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DEFINITION OF AGRICULTURE PROPERTY

AGRICULTURAL PROPERTY DRAFT DATA MODEL

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1. Introduction

Digital integration of real time information for Australian producers presents a massive value uplift for informed and timely decision making on a property. At a fundamental level, enabling digital information to be integrated for producers requires a consistent spatial property database containing accurate boundaries of Australian agriculture producing properties. Currently, no complete and maintained dataset exists in Australia. The land parcel component defining accurate boundaries of property is well defined and accessible (land cadastre), yet it is not optimised to provide a holistic linked view into all land parcels that constitute a producing property, nor tagged to allow filtering to agricultural properties. In fact, the definition of a 'producing property' (or agriculture property) for all types of agri-foods (i.e. grain, horticulture, livestock, hobby farms etc.) is not well defined. For example, hobby farms may not be captured at all if they do not meet the considerations for a primary producing property, yet still produce agriculture outputs of noteworthy scale.

Having a single property database for producing properties seems like an obvious requirement, yet the challenge of having a clear definition of what is a producing property is still not clear. Simply put, a land-based definition is different to an operational based definition and once again different to a commercial definition of what may be classed as an agriculture property.

This project seeks to propose a definition of agricultural property and an associated draft data model so that all agriculture properties across Australia can be identified and linked to their fundamental information, such as property ownership, or business classification. Only by having a consistent definition and a data model could a future authoritative agriculture property dataset be generated and used across all stakeholders who are required to report on agriculture land use in Australia.

This Agricultural Property Draft Data Model report builds on the proposed definition of agricultural property detailed within the companion *Agricultural Property Definition* report, and uses the insights derived from analyses of the stakeholder consultation to develop a draft data model. The draft data model includes description of the product and its purpose, the spatial representation of the dataset, a data model schema diagram, attributes, and a data dictionary, potential contributors, metadata, access levels, potential business models, data history, and ideas for production, maintenance and delivery. It is also supported by the terminology descriptions (refer to the Appendices) and statement of driver and value proposition (section 2) from the *Agricultural Property Definition* report.

Acknowledgements

This research project would now have been possible without the generous support and contributions from many organisations and individuals. Most notably, the project was sponsored by Meat and Livestock Australia in partnership with Geoscape Australia, with these organisations also supporting the Project Review Group. We would also like to acknowledge the contributions of the many people who were interviewed, attended workshops, or provided survey contributions to this process.

2. Key Information from the Definition Report

A companion to this document has been created to discuss the drivers, justification and complexity around creating a definition of agricultural property.

The key pieces of information from this *Agricultural Property Definition* report that impact the data model are the driver, value proposition, overarching definition, definition sub-classes, and the data model key insights from stakeholder consultation. These are all highlighted below. For descriptions of the terminology used and relationships between terms as per the definition report, please refer to Appendix 1 – Terminology and Appendix 2 – Relationships Between Terms.

KEY DRIVER
Biosecurity

VALUE PROPOSITION
A nationally consistent definition of agricultural property and an associated data model will improve efficiency, minimise risk, and increase profitability for countless agricultural use cases by creating an accessible, authoritative source of current, consistent and complete agricultural property data.

OVERARCHING DEFINITION
An agricultural property is a land parcel, or a collection of land parcels, with common ownership and an agricultural usage.

DEFINITION SUB-CLASSES
- Class 1 – Primary Production
- Class 2 – Moderate/Hobby Agricultural Usage
- Class 3 – Casual/Urban Agricultural Usage

DATA MODEL KEY INSIGHTS
- Data model should align with the cadastre and the PIC reform
- Property boundaries are key, parcel and paddock boundaries would also be useful to a lot of stakeholders
- Key attributes should be part of the model, which should also consider compatibility with existing datasets
- Data history is important but not critical to most applications, currency is more important
- Data contributors should be minimised to reduce complexity in creation and maintenance
- Access levels are essential, with a level of open data recommended
- As much metadata as possible should be included, adopting an existing standard
- MVP that can be accurately created and maintained, leveraging existing data

3. Informal Description of the Data Product

The draft data model for the agricultural property dataset describes a minimum viable product (MVP). It focuses on a Stage 1 (see section 14) initial production of high accuracy, complete data for sub-class 1 of the definition – Primary Production, although the model does allow for expansion of the MVP in future, for example to include paddock level information. The draft data model is subject to change based on the PIC reform process outcomes, as creation of an agricultural property dataset at the Class 1 level will require the inclusion of plants as part of the PIC. The draft data model should also be validated with a biosecurity use case before it is finalised.

The Agricultural Property dataset aims to be the authoritative source of Australian agricultural property information. Records aim to include the definition sub-class, Property Identification Code (PIC), Cadastral identifier, property owner and contact details, physical property address, enterprise operator and contact details, property manager and contact details, agricultural usage and ABN, noting that some of this information is sensitive. The dataset is comprised of two themes:

1. Australian Agricultural Property Boundaries
2. Australian Cadastral Boundaries (Parcels) within agricultural properties

The Agricultural Property dataset will use existing and recognised Cadastral data and other sources (referred to as contributors) of information from the state and territory government land records and Commonwealth government agencies. A rigorous process will be used that involves textual address comparison, matching and geospatial validation to provide both national consistency and national coverage.

It should be noted that there are currently several other projects within this space which may inform, contribute to, or need to align with this data product (and vice versa). These should be kept in mind when developing the dataset through the stages of development described in section 14. Projects include:

- Federal Department of Agriculture: *Property Identification (PIC) Reforms*
- ICSM, Permanent Committee for Cadastre: *Cadastre 2034: Powering Land and Real Property*
- Food Agility CRC: *Unique Property Identifiers*
- Forest and Wood Products Australia & Cotton RDC: *Increasing farm gate profits, the role of natural capital accounts*
- Australian Farm Institute: *Defining a Farmer (new project)*
- DAS: *Agricultural Property Dataset & Paddock Crop Types*
- DataFarming: *DEA Labs Automated Agricultural Paddock Boundary Delineation*
- ProAgrica: *AgEx data analytics agricultural property data for their customers*

4. Purpose

Agricultural Property will be a seamless national database of Australia's agricultural property and associated land parcels. Agricultural property data is a foundation dataset enabling many applications with a focus on biosecurity, and aiding improvements to agricultural process' and systems.

The dataset is being designed to meet the needs of organisations that require a graphical representation of agricultural properties and land parcel boundaries on a broad scale (especially when data for all sub-classes is available). The included attributes will then enable users to filter the broad dataset to their specific application requirements and/or integrate it with other data in servicing their business needs. It will be possible to use this graphical index of agricultural property and land parcels to reference and overlay other geographic and land administrative data available from respective jurisdictions.

The Agricultural Property theme will provide a national dataset that identifies the three relationships that exist between an agricultural property and a cadastral parcel. These are:

1. where one cadastral parcel is equal to one agricultural property
2. where many cadastral parcels make up one agricultural property
3. where one cadastral parcel contains many agricultural properties

5. Spatial Representation

The key insight from stakeholder engagement informing this component of the data model is **property boundaries are key, parcel and paddock boundaries would also be useful to a lot of stakeholders**. Hence the MVP should focus on agricultural property boundaries, and as properties are parcels or collections of parcels the inclusion of parcels is logical. There is often confusion in the language of parcels and properties when it comes to boundaries, so part of the value of an MVP will be to test with suppliers and customers whether this key insight has been interpreted appropriately. Although paddocks are of interest to stakeholders, automated paddock data creation is currently in its infancy and may be better integrated at a later stage. The integration of address points, buildings or property features like dams into this dataset is not recommended, as they would significantly increase complexity, and these features would be better stored in separate but readily linkable datasets.

The Agricultural Property dataset will cover the boundaries within the complete national geography of Australia (AUS). The feature type will be spatial polygon for the properties and parcels. The table below outlines the features and the method of their integration into the dataset.

Table 1 Dataset spatial features and integration

| Entity	Description	Integration	Rules
Agricultural Property	An agricultural property is a land parcel, or a collection of land parcels, with common ownership and an agricultural usage. An Agricultural Property may have many contiguous or non-contiguous polygons defining its boundary. Parcels separated, or divided, by a road, watercourse or railway may be considered to be contiguous. If a Property has strata, these will be captured as points. As states and territories handle contiguousness differently, permitting both will allow jurisdictions to retain their current methods.	An Agricultural Property has: • One to many related parcels • Zero or more related G-NAF Address records • PIC • One or more management entities (person or business) • Agriculture Usage	Property should be related to at least 1 parcel record.
Parcel	A Cadastral Parcel is the smallest area of land capable of sale without further approval to subdivide. It will usually only have 1 polygon defining its boundary. However, in some cases it is necessary to have many polygons defining the boundary. These cases are usually when road/river easements run through the parcel.	A Parcel has: • One to many related properties	Parcel should be related to at least 1 property record.

The below four diagrams of Figure 1 provide visual examples of the spatial representation of contiguous and non-contiguous properties and parcels within the Agricultural Property dataset.

1. Single property with one contiguous parcel

Property	1 property
Parcels	1 contiguous parcel (light green) split by a road
Owner	Same owner recorded on title however may be an individual, couple, partnership, or company
PIC	One or more PICs (sub-class 2 and 3 properties may have 0)
Agricultural Usage	Contains an agricultural usage, activities may vary e.g. mix of crops and grazing
Address	One or more address'

2. Single property with two contiguous parcels
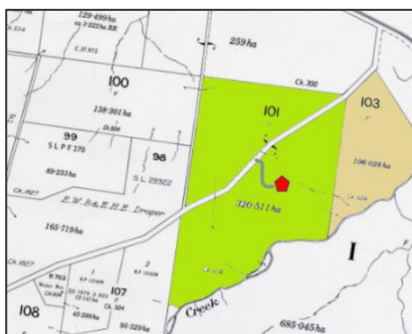
Property	1 property
Parcels	2 contiguous parcels (light green and brown)
Owner	Same owner recorded on title however may be an individual, couple, partnership, or company
PIC	One or more PICs (sub-class 2 and 3 properties may have 0)
Agricultural Usage	Contains an agricultural usage, activities may vary e.g. mix of crops and grazing
Address	One or more address'

Note: If parcel 103 (brown) was leased by the owner of 101 (light green) rather than owned, it would still be a single property (assuming it is a registered lease).

However, if both 101 and 103 have the same owner and 103 is leased to another via a registered or private lease, the parcels would be separate properties.

3. One/Two properties (depending how the jurisdiction handles contiguity) with three parcels
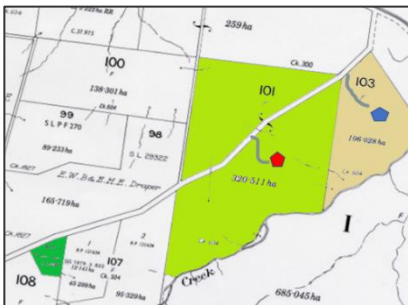
Property	1 or 2 properties depending how jurisdiction handles contiguity
Parcels	3 parcels (light green, brown and dark green), 1 of which (dark green) is non-contiguous
Owner	Same owner recorded on title of all three parcels however may be an individual, couple, partnership, or company
PIC	One or more PICs (sub-class 2 and 3 properties may have 0)
Agricultural Usage	Contains an agricultural usage, activities may vary e.g. mix of crops and grazing
Address	One or more address', at least 2 likely

4. Two/Three properties (two green, one red) with the same owner but non-contiguous
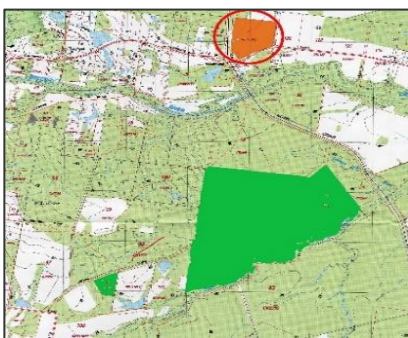
Property	2 or 3 properties depending how jurisdiction handles contiguity, assuming red parcel outside bounds of contiguity for all
Parcels	4 or more
Owner	Same owner recorded on title of all parcels however may be an individual, couple, partnership, or company
PIC	One or more PICs (sub-class 2 and 3 properties may have 0)
Agricultural Usage	Contains an agricultural usage, activities may vary e.g. mix of crops and grazing
Address	One or more address', at least 3 likely

Figure 1 Visual examples 1-4 of the spatial representation of Agricultural Property data (adapted from (Hirst et al., 2018)

6. Data Model Schema Diagram

The key insight from stakeholder engagement informing this component of the data model is the **data model should align with the cadastre and the PIC reform** so that the data is authoritative and aligns with official government business and institutional frameworks. This is consistent with this report's recommendation that the MVP should focus on agricultural property boundaries and parcels, as parcels are the spatial boundaries of the cadastre. Hence including parcels will mean the Agricultural Property dataset does align to the existing cadastre, although it will not contain all parcels or properties, only those within the definition of agricultural property. The resulting agricultural property layer may be different to the property layer defined by the land taxation and valuation framework due to complex agricultural ownership and leasing arrangements; however, this will become clearer during dataset development.

PICs and their associated attribute information also form a key component of the ideal data model schema shown in Figure 2. Paddock level data has been included to future proof the data model for later stages of development. One advantage of the relational model is that components can be pursued independently using a staged approach to implementation (see section 14). A staged approach will likely be required because of challenges in accessing some data (e.g. there can be a significant price tag to purchasing some title information from jurisdictions). The suggested stages may need to be refined as development progresses. The data model schema references several external tables; these have been included to show integration points with the schema and should not be considered part of the Agricultural Property Data Model.
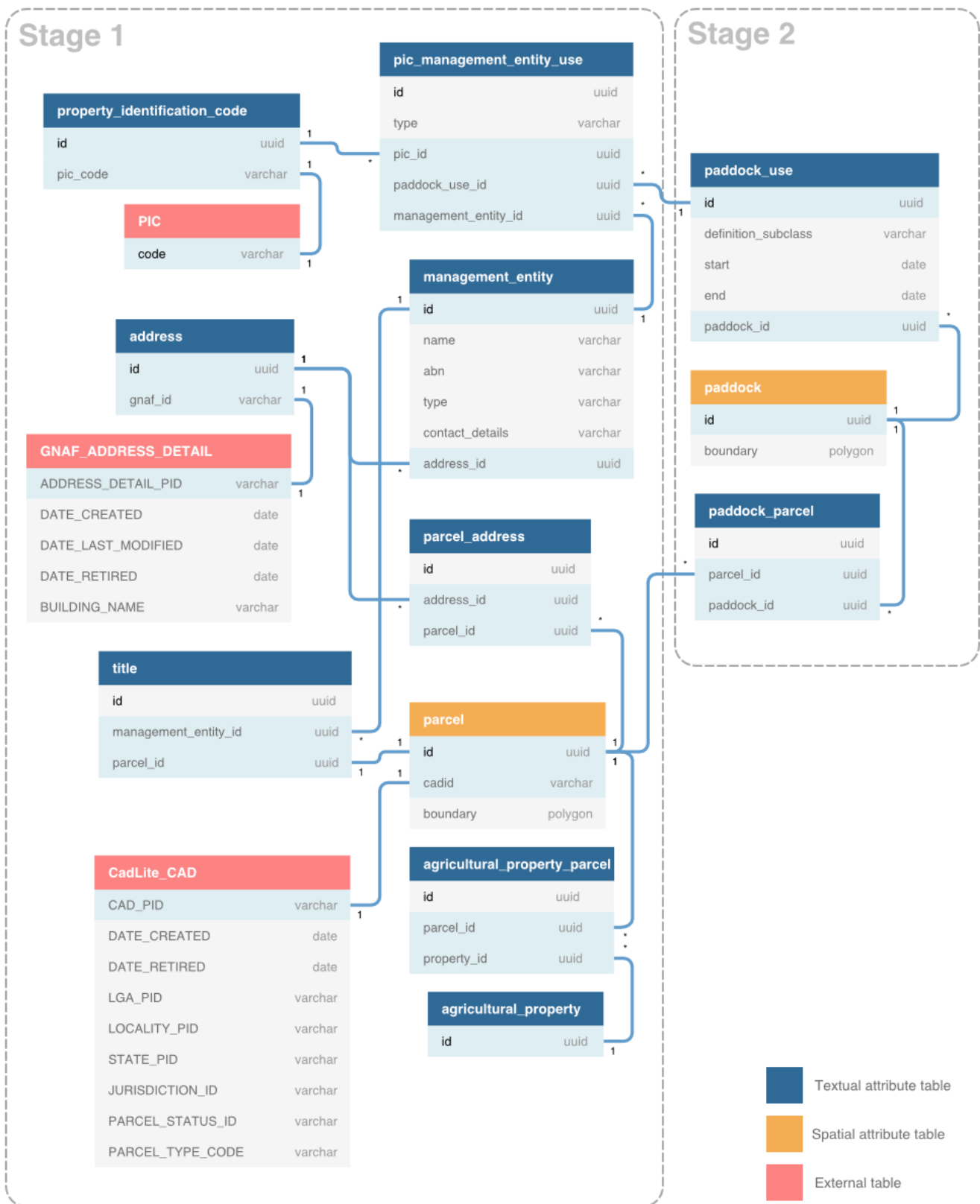
Figure 2 Data model schema diagram (for explanation of stages see section 14)

7. Attributes and Data Dictionary

The key insights from stakeholder engagement informing this component of the data model are that **key attributes should be part of the model, which should also consider compatibility with existing datasets** and the **data model should align with the cadastre and the PIC reform**. The key attributes and existing datasets they may be sourced from are provided in Table 2, along with more information on what is contained in existing datasets in Table 3 (section 8). Please reference Table 3 to understand the *Source* column of Table 2. Each additional attribute included in the dataset increases complexity and the risks associated with dataset creation, hence stages of development are recommended (see section 14) which may need to be refined during development.

Table 2 Key attributes and sources

Priority Rank	Key Attribute	Source	Importance
1	Definition sub-class number	Created as part of the dataset	Required as part of the definition sub-classes described in the *Agricultural Property Definition* report. Required by the ATO to subset the dataset to class 1 for their use case.
2	Property Identification Code (PIC)	NLIS PIC database (or new national register if one is created as part of the PIC reform), or jurisdiction PIC databases	Requested by 55% of survey stakeholders and rated highly by phone interview stakeholders. A key attribute for the biosecurity use case and required to meet the key insight *data model should align with the cadastre and the PIC reform*.
3	Cadastral identifier	Geoscape Australia's CadLite cadastral parcels, or jurisdiction cadastral datasets	Requested by 54% of survey stakeholders. Required to meet the key insight *data model should align with the cadastre and the PIC reform* and enable easy linkage to cadastral data.
4	Property owner and contact details	NLIS PIC database (or new national register if one is created as part of the PIC reform), or jurisdiction PIC databases	Rated highly by phone interview stakeholders. A key attribute for the biosecurity use case in order to be able to contact property owners. Sensitive information so will require restricted access.
4	Physical property address	Geoscape Australia's Geocoded National Address File (G-NAF) and/or PIC database	Requested by 50% of survey stakeholders and rated highly by phone interview stakeholders. A key attribute for the biosecurity use case in order to access a property.
4	Enterprise operator and contact details	NLIS PIC database (or new national register if one is created as part of the PIC reform), or jurisdiction PIC databases	Requested by 52% of survey stakeholders. A key attribute for the biosecurity use case in order to be able to contact enterprise operators.
5	Property manager and contact details (persons responsible for stock and/or plant types)	NLIS PIC database (or new national register if one is created as part of the PIC reform), or jurisdiction PIC databases	Rated highly by phone interview stakeholders. A key attribute for the biosecurity use case in order to be able to contact property managers.
5	Agricultural usage description (specific	NLIS PIC database (or new national register if one is created as part of the PIC reform), or jurisdiction PIC databases, or	Rated highly by phone interview stakeholders. A key attribute for the biosecurity use case in order to understand the agricultural usage type/s and

	type(s) of enterprise being conducted)	Valuer Generals Australian Valuation Property Classification (land use) Codes*, or earth observation analysis	hence livestock and crops present on the property.
5	Australian Business Number (ABN)	Australian Business Register (ABR)	Rated highly by survey and phone interview stakeholders. Required by the ABS (and potentially also the ATO) to determine EVAO to subset the dataset to their use case.
6	Estimated Value of Agricultural Operations (EVAO)	Australian Business Register (ABR)	Rated highly by survey stakeholders. However, not recommended for the MVP as can be derived via the ABN attribute.
7	ALUM class	ABARES Australian Land Use and Management Classification (ALUM) 2016	Outlined as part of definition sub-classes but not essential for the MVP as can be obtained through spatial analysis or inferred from the sub-class definition.
7	ANZSIC subdivision	Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006	Outlined as part of definition sub-classes but not essential for the MVP as can be inferred from the sub-class definition.
8	Ground cover	ABARES ACLUMP Ground Cover Monitoring for Australia	Rated highly by survey stakeholders as part of weighted average results. However, not recommended for the MVP as can be linked via spatial analysis.
8	Annotations	Department of Agriculture, Water and the Environment National Residue Survey	Rated highly by survey stakeholders as part of weighted average results. However, not recommended for the MVP as PIC capable to be linked to chemical residue status.
8	Landscape status	ABARES ACLUMP National, or jurisdictional landscape datasets	Rated highly by survey stakeholders as part of weighted average results. However, not recommended for the MVP as can be linked via spatial analysis.

These are nationally consistent codes that were agreed to by the Valuer Generals of all jurisdictions about 10 years ago but may not have been adopted by all states and territories.

The feature catalogue in support of the data model schema is provided in Appendix 3 – Data Dictionary. Spatial attributes will be added to the feature catalogue in the same manner as other attributes for completeness and conformance to the data model schema. Table 4 refers to all tables in the Feature Catalogue.

8. Potential Contributors

The key insight from stakeholder engagement informing this component of the data model is **data contributors should be minimised to reduce complexity in creation and maintenance**. For the initial MVP, the contributors to the data are likely to be the state and territory government departments responsible for cadastral data via Geoscape Australia's CadLite product, state and territory government departments responsible for PICs via the national PIC register/s (e.g. NLIS and a new plant system if one is implemented), state and territory government land records and Commonwealth government agencies responsible for address data via Geoscape Australia's G-NAF product, and business owners via the Australian Government ABR, as listed in Table 3. It is important to recognise that some data may not be available at the record level for all users, for example, the ABR is not available at the record level to non-government users. These jurisdictional datasets are already provided and nationally consolidated, which minimises effort for the MVP.

Stages 2 and 3 of development may require additional data from state and territory government departments for example attributes from jurisdictional Valuer Generals - with the information in Table 3 based on the Victorian Valuer General database. Later stages may also require a broader range of contributors for example Research and Development Corporations or individual property owners of properties without PICs, and potentially the creation of data such as paddock boundaries. This may necessitate incentives for contribution or further legal reform to mandate the provision of information. For example, property owners may be incentivised to provide these details by giving them a free biosecurity management plan as an outcome, which is currently a legislative requirement for farmers and a business overhead for them.

Table 3 Existing national and state level contributing datasets

Existing Dataset	Information it Contains	Type
Geoscape Australia's CadLite, or jurisdiction cadastre datasets	Cadastral parcels and identifiers	Spatial (polygon)
NLIS PIC database (or new national register if one is created as part of the PIC reform), or jurisdiction PIC databases	The reform principals state the following must be included in jurisdictional databases (Australian Government Department of Agriculture, 2019); • PIC • property owner name, or other responsible individual, ABN (where available), contact and associated property details • property street address and/or geospatial identifier • property manager details (if applicable) • enterprise operator details (if different from property owner details) • details of persons responsible for stock and/or plant types • type(s) of enterprise being conducted and a description of the specific livestock and/or plant types present • associated enterprise ownership details, including associated properties • capable to be linked to property pest and disease status—for example, quarantined • capable to be linked to chemical residue status • status of property identifier (active or inactive)	Aspatial (but potentially spatial after the reform as principals state "The property identifier will be associated with a readily accessible state or territory geospatial database")
Geoscape Australia's Geocoded National Address File (G-NAF), or jurisdiction address datasets	Property address including state, suburb, street, number and coordinate reference	Spatial (point)
Australian Business Register (ABR)	• ABN • business contact details including an address, postal address, email address and telephone number • business activity (usually the main source of income for the enterprise e.g. agriculture) • business locations (for all premises operated by the enterprise) *Note*. ABN is the key piece of information required from the ABR. The remaining attributes may alternatively be sourced from the PIC database.	Aspatial
Jurisdiction Valuer Generals Databases	• Australian Valuation Property Classification (land use) Codes • Land value drivers e.g. arable versus non-arable, access to property, water supply, water rights, pasture condition, vegetation type, soil type, license areas, zoning and overlay information, land area, building areas.	Aspatial

9. Metadata

The key insight from stakeholder engagement informing this component of the data model is **as much metadata as possible should be included, adopting an existing standard**. This supports the implementation of a comprehensive metadata standard for the agricultural property dataset. It is suggested that the existing ANZLIC metadata profile guidelines https://www.anzlic.gov.au/sites/default/files/files/anzlicmetadataprofileguidelines_v1-2.pdf (available via the page https://www.anzlic.gov.au/resources/anzlic-metadata-profile) be used which adopt established Australian, New Zealand and International Standards including the ISO 19115 Geographic information - Metadata standard.

10.   Access Levels

The key insight from stakeholder engagement informing this component of the data model is **access levels are essential, with a level of open data recommended**. Many stakeholders advocated for a level of open data or an aggregated, deidentified version of the dataset to enable statistics, planning and economic growth reporting. Privacy was highlighted as a big concern by stakeholders and it was proposed that primary producers be able to nominate what information pertaining to their property is made available, possibly as part of the PIC registration/reform process.

With biosecurity as the key driver, it is also critical that relevant government organisations have access to the necessary sensitive information (e.g. contact, property access, numbers of livestock etc.) in the case of biosecurity and emergency response. This is in line with the PIC reform principals which state "In the event of a biosecurity or food safety emergency or as otherwise required by law, the property identifier, and associated data, is to be shared to the maximum amount permitted, consistent with privacy legislation, amongst the Australian Government, state and territory governments, research laboratories and industry as appropriate" (Australian Government Department of Agriculture, 2019).

 Hence, four levels of access are proposed:

1. Open Limited Access
    a. To agricultural property boundaries and limited attribute information based on attributes that are already freely available from other sources or are not sensitive information
    b. Access provided via Open Data (www.data.gov.au)
2. Commercial Moderate Access
    a. To all spatial data within the agricultural property dataset and any additional attributes primary producers nominate to be made available pertaining to their property, or if nomination is not possible, a standard set of non-sensitive attributes if there are any in addition to the *Open Limited Access* level
    b. Geoscape Australia Partner Network via a commercial model
3. Emergency Full Access
    a. To all spatial data within the agricultural property dataset and all attribute information available including sensitive information
    b. Possibly under the Biosecurity Act 2015
4. Jurisdictional Full Access
    a. State departments contributing to the dataset receive a completed data product back for their state only, to incentivise state level contributions. They would be required to adhere to the other three access levels if providing the data beyond the department.

11.   Business Model

There are a number of different business models under which the dataset creation could be funded. While this paper does not intend to propose a business model, potential business models that could lead to a sustainably resourced agricultural property product include:

1. Government Funded Model
    a. Suitable for development of a government held data product
    b. It may include an open data access level (see section 10)

Examples of this include the Australian Business Register (Federally funded), the Valuer Generals land use codes (state funded). These data products are also likely to be inputs to the proposed agricultural property data product.

2. Full Commercial Model
    a. An entity or entities seek to create the dataset and get a return on the investment by selling the dataset and providing supporting services
    b. Unlikely to have the same level of open data access

Examples of this include the Data Farming paddock boundary data product, or commercially available satellite imagery products such as Maxar, Airbus and Planet.

3. Hybrid Model
    a. Some government funding in return for a commitment by the entity or entities creating the data to maintain an open version of the dataset, with a commercial model for higher value attributes
    b. The access levels proposed in section 10 imply a form of hybrid model whereby the commercial moderate access level subsidises the cost of building and maintaining the dataset

An example of this would be the current Geoscape Australia model. The GNAF Address dataset is funded by the government as an open data product, however Geoscape Australia also consolidates and aligns a range of other government data products and serves these to customers as a commercial model.

12.   Data History

The key insight from stakeholder engagement informing this component of the data model is **data history is important but not critical to most applications, currency is more important**. Data currency is critically important to applications such as emergency response for which data history is not as relevant, however things like historical chemical use can be important. Hence, data history should be captured but may not be implemented as part of the initial MVP. It may be incorporated at a later stage of development of the product. A suggested approach for this is to keep all spatial data and attributes within the one dataset and attribute with a "retired" flag which can be used to filter the master dataset so that only current data is supplied to users (or historical data if requested). This is in line with the way the Victorian government manages data history within the Vicmap products.

13.   Update, Maintenance and Delivery

Data maintenance enforces data integrity (both spatial and aspatial) while quality assurance processes are used to check the structural integrity of the data. The ideal situation is a level of continuous maintenance which is indicative of a well-connected ecosystem. However, this is probably unrealistic for the MVP. Hence, there will be different update frequency requirements for the spatial component and various attributes of the MVP dataset. The suggested update schedules for the proposed components of the MVP dataset are;

- Geoscape Australia CadLite data is updated monthly so a monthly update schedule should be implemented for the spatial data
- PIC data will ideally have a monthly (or more frequent) update schedule as (after the reform) requirements will be
    o *It is to be mandatory for property owners (or other responsible individual) to provide and update required information.*
    o *There will be certain material changes including change of ownership and contact details that will need to be updated within 14 days.*
    o *Property identifier information will be renewed at least every three years.*
- Geoscape Australia's G-NAF is updated quarterly so address information sourced from G-NAF should be updated quarterly
- ABR data will ideally have a monthly (or more frequent) update schedule as ABR requirements are
    o *Users must update their details within 28 days of becoming aware of changes.*

Users could access this data through a variety of methods but as per the Access Levels described, there will likely need to be some level of control to support this. Access via APIs and downloads (ideally self-help type access models once user credentials are established) are the most logical.

14. Production Ideas

The key insight from stakeholder engagement informing this component of the data model is a **MVP that can be accurately created and maintained, leveraging existing data**. Hence it is suggested that creation of the MVP dataset should leverage the existing cadastre for its spatial basis and the PIC, G-NAF and ABR databases for attribute information. There should be a clear and transparent workflow of how the dataset is created and updated to ensure acceptance and uptake of the dataset and willingness to contribute to it. There will also need to be stages of development, in line with the levels of completion and accuracy of the sub-classes of the definition such as;

1. **Stage 1** = MVP leveraging existing data and based on developing complete and accurate data for sub-class 1
2. **Stage 2** = Improving the completion and accuracy of data for sub-class 2, potentially adding paddock boundaries and additional attributes and incorporating data history
3. **Stage 3** = Improving the completion and accuracy of data for sub-class 3, potentially adding additional attributes and implementing a level of continuous maintenance

These proposed stages of development may need to be refined during dataset development.

A suggested potential Stage 1 workflow for the initial MVP is:

1. Start with the CadLite national cadastre
2. Overlay CadLite with G-NAF address data to apply the physical property address attribute to each property
3. Match the address and/or cadastral parcel to the PIC reform "*property street address and/or geospatial identifier*" based on the following PIC reform principles
    a. *The property identifier will be associated with a readily accessible state or territory geospatial database, which is able to be accessed by other jurisdictions in the event of a biosecurity emergency or other regulatory purpose.*
    b. *The property identifier is to be identified with a locality based street address and/or a geospatial reference of the property area.*
4. Filter the matched dataset to remove properties without a PIC
5. Apply all relevant attributes from the PIC database
    a. *property owner name, or other responsible individual, ABN (where available), contact and associated property details*
    b. *property street address and/or geospatial identifier*
    c. *property manager details (if applicable)*
    d. *enterprise operator details (if different from property owner details)*
    e. *details of persons responsible for stock*
    f. *type(s) of enterprise being conducted and a description of the specific livestock present*
    g. *associated enterprise ownership details, including associated properties*
6. Match the filtered dataset to the ABN database on business address from *d* above and ABR database attribute
    a. *business contact details including an address, postal address, email address and telephone number*
7. Apply the ABR database ABN to properties without an ABN already from the PIC database

Stakeholder thoughts on the future proofing and maintenance component included that in order to develop the dataset, memorandums of understanding should be established with the data providers. Ideally there should be a collaborative, pull request model which allows attributes to be added later with a mechanism to allow users to suggest new attributes and apply for amendments. A steering group may be required to approve changes. An automated update process should be implemented for the dataset.

15.   References

1. Australian Government Department of Agriculture (2019). Livestock/Plant sector property identification reforms—draft principles and business rules. [online] Property ID reforms. Canberra: Commonwealth of Australia. Available at: https://haveyoursay.agriculture.gov.au/property-id-reforms [Accessed 12 Mar. 2020].
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15. Appendices

Appendix 1 – Terminology

Term	Description/Definition
Address	An address is a structured label - usually containing a property number, a road name and a locality name - used to identify a plot of land, a building or part of a building, or some other construction (Hirst et al., 2018). Geocoded addressing is the process of associating an address with coordinates such as a latitude and longitude to enable it to be readily mapped and related to other spatial data. Geoscape Australia's G-NAF geocoded address dataset contains all physical addresses in Australia.
Agricultural activity type (Land use)	The type of agricultural activity or land use conducted on land, for example the Australian Land Use and Management (ALUM) Classification system includes the classes: Grazing natural vegetation, Production forestry, Dryland cropping, Irrigated horticulture, Intensive animal and plant production etc. See also "Land use".
Agricultural usage	As biosecurity is the key driver of the definition of agricultural property in this report, the term "agricultural usage" is adopted within the definition instead of "primary production". For this purpose, agricultural usage is broader than primary production and encompasses all existing and emerging sectors of agriculture, businesses and hobbies, with no minimum property size or value output, including for example hobby farms, peri-urban and urban properties with single livestock, fruit trees and vegetable gardens, farmers markets and travelling stock routes etc. Emerging sectors include native plants such as kakadu plum, seaweeds and native pepper, as well as newer additions to Australian agricultural flora such as quinoa, hazelnuts and coffee. Emerging animal industries including sea urchin, camel milk, game birds, working dogs, alpaca and crocodile (AgriFutures Australia, n.d.).
Biosecurity	Biosecurity involves science-based quarantine assessments and policy advice designed to prevent, respond to and recover from pests and diseases that threaten the economy and environment, as well as protect animal, plant and human populations against harmful biological or biochemical substances. (Department of Agriculture, Water and the Environment, 2020)
Business	The ATO describes factors that indicate a business as including (Australian Taxation Office, 2019): • Registration of a business name or obtaining an ABN • Intention to (eventually) make a profit • Repetition of similar types of activities • Size or scale of the activity is consistent with other businesses in the industry • The activity is planned, organised and carried out in a businesslike manner. This may include keeping business records and account books, having a separate business bank account, operating from business premises, having licenses or qualifications, having a registered business name.
Cadastre (Parcel)	A cadastre is an official register showing details of ownership, boundaries and the value of real property in a district, made for taxation purposes. A cadastral map displays how boundaries subdivide land into units of ownership. Digital Cadastral DataBases (DCDBs) are modern versions of 'the cadastre' and provide spatial views of land parcels. (ICSM, 2019b)
Hobby farm	A hobby farm is generally considered by banks to be a non-income-earning rural property usually between 10 to 100 hectares (Home Loan Experts, 2019). However, it is possible to earn a small amount of money selling things like eggs and vegetables at a market. The ATO describes a hobby as having no intent, plan or system to make a profit; being motivated by personal pleasure; having no repetition or regularity of sales; not carried on in the same manner as a normal business activity; of small scale; and any produce is sold to friends and relatives and not to the public at large (Australian Taxation Office, 2011).

Holding	A land holding is a term used in NSW to refer to a collection of non-contiguous parcels that are under common ownership. (Hirst et al., 2018)
Land	Land is often referred to as 'real property', which, in very basic terms, means property that is fixed and immovable — as distinct from personal property which, again in basic terms, means property (as in goods and chattels) that is not fixed and can be moved. (ICSM, 2019b)
Land cover	Land cover refers to the physical surface of the earth, including various combinations of vegetation types, soils, exposed rocks and water bodies as well as anthropogenic elements, such as agriculture and built environments. Land cover classes can usually be discriminated by characteristic patterns using remote sensing. (ABARES, 2016)
Land status / tenure	Land status refers to the land tenure or legal regime under which land is owned. In Australia it includes freehold (including forms of freehold land tenure that are held by traditional owner groups including Aboriginal and Torres Strait Islander land) and non-freehold land or Crown land, which may either be leased or licensed. (Australian Trade and Investment Commission, 2019)
Land use	Land use is the purpose to which the land cover is committed. Some land uses, such as agriculture, have a characteristic land cover pattern for many (but not all) agricultural uses. These usually appear in land cover classifications. Other land uses, such as nature conservation, are not readily discriminated by a characteristic land cover pattern. For example, where the land cover is woodland, land use may be timber production or nature conservation. National land use mapping in Australia is conducted broadly at two scales: national scale and catchment scale. Both land use mapping methods use the Australian Land Use and Management (ALUM) Classification system. (ABARES, 2016)
Land value drivers	The drivers for land value include attributes such as whether the land is arable or non-arable, access to the property, water supply, water rights, pasture condition, vegetation types, soil type, license areas, zoning and overlay information and so on.
Lease (agricultural)	An agricultural lease is any lease of land for the purpose of production, growing, harvesting and farming of produce. Tenancy Acts vary between states/territories.
	Some of the most common types of lease are (The Farm Table, 2020):
	• fixed cash: the tenant pays a fixed amount of rent/hectare on a monthly, bi-annually or yearly basis
	• flexible cash lease: this is a variation to the above and involves the final rental payment being tied to the actual yield and/or selling price of the commodity. This ties in the expense for the tenant to profitability and the landowner shares in the risk/return
	• crop or livestock share lease: the landowner may supply some of the production inputs (e.g. Cropping: seed, labour, chemical, fertiliser or Livestock: equipment, feed costs) and then may receive a portion of the final crop or livestock income/weight gain
Lot or Lot on plan (Parcel)	Lot on plan is a legal parcel description or a parcel identifier. The codes used vary by state/territory.
Manager	In terms of agriculture, manager may refer to the property (land) manager i.e. the person responsible for the management of the property, or the farm manager i.e. the person responsible for the agricultural activity e.g. husbandry of the livestock or the management and biosecurity of the crops.
Owner	In terms of agricultural property there are two types of owner: the property (land) owner, and the agricultural activity (crop or livestock) owner. These may or may not be the same.
	Ownership is having the better rights to possession i.e. ownership means more than possession in the example of a rented property where the tenant has rights to possession, but the owner can still

	end the lease provided legal requirements have been adhered to (Craddock Murray Neumann Lawyers Pty Ltd, 2014). Owner, of land, means the following (Hirst et al., 2018): a. if the land is freehold land - the registered owner of the land b. if the land is the subject of a lease registered under the relevant land title Act - the lessee of the land c. if the land is the subject of a registered lease of state-owned land (State Owned Land Leases) - the lessee of the land d. if the land is a reserve - the trustee of the reserve e. if a person has occupation rights in relation to the land under a licence or permit - the licensee or permittee f. If land is state-owned land administered by a state agency for a specific use (e.g. state forest, national park) – the state agency
Paddock (field)	The smallest unit of production of a property being a field or plot of land enclosed by fencing or defined by natural boundaries. Paddock is used more frequently when referencing open areas that are fenced in, with livestock such as cows, sheep and horses in them. Field is used more frequently when referencing an area in which crops are grown.
Parcel (also known as block)	A land parcel is an area of land with defined boundaries, under unique ownership for specific real property rights (ANZLIC, n.d.). The Geoscape Australia CadLite cadastre theme contains parcels which are *essentially the smallest area of land capable of sale without further approval to subdivide*. It may consist of more than one piece (e.g. if split by an easement). A parcel defines the area of land that is owned, each parcel is referenced by a land title which defines who the owner is and the conditions of ownership. A CadLite Cadastral Parcel (CAD) will usually only have 1 polygon defining its boundary. However, in some cases it is necessary to have many polygons defining a CAD's boundary. These cases are usually when road/river easements run through the CAD (CadLite Product Description, 2017).
PIC	A property identifier (or property identification code) is the basis of a traceability system. State or territory governments currently issue PICs to properties with livestock. Each state/territory currently has different rules relating to PICs but there is a national reform underway. (Department of Agriculture, Water and the Environment, 2019)
Polygon	A polygon is any 2-dimensional shape formed with straight lines.
Primary production (agricultural)	Primary production involves acquiring raw materials e.g. metals and coal, oil, rubber, foodstuffs, fish. Agricultural primary production is a subset of this for agricultural products. For tax purposes, a primary producer is an individual, partnership, trust or company operating a primary production business if they undertake: plant and/or animal cultivation, fishing and/or pearling, or tree farming and/or felling (Australian Taxation Office, 2018).
Property (land)	The PIC reform and CRCSI report *Understanding and defining property spatial data* agree on the definition of 'property', however the CadLite Product Description differs in that parcels do not have to be contiguous (touching). - PIC Reform: A property will consist of one or more parcel(s) of land that are contiguous or sufficiently proximate, operated as a single business under the same ownership or management arrangement (Australian Government Department of Agriculture, 2019). - CRCSI Report: A property is a land parcel, or a collection of contiguous land parcels (parcels separated, or divided, by a road, watercourse or railway may be considered to be contiguous), with single ownership used for a common usage by a single entity (Hirst et al., 2018).

	• CadLite: A property is an area of land recognised by Local Government (or equivalent agency in the ACT) as a singularly valued/rateable entity. It may comprise one or more cadastral parcels or part of a parcel with boundaries not needing to align between the two (although commonly this is the case). Where the property is comprised of multiple parcels, the parcels do not have to be contiguous. A CadLite Property may have many polygons defining its boundary (CadLite Product Description, 2017). Hence for the purposes of the definition of agricultural property, the definition of property used will be a land parcel, or a collection of contiguous or non-contiguous land parcels, with single ownership used for a common usage. As states and territories handle contiguousness differently, permitting both will allow jurisdictions to retain their current methods. This is in line with Principal 2 (especially 2.3 and 2.6) of the PIC reform draft principles ad business rules (Australian Government Department of Agriculture, 2019).
Title	The foundation of property rights under Australian law (Craddock Murray Neumann Lawyers Pty Ltd, 2014). Property legislation in all states and territories is based on the Torrens principle of registration of title. Each state and territory has a central register of all land in the state which shows the owner of the land. The land title is the official record. It can also include information about mortgages, covenants, caveats and easements. (Australian Government, 2020)
Traceability	Traceability is the ability to follow the movement of a product through stages of production, processing and distribution. It is very important for biosecurity. (International Standards Organisation, 2007)

Appendix 2 – Relationships Between Terms

Terms	Relationship
Address - Property	A property can have zero or many addresses. An address must be unique and therefore can be assigned to only one property, however an address, of some form, should be assigned to each property.
Agricultural activity type – Land use	Agricultural activity types can be categories of land use. Not all land uses are agricultural, and existing land use classification descriptions may not cover the detail of all agricultural activity types.
Cadastre – Parcel	Parcels are the spatial boundaries of the cadastre. The cadastre contains additional information on ownership and value.
Lot on plan – Parcel	Lot on plan is a legal parcel description or a parcel identifier.
Paddock - Parcel	There is a many-to-many relationship between paddocks and parcels. Three examples that are supported by a many-to-many relationship between paddocks and parcels are; 1. where one paddock is equal to one parcel 2. where many paddocks make up one parcel 3. where one paddock contains many parcels
Property - Business	There can be zero, one or multiple businesses on a property. A business may also own one or more properties.
Property - Parcel	The Property theme of CadLite provides a national dataset that identifies the three relationships existing between a property and a cadastral parcel (CadLite Product Description, 2017). These are: 1. where one cadastral parcel is equal to one property 2. where many cadastral parcels make up one property 3. where one cadastral parcel contains many properties
Title – Parcel	Each parcel is referenced to a land title which defines the owner and conditions of ownership.
Title - Lot on plan	Some properties may have one title but many lots-on-plan within that title.
Title - Property	A property may have one title or multiple titles.
PIC - Business	One or multiple PICs can be controlled by one business.
PIC - Property	Each state/territory currently handles PICs differently (see below for examples). All state/territory governments currently require PICs for properties related to livestock. There is a national reform underway to extend PICs to plant production as well as create consistency between jurisdictions. • In NSW a property usually has its own PIC, but on approval by Local Land Services (LLS) there can be multiple properties per PIC if the properties are used for a common purpose (e.g. grazing the same livestock) and are adjoining or nearby. • In the NT, PICs are permanently attached to the parcel of land and stay with the property, not with the owner. • In SA, one PIC is required per property if the property has multiple parcels of land within 100km, however if parcels are more than 100km apart each must register a different PIC. • In VIC, a single PIC can be allocated to a property consisting of more than one parcel of land, provided the blocks are part of the one enterprise and are within the same or adjacent localities. Home gardeners are not required to apply for a PIC. Three relationships exist between PIC and property: 1. one property can have one PIC 2. one property can have multiple PICs 3. multiple properties can have the one PIC

Appendix 3 – Data Dictionary

Table 4 Reference table for feature catalogue data dictionary tables

Column	Abbreviatio	Description
Name	Name	The Name of the column in the integrated Database
Data Type	Data type	The data type of the column
Description	Description	A description of the column and what the expected contents are
Primary Key	Prim Key	If 'Y' then this column must always have a unique value
Obligation	Man	Y = mandatory. If 'Y' (mandatory), this column is populated with data. That is, all ACTIVE records must have values in this column.
Foreign Key Table	F K TABLE	Represents a column in the 'Foreign Key Table' that this column is referred to by another table.
Foreign Key Column	F K Col	Represents a table in the integrated Database that this column is referred to.
10 Character Alias	10 Char Alias	An alias for this column name – up to 10 characters maximum. Used to define the name of the column when in ESRI Shapefile format.

Note: tables noted as being external to the Agricultural Property Data Model have not been included in the data dictionary. Please refer to their corresponding product definition documents.

The agricultural property table (Table 5) has been included with the expectation it will be expanded in future.

Table 5 Agricultural property

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id

The agricultural property parcel table (Table 6) maintains the many-to-many relationship between properties and parcels. In future it is expected that additional attributes will be added to this table. The id attribute could be removed by utilising a composite key of the parcel_id and property_id attributes.

Table 6 Agricultural property parcel

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
parcel_id	uuid	Parcel		Y	parcel	id	parc_id
property_id	uuid	Property		Y	property	id	prop_id

The parcel table (Table 7) has a one-to-one relationship with cadastre parcels defined in the CadLite product. To offer a degree of flexibility parcels are not required to have a cad_id or geospatial boundary definition.

Table 7 Parcel

Name	Data Type	Description	Prim Key	Man	FK TABLE	FK Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	ID
cad_id	varchar	Cadastre parcel as defined in CAD Lite product.					cad_id
boundary	polygon	Geospatial boundary of the parcel					boundary

The parcel address table (Table 8) maintains the many-to-many relationship between parcels and addresses.

Table 8 Parcel address

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
address_id	uuid	Address			address	id	cad_id
parcel_id	uuid	Parcel			parcel	id	boundary

The address table (Table 9) has been included to support the Agricultural Property Data Model persisting some details relating to an address. Including a definition of an address in this data model reduces the number of references to external data and supports referential integrity, if required the address table could be replaced by referring directly to the GNAF Address Detail table.

Table 9 Address

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
gnaf_id	uuid	Address					gnaf_id

The title table (Table 10) supports the principle that each parcel has a title and that title is held by a management entity.

Table 10 Title

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
management_entity_id	uuid	Management entity holding title		Y	management_entity	id	me_id
parcel_id	uuid	Parcel		Y	parcel	id	parc_id

A management entity as per the management entity table (Table 11) may refer to a person or business.

Table 11 Management Entity

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
name	varchar	Name of person or business					name
abn	varchar	Australian Business Number					abn
type	Varchar / enum	String or enum indicating the type of this management entity (person, business)					type
contact_details	varchar	Name, phone number, email address. This attribute could be expanded.					contact
address_id	uuid	Address			address	id	addr_id

The property identification code table (Table 12) has been included to reduce the number of references to external data and supports referential integrity. If required, the property identification code table could be replaced by referring directly to an external PIC table.

Table 12 Property Identification Code

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
pic_code	varchar	PIC identifier					pic_code

The PIC Management Entity Use table (Table 13) links a PIC to the paddock it is applied to along with a management entity. The type attribute within this table defines the nature of the relationship (e.g. farmer, administrative contact, ownership of crops or livestock).

Table 13 PIC Management Entity Use

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
type	Varchar / enum	Defines the nature of the relationship between the PIC, paddock, and management entity.					type
pic_id	uuid	PIC		Y	property_identification_code		pic_id
paddock_use_id	uuid	Paddock use		Y	paddock_use	id	pu_id
management_entity_id	uuid	Management Entity		Y	management_entity	id	me_id

The paddock use table (Table 14) adds a temporal component to the relationship between paddocks and their use (as defined by links to the PIC). Null values for an end date of a paddock use indicate current use.

Table 14 Paddock use

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
definition_subclass	Varchar / enum	Definition subclass (eg; class 1 – Primary Production, class 2 – Moderate / Hobby Agricultural usage, class 3 – Casual / Urban Agricultural Usage)		Y			subclass
start	date	Start date the paddock was used for		Y			start
end	date	Date at which the paddock ceased being used					end
paddock_id	uuid	Paddock being used for this timeframe		Y	paddock	id	padd_id

The paddock table (Table 15) defines the existence and geospatial boundary (if available) of a paddock.

Table 15 Paddock use

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
boundary	polygon	Geospatial boundary of property					boundary

The paddock parcel table (Table 16) maintains the many-to-many relationship between paddocks and parcels. The id attribute could be removed by utilising a composite key of the paddock_id and parcel_id attributes.

Table 16 Paddock use

Name	Data Type	Description	Prim Key	Man	F K TABLE	F K Col	10 Char Alias
id	uuid	Unique identifier	Y	Y	-	-	id
paddock_id	uuid	Paddock			paddock	id	padd_id
parcel_id	uuid	Parcel			parcel	id	parc_id