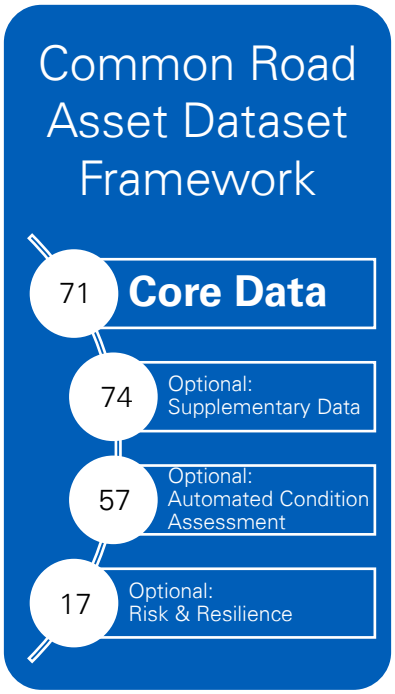
Common Dataset Framework Approach

Common Dataset Framework

Common Dataset Framework

A core component of the RRSP has been to develop a Common Dataset Framework (refer to Attachment 1 – Rural Roads Common Dataset Framework) that will help build consensus on road statutory and funding grant reporting requirements, as well as reflecting good road asset management practices.

This Common Dataset Framework leverages and builds on previous industry harmonisation efforts, in particular the Austroads Data Standard for Road Management and Investment in Australia and New Zealand,[4] and sense checked against the Vicmap Transport Data Model. This Common Dataset Framework has been developed through consultation with nominated council representatives, nominated State Government representatives and external entities (e.g. MAV, IPWEA). The Common Dataset Framework confirms the statutory and grant data requirements from various authorities and gains understanding of the local government operating environment through sample data and survey questions.



The Common Dataset Framework allows areas for improvements to be identified which can be tailored to each council's operating environment. In summary, the Common Dataset Framework is made up of Core and Supplementary data items:

- Core data items to meet statutory, grant, emergency and basic asset management requirements
- Optional supplementary data items as value-add data items to further support and inform asset management decision making
- Optional risk and resilience data to support asset management decision making
- Optional automated pavement condition assessment data to demonstrate best practice in road pavement condition monitoring.

An 8 asset lifecycle information layer methodology is adopted as the foundational structure across the Common Dataset Framework. Those 8 information layers represent the asset lifecycle in a simple and purpose driven manner, capturing the *What, Where, Capability, Utilisation, Condition, Performance* and *Cost* related to road assets. It enables the opportunity for the dataset to grow in the future in a organised manner as the maturity of council practice evolves.

How the Framework should be Interpreted

This Common Dataset Framework is not an enforced standard, but a framework that outlines the core data items together with optional supplementary data items. This Common Dataset Framework does not represent the 'final destination' in terms of asset information practices, rather a framework outlining current requirements, and enabling future dataset expansions. It is important to note that, the *Work* (e.g. repair of a pothole) information layer is not within the scope of the Common Dataset Framework.

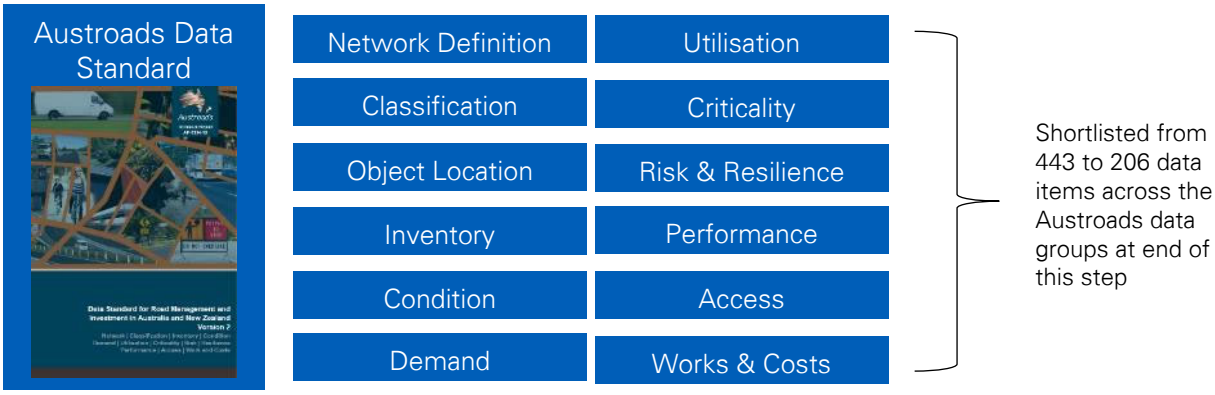
A Four Step Development Methodology

Step 1 – Adapting and shortlisting critical data elements from the Austroads Data Standard

As noted by the Institute of Public Works Engineering Australia (IPWEA) "*Austroads' Road Asset Data Harmonisation Project is ambitious. The project team's goal is to help every level of road agency and government across Australia and New Zealand gradually adopt standardised ways of recording road asset information.*" While ambitious, the Austroads has paved the way through its development of a harmonised data standard for road management and investment.

The first step in the Common Dataset Framework development involved the review and identification of relevant data elements within the Austroads data standard for rural council environment. This includes understanding Austroads prioritised harmonised data items as well as the varying levels of data sophistication. This have resulted in 206 data items being shortlisted from the full 443 Austroads data items. For additional information on Austroads data functional groups, refer to Appendix.

Figure 1: Shortlisting of Austroads Data Items Process



[4] IPWEA, Paving the way: Austroads Road Data Harmonisation

Common Dataset Framework

Step 2 – Application of the 8 asset lifecycle information layers

An 8 asset lifecycle information layer methodology is adopted as the foundation structure of the Common Dataset Framework. This approach is adaptive and caters for future dataset expansions as the asset management practices of the different council's mature.

Data items within the Common Dataset Framework are categorised into these 8 information layers shown in Figure 3. Those information layers are used as a simple but effective way to represent asset lifecycle across the plan, acquire, operate, maintain and dispose phases (see Figure 2), and highlights the fundamental purposes of the data.

This enables information organisation and represent inter-relationships with different information concepts. It also enables communication between asset management and non-asset management personnel. Relationships between data within the layers can be hierarchical, relational aggregated, calculated or derivable.

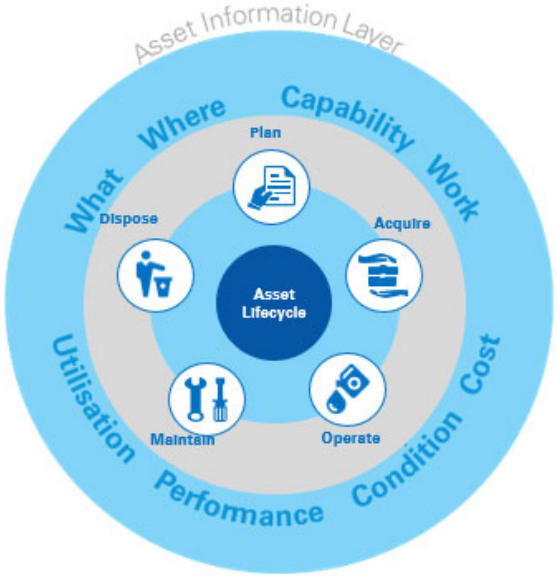


Figure 2: The 8 Asset Lifecycle Information Layer Methodology

Note that the *Work* layer is out of this project scope. The *Work* information layer refers to data used to describe defects (e.g. potholes), work orders and treatments, commonly managed utilising a computerised maintenance management system (CMMS). *Work* data is captured as its own register and involves nested relationships between defect, treatment, contract management, workflows and customer relationship management. *Work* data acts as a parallel and relational database to the data that is directly describing the road asset.

Figure 3: The 8 Asset Information Layers

What

Typical *What* information would be static, factual, primary data such as the asset identifier, asset classification (type, sub-type), ownership and responsibility, time of installation, asset to asset relationship IDs. Knowing the 'What' allows targeted tracking and decision making on an asset entity over the duration of its life.

Where

Typical *Where* information would describe the topographical and topological location. This could be within a polygon (catchment, zone, facility), a polyline (linear assets start, end and route) or a point (spatial xyz co-ordinates, next to, attached to). Knowing the 'Where' allows targeted decisions making with the significance of different locality in mind.

Capability

Typical *Capability* information describes what an asset is capable of delivering such as factual tolerances, depth, weight capacity, output from a design perspective. Covering off function and capacity of that the asset is capable of delivering, the actual capability can degrade through deteriorating asset condition. Knowing the 'Capability' allows in-depth decision making such as comparing capability against utilisation, and current versus desired capability.

Cost

The financial information associated with a assets or work on assets. These capital and operational costs will be brought together to determine the whole life cost of an asset. Costs also include the current value of the assets (e.g. replacement value, written down value). Knowing the *Cost* enables lifecycle costing to be part of decision making. It enables benefits versus costs and defines the value of our asset portfolio.

Utilisation

Typical *Utilisation* information include measuring what factors that cause an asset to degrade. Utilisation measures how much the asset has been used at a point in time (e.g. traffic volumes, traffic type and axle load). Knowing the 'Utilisation' allows in-depth decision making such as utilisation against capability, and track change in utilisation over time.

Performance

Typical *Performance* information includes time dependent target measures at whole of network, system or individual asset level. At a system level, this could be KPIs, financial performance measures, levels of risk, levels of service (e.g. technical, customer). Knowing the 'Performance' allows in-depth decision making that is organisational, system, and service outcome facing.

Condition

Typical *Condition* information includes a rating against peer assets which are typically measured using algorithm or prediction models. This information is largely defined in Engineering Standards but must be available in a form that supports on-site operations (e.g. condition score (1-5)). A representation of condition can also be captured through photos or sensors. Knowing the 'Condition' allows in-depth decision making that evaluates the assets current state as well as future lifecycle states.

Work (out of project scope)

Typical *Work* information includes time dependent information used to record the future or historic activities on an asset or location. This includes: *What* asset, task, date, duration, results, crew or person. Knowing the *Work* enables understanding of historical and actual work loads as well as forward works pipelines.

Common Dataset Framework

Step 3 – Reviewing shortlisted dataset against statutory, grant funding and asset management requirements

This step involves the identification and incorporation of relevant council reporting data items identified by the various entities. These entities were the Victoria Local Government Grants Commission (VLGGC), Emergency Management Victoria (e.g. DFRA Guidelines), Vicmap (e.g. transport data model) and the Australian Local Government Association (ALGA). A sample rural council road asset datasets was also examined. This process resulted in the addition of 19 data items which brings the total data item count to 225 at the end of this step.

The initial short listed Common Dataset Framework was then tested with the councils. The feedback from the councils identified that their asset management plan and long term financial plan met the Local Government Act obligations, while road management plan met the Road Management Act requirements. Councils agreed that the Common Dataset Framework met the VLGGC and disaster and emergency grant funding requirements. Roadside Weed and Pest Control grant reporting had mixed responses on the level of relevance it had with Common Dataset Framework.

A summary of the council reporting obligations across statutory and grant requirements mapped to the 8 asset information layers are shown in the Table 1. The ticks represent the relevant information layer required to support the reporting obligations.

Table 1: Application of the Asset Lifecycle Information Layers to Council Reporting Obligations

		Asset Lifecycle Information Layers							
		Where	What	Capability	Utilisation	Condition	Performance	Cost	Work
Reporting Obligations	Asset Management Plan	x	x	x	x	x	x	x	x
	Long Term Financial Plan	x	x	x		x	x	x	x
	Road Management Plan	x	x	x		x	x		x
	Victoria Local Government Grants Commission (VLGGC)	x	x	x	x			x	
	Natural Disaster/Emergency DFRA Grants	x	x	x	x	x		x	x
	Roadside Weed/Pest Control Grant	x	x						

Step 4 – Undertake survey across the councils to build consensus and develop a tailored common dataset framework

Each council undertook a self-assessment in terms of data availability and quality. Councils' view on each data item's relevance to council's current asset management processes were sought.

The final Common Dataset Framework has utilised the combined knowledge gained from industry best practice through the Austroads Data Standard, identified statutory, grant funding and asset management data requirements from key entities as well as an understanding of the rural council environment and maturity through individual surveys.

The Common Dataset Framework is separated into core data, which is a fundamental requirement, and optional data, which act as value-add opportunities and good practice outcomes. A total of 71 data items are classified as core and 148 data items classified as optional. Data items are treated as core data when it is:

- Required to meet statutory, grant funding or basic asset management requirements, and
- A majority of councils have highlighted the data item as critical as part of their asset management practice (7 out of 10 councils)

Table 2: Number of Data Items in Asset Lifecycle Information Layers

Asset Information Layer	Number of Core Data Items	Number of Optional Data Items
What	9	4
Where	10	2
Capability	15	27
Utilisation	7	6
Condition	5	82
Performance	11	21
Cost	14	6

Appendix

Grant Funding Data Requirements

Identified data requirements from VLGGC (Victorian Local Government Grants Commission) grant process

Information Layer	Data Element	Example
What	Asset class	E.g. pavement
Where	Road ID	Identifies the location of the asset
	Road name	
	Chainage at start of street segment	
	Chainage at end of street segment	
Capability	Functional classification	E.g. arterial
	Strategic route	Y/N
	Road length	Length of road segment
	Road surface status	E.g. sealed, unsealed formed & sheeted, unsealed natural
Utilisation	Average annual daily traffic	Traffic volume AADT
	Daily vehicle count	Traffic volume vpd
	Traffic count method	Actual or estimated
Cost	Current Replacement Value	Current replacement cost for asset valuation
	Written Down Value	Current WDV or depreciated replacement cost for asset valuation

Grant Funding Data Requirements

Identified data requirements from Disaster Recovery Funding Arrangement and Emergency Management Funding grant process

Information Layer	Data Element	Comment
What	Asset class	E.g. pavement
Where	Road ID	Identifies the location of the asset
	Road name	
	X/Y coordinate start	
	X/Y coordínate end	
	Chainage at start of street segment	
	Chainage at end of street segment	
Capability	Functional Classification	E.g. arterial
	Traffic flow direction	E.g. one-way, two-way
	Length	Road length and length of seal
	Width	Link section average width and width of seal
	Area	Area of seal
	Road surface status	E.g. sealed, unsealed
	Surfacing material type	Pavement surface material
	Layer material	Pavement formed layers material
Utilisation	Tourist route	Route information
	Hospital access road	Route information
	Bus or public transport route	Route information
	Average annual daily traffic	Traffic volume AADT
	% of AADT classified as heavy vehicle	% of heavy vehicle as part of AADT
Condition (Pre-Disaster)	Visual pavement condition data	Various pavement condition survey results (pre-disaster or business as usual) Condition photo is captured.
	Visual condition survey date-time	
	Visual condition survey operator	
	Visual condition survey photo	
	Pre-disaster report	Reference link to completed DFRA pre-disaster asset condition assessment report

Austroads Data Function Groups

Austroads Data Standard

- Network Definition
- Utilisation
- Classification
- Criticality
- Object Location
- Risk & Resilience
- Inventory
- Performance
- Condition
- Access
- Demand
- Works & Costs

Function Groups	Overview Statement (sourced from Austroads)
Network Definition	All road agencies need to define its road network in terms of the road links and their connectivity. This network model provides the basis for route planning and referencing network related data that cannot be directly associated with road based assets.
Classification	Classification for a transport network/system attributes to each component link a functional priority or status level within the network. Any network will generally include links classified at most levels across this spectrum within it. In this Standard the New Zealand One Network Road Classification (ONRC) has been used as an example of a classification system.
Object Location	All assets (objects) are represented, spatially as a point, polyline, or polygon, depending on the extent of the asset. The appropriate graphical representation has been specified, for each asset group, in the inventory section of this Standard.
Inventory	Inventory is the basic information about assets that includes describing the location, type and attributes of the asset. Asset inventory information is fundamental to making informed asset management decisions, and it's associated reporting. Asset inventory elements and associated components are therefore critical for aggregated asset reporting, service standards, asset performance measurement or asset management activities.
Condition	Condition data describes asset information that relates to either its functional performance or where it sits in its lifecycle. Understanding condition data is fundamental to many asset management practices including planning, valuation and predictive modelling. Condition data will often interact with other pieces of data to inform items such as access, performance, risk, works and costs.
Demand	"Demand" refers to measurement of the required usage and/or traffic loading of the asset. Most road management agencies record data in some form about the usage of the asset. Most commonly this would include traffic information. Demand asset data therefore includes data like average daily traffic, annual traffic, percentage heavy vehicles and similar information. There are different standards and practices of measurement and recording of demand information.
Utilisation	Utilisation is the current usage versus current capacity and is typically presented as a ratio. The ratio defines the proportion of an asset's available capacity that is being used. Most road management agencies record data in some form about the usage of the asset. Most commonly this would include traffic information. Utilisation asset data therefore includes data like average daily traffic, annual traffic, percentage heavy vehicles, pedestrian counts, bicycle counts and similar information. There are different standards and practices of measurement and recording of utilisation information.

Austroads Data Function Groups

Austroads Data Standard

Network Definition	Utilisation
Classification	Criticality
Object Location	Risk & Resilience
Inventory	Performance
Condition	Access
Demand	Works & Costs

Function Groups	Overview Statement (sourced from Austroads)
Criticality	Criticality considers the importance of assets in the delivery of the organisational obligations and objectives. In a road context, this can be considered in two ways: • At an asset or component level, in terms of how individual the assets impact the route; and • At a road level, in terms of the importance of that route. The organisational objectives may include economic development, economic sustainability, safety, preservation of life, and community welfare.
Risk	Risk analysis determines the potential to gain or lose something of 'value', that is determining the probability of quantifiable damage, injury, liability, loss, or any other negative occurrence caused by external or internal vulnerabilities, and that may be avoided through pre-emptive action. Risks analysis should be undertaken on all asset related activities such as planning, design, construction, acquisition, operations and disposal. Risk assessment is part of the process of continual improvement rather than a one-off action. Assessments need to be reviewed and updated within the risk registers throughout an asset life.
Resilience	Resilience of road transportation lifelines is dependent on their vulnerability to a loss of quality or serviceability, and the time taken to bring them back into original usage state after the reduction or loss of service. Resilience is considered in three states: Damage State, Access State, and Duration State. The reason for this is that after an event some availability may be able to be reinstated in a relatively short time frame. These three states can be assessed for various scenarios on primary routes, and be plotted on to a GIS layer to understand the impact of an event at a network level.
Performance (Asset)	Asset performance, in terms of this Standard, refers to technical levels of service (TLoS) derived from objective data and measured qualitatively. Measurement of TLoS enables asset owners and users to understand how the network of assets is performing.
Performance (Financial)	Financial performance, in terms of this Standard, refers to Financial Level of Service (FLoS) measures that provide an indication of the financial efficiency and effectiveness derived from objective data and measured qualitatively. Measurement of FLoS enables asset owners and users to understand how the network of assets is performing in terms of financial return and sustainability.
Performance (Service)	Levels of service have traditionally been presented in terms of technical or engineering focused requirements, such as intervention triggers and response time requirements. In recognition of the increasing focus in the way the assets support the delivery of the service to the community, customer levels of service are being used to evaluate the service performance of asset systems.
Access	Access and restrictions for the transport network/system includes the factors that affect or limit travel use or behaviour by some or all users of the road asset, often based on some characteristic of the user.
Works and Costs	The purpose of this function group is to provide a data set for planning, describing and capturing maintenance and forward works and the associated costs.