subject matter – geospatial standards, interface design, blockchain architecture, collaboration itself.

The first is that sovereignty had to be lived through the work, not only represented by its output. It would have been possible to treat Indigenous jurisdiction as a specification to be met – a set of requirements handed to an engineering team and checked off once satisfied. That approach was deliberately not taken. Sovereignty was practised in how decisions were made, who made them, and on what terms, at every stage from the earliest conceptual work through to the final prototype. The technical result and the way it was produced were never separable.

The second is that coexistence, not competition, turned out to be the right frame for almost everything the project touched. It was the right frame for representing Indigenous jurisdiction alongside local government areas, postcodes, and state and territory boundaries, so that no layer had to be diminished for another to be recognised. It was equally the right frame for the collaboration itself, in which Indigenous governance expertise and non-Indigenous scientific and engineering expertise each retained their own integrity rather than one assimilating into the other.

The third is that protecting what needs protecting and remaining open about everything else are not in tension – they are two halves of the same discipline. The project held a firm line throughout: some aspects of the underlying mechanism needed to stay undisclosed, while the purpose, structure and reasoning behind the wider framework could be described honestly and in detail. Learning to hold that line consistently, rather than treating disclosure as an all-or-nothing choice, shaped almost every decision documented in this report.

The fourth is that building inside existing infrastructure, rather than beside it, paid off in ways that went beyond the purely technical. Meeting Australia's own geospatial standards meant the resulting framework did not need to argue for its own legitimacy separately from the systems it needed to sit alongside. The same logic held for the collaboration: working within, rather than around, established institutions and processes made the outcome something that could actually be tested against existing standards, rather than a parallel system whose credibility had to be taken on faith.

The fifth lesson is that translation between disciplines was never a one-off handover. It had to happen continuously – between jurisdictional concepts and engineering requirements, between infrastructure and interface, between interface and ledger – and it had to happen in both directions each time. Assuming that translation was a task to be completed once, early on, would have missed most of what actually made the collaboration work.

The final lesson is one of restraint. The project's role was to build a capability – a piece of infrastructure that could represent a Nation's jurisdiction to a rigorous technical standard. It was never the project's role to decide how, whether, or by whom that capability should be used. Keeping that distinction clear, even when it would have been

simpler to make assumptions on the Nations' behalf, was one of the more difficult and more important disciplines this research had to maintain.

5.4 Personal Reflections

I have spent much of my professional life working across law, higher education, and Indigenous governance and nation-building, and I did not expect that a project working through geospatial standards, generative interfaces and blockchain architecture would feel like a continuation of that same work. It did. What changed was the medium, not the responsibility.

For most of my career, the question of how a Nation's jurisdiction is recognised has played out in law, in policy, and in negotiation between governments and Indigenous peoples. This project asked a version of that same question in a register I had not previously worked in as closely: what does it take for a Nation's jurisdiction to be recognised by a digital system, to the same technical standard the system already affords to a local government boundary or a postcode? I did not need to invent an answer to whether Indigenous jurisdiction deserved that recognition. That was already settled, in law, in scholarship, and in the lived and continuing relationship between Aboriginal and Torres Strait Islander peoples and Country. What the project let me do was work through how that recognition could actually be built.

The collaboration with the CSIRO team gave that work its shape. I came to this project able to draw on a lifetime of lived experience as a Wiradjuri man and a career spent thinking about governance and nation-building. The researchers I worked alongside brought a different, equally serious kind of expertise – in geospatial science, in software engineering, in blockchain architecture, in interface design. Neither of us needed the other to become something we were not. What we needed, and what we built together, was a working relationship in which each discipline could hold its own standard of rigour while remaining genuinely answerable to the other. I do not take that kind of collaboration for granted, and I do not think it happens automatically. It had to be chosen, repeatedly, at every stage of the work.

What stays with me most, closing this report, is not any technical outcome, though I am proud of what was built. It is that Country – something I never needed convincing was already jurisdiction, already law, already governance – can now also be held, verifiably and rigorously, inside a digital system built to the same standard as the rest of this country's infrastructure. That was never going to change what Country is; it was only ever going to change what our digital systems are capable of recognising. I hope this work proves useful to the Nations who might choose to use it, on their own terms, and that it stands as one example of what becomes possible when sovereignty is enacted throughout a project, not only acknowledged at its start.

References

This Companion Report draws on the same standards, systems and data sources documented in the bibliography of the Final Report. For full citation details, readers should consult the Bibliography included in the CSIRO Final Report, Forging Futures: Indigenous Nations Information and Place Tracing through Cutting-Edge Science and Collaboration.

The standards and systems referenced throughout this report include:

NationalMap – Geoscience Australia's national geospatial data platform.

AIATSIS – the Australian Institute of Aboriginal and Torres Strait Islander Studies.

GS1 – international standards for supply chain identification and product traceability.

CASA – the Civil Aviation Safety Authority.

Hyperledger – an open-source blockchain framework.

GeoJSON – an open standard for encoding geospatial data structures.

GDA2020 / EPSG:7844 – the Geocentric Datum of Australia 2020, the national geodetic datum used throughout this project's geospatial standards.

MGA Zone 55 – the Map Grid of Australia projection zone applied to the project's grid fabric.

Australian Bureau of Statistics – source of the Local Government Area (LGA) and Postcode Area (POA) datasets used to establish coexisting jurisdictional layers.

Appendices

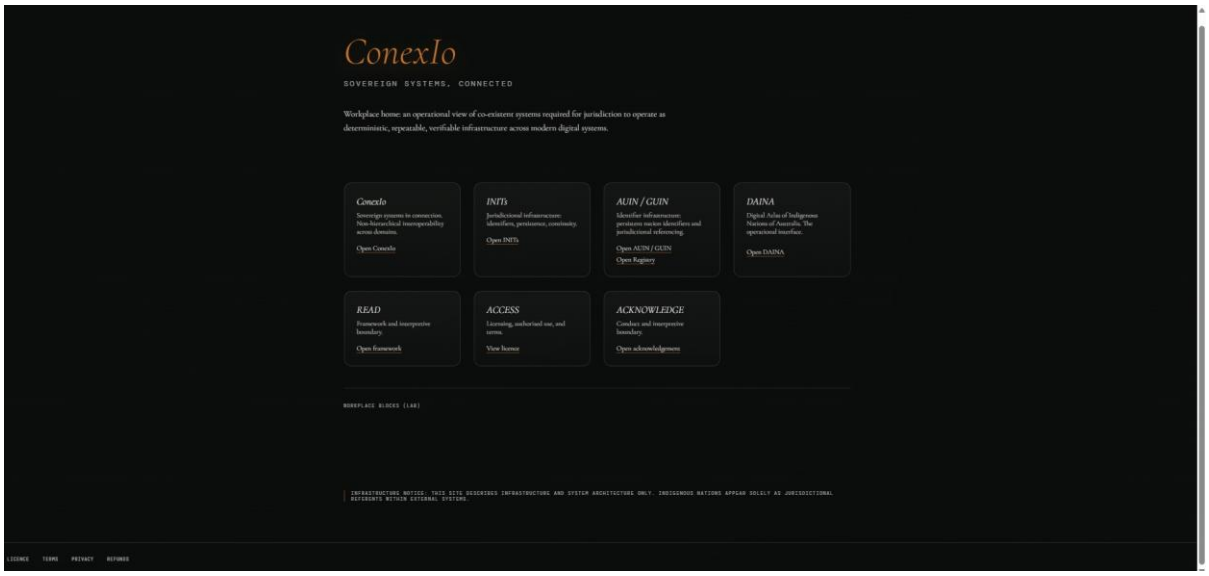
The following appendices present illustrative views of the operational interfaces and registers referred to throughout this Companion Report. They are included to give readers a visual sense of the infrastructure described in the preceding chapters, and should be read alongside the fuller technical description contained in the Final Report.

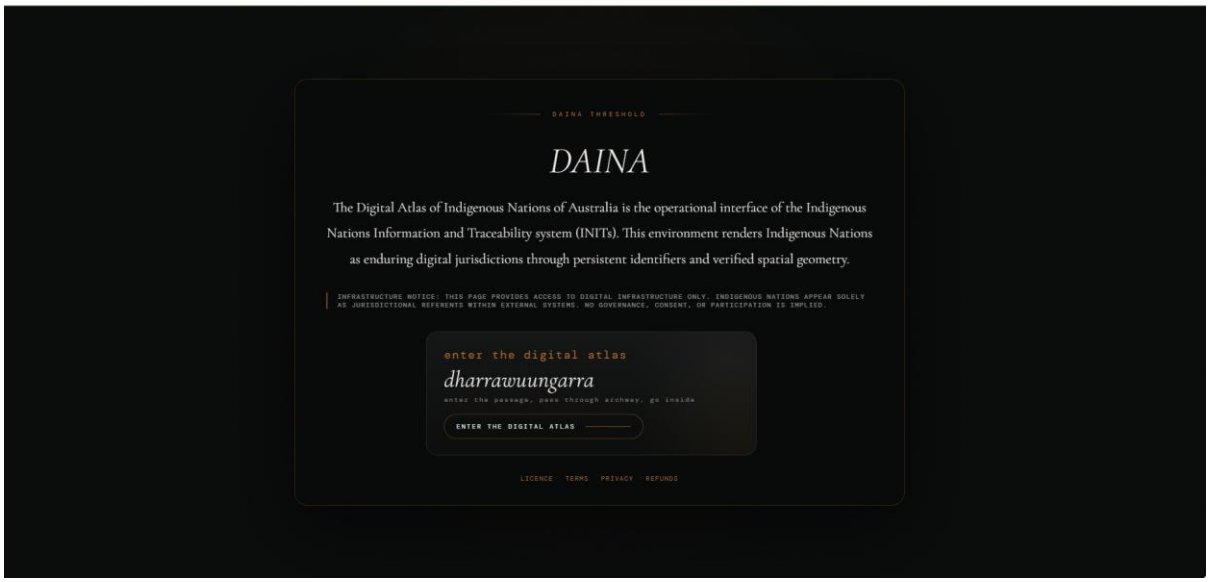
Appendix A: The Access Journey

AUIN and the Digital Atlas (DAINA) do not stand alone. Both are components within a broader operating architecture – the Indigenous Nations Information and Traceability system (INITs) – that this Companion Report and the Final Report describe throughout. Within that architecture, AUIN provides the deterministic identifier infrastructure to which jurisdictional information attaches, while DAINA provides the interface through which that infrastructure is represented and read. The following views illustrate the path

by which a user reaches AUIN–0001 within this architecture, beginning with the acknowledgement that gates entry to the environment, moving through the connected-systems workspace from which INITs, AUIN/GUIN and DAINA are each accessed, and arriving at the threshold of the Digital Atlas itself.

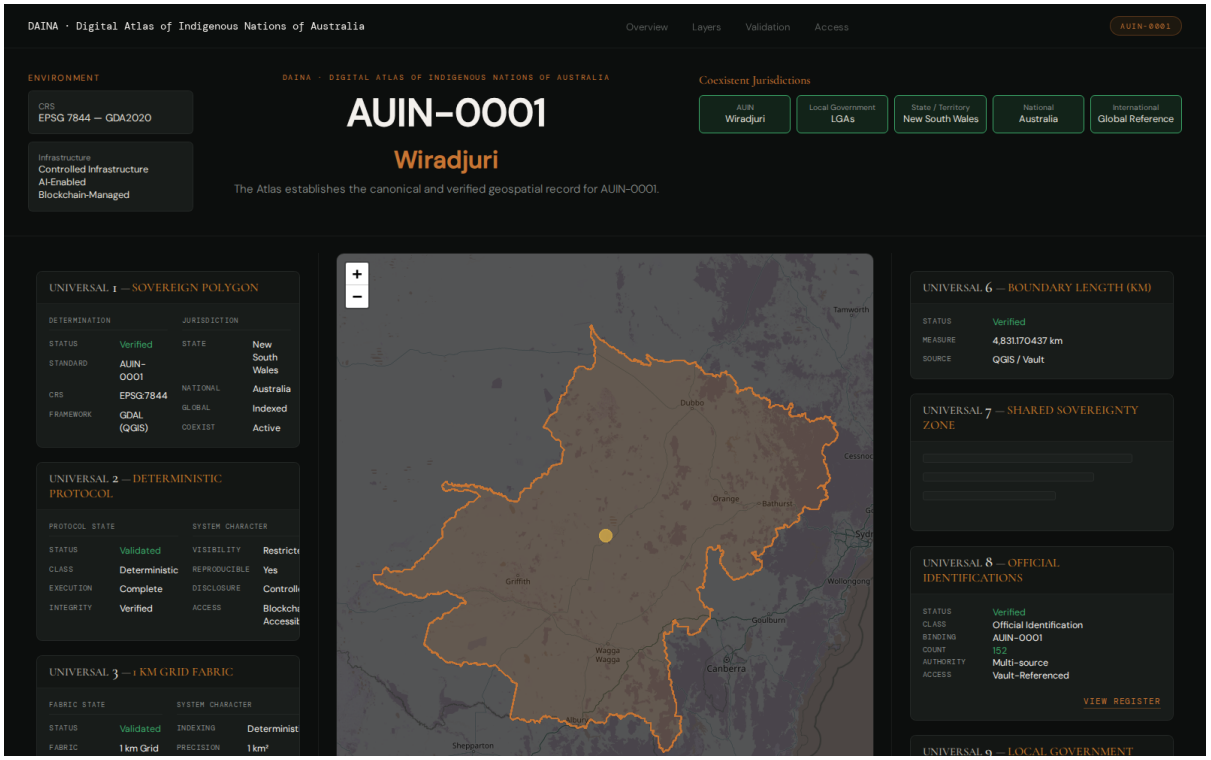


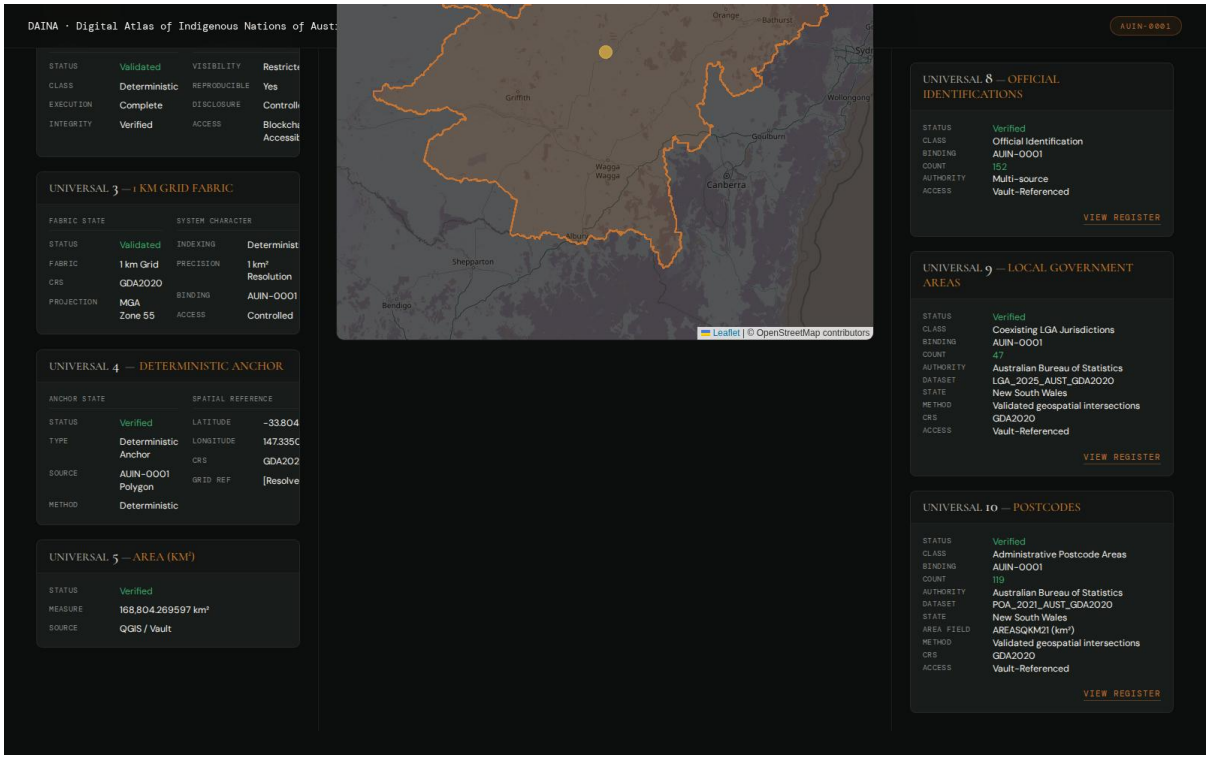




Appendix B: DAINA – Digital Atlas of Indigenous Nations of Australia

The Digital Atlas presents AUIN-0001 (Wiradjuri) as a canonical, verified geospatial record, alongside the coexisting jurisdictional layers – local government, state and territory, national and international – described in Section 2.6.



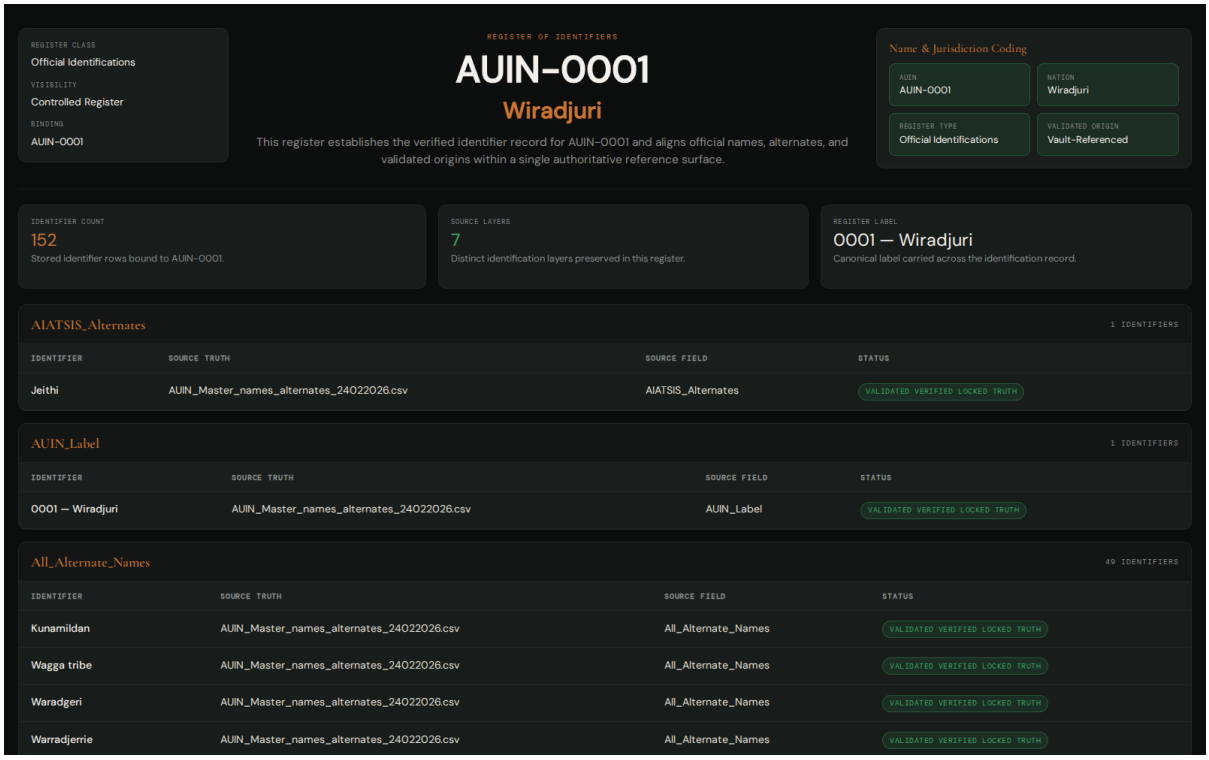


The following continental-scale view shows the Digital Atlas resolving all indexed Nations at once, illustrating how AUIN's canonical identifiers scale from a single Nation's record to a nationwide index of coexisting jurisdictions.



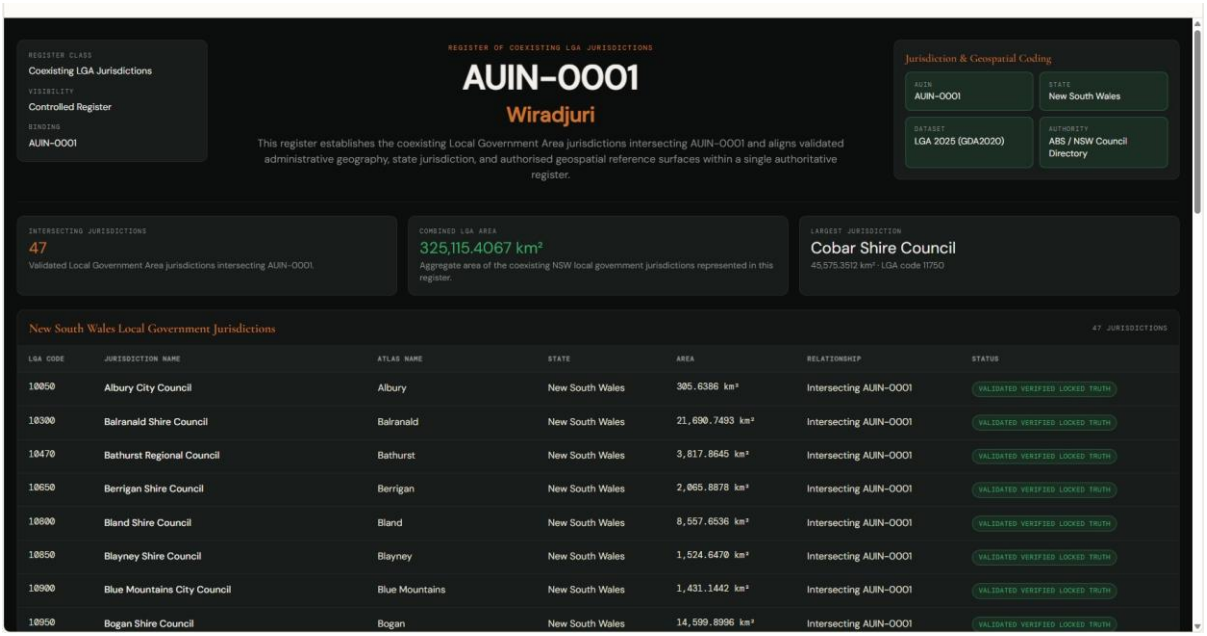
Appendix C: Register of Identifiers

This register aligns official names, alternate names and validated origins for AUIN-0001 within a single authoritative reference surface, as described in Section 2.5.



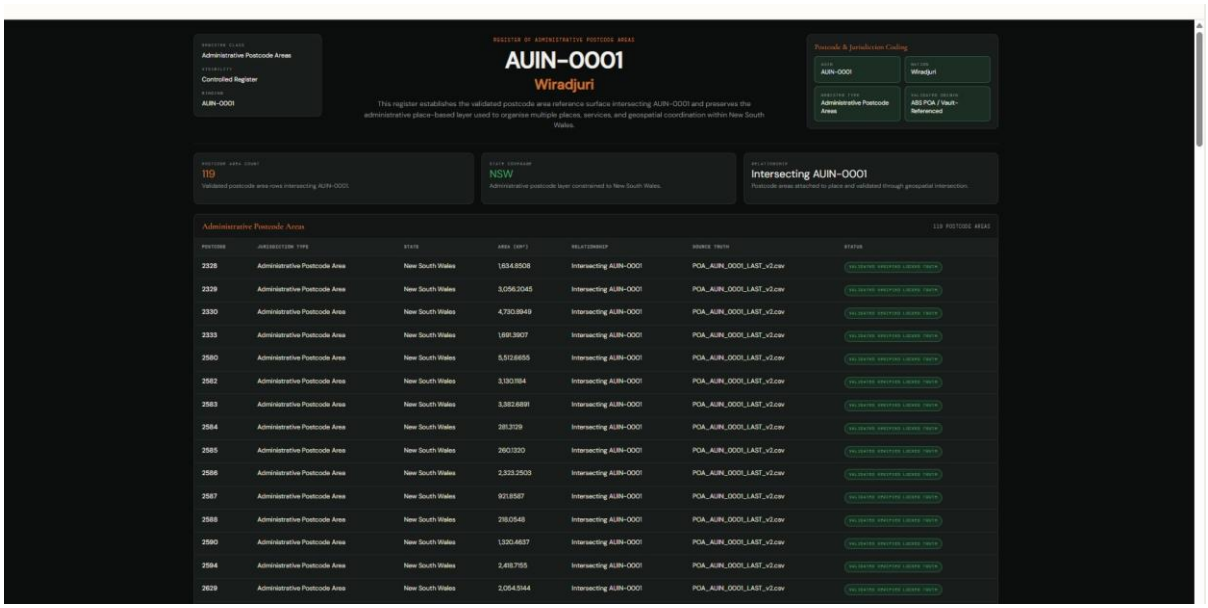
Appendix D: Register of Coexisting Local Government Area Jurisdictions

This register records the Local Government Area jurisdictions intersecting AUIN-0001, aligning validated administrative geography with the coexistence principle described in Section 2.7.



Appendix E: Register of Administrative Postcode Areas

This register records the administrative postcode areas intersecting AUIN-0001, preserving the place-based layer used to organise services and geospatial coordination described in Section 2.6.



Appendix F: Jurisdiction Terminal – Summary of Jurisdictional Coexistence

This terminal view brings together the coexisting jurisdictional layers recognised for AUIN-0001 – Nation, local government, state and territory, national and international – within a single summary interface.

