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PNG RMS Data Standard

13/02/2025 8:41 am +10

The **PNG DoWH RMS Data Standard**, accessible at the link below. The Data Stanadard is described and defined by the following two datasets;

- The **Table Register** contains a (draft) list of relevant PNG DoWH RAMM database tables. For each table listed, additional information is included such as a short description about the table's purpose and operational status.
- The **Data Dictionary** contains a detailed list of (draft) attributes for the relevant tables listed in the Table Register. For each attribute identified, additional supporting information is provided such as the attribute description, data type and obligation level.

The data standard is a living document and is updated to reflect changes in the configuration of the *Papua New Guinea AWM database*.

Access the live version of the PNG DoWH RMS Data Standard by clicking here.

The Data Standard Essentials

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What is the Data Standard?

The data standard is made up of three parts:

1. A spreadsheet that sets out and defines the data tables that will be used in AWM
2. A spreadsheet that sets out and defines the attributes in each of the data tables.
3. Articles in this KnowledgeBase (KnowledgeOwl) that provides supporting information that allow users to better understand and use the data standard consistently in a variety of scenarios.

Asset Table Names

- You will notice asset table names with "(AMDS)'. This indicates that the table has come from the AMDS standard.
- If the name has "(AMDSX)" at the end it indicates that the data standard is a modified version from AMDS.
- If the name has "(PNG)" at the end it indicates that this is a new data design specifically for local RMS needs (e.g. Causeway)

The following provides deatil of each table currently being deployed as part of phase 1 of the Road Management System (RMS) implementation whihc Asset & Work Managment (AWM) forms part of.

Assets to be Managed in AWM

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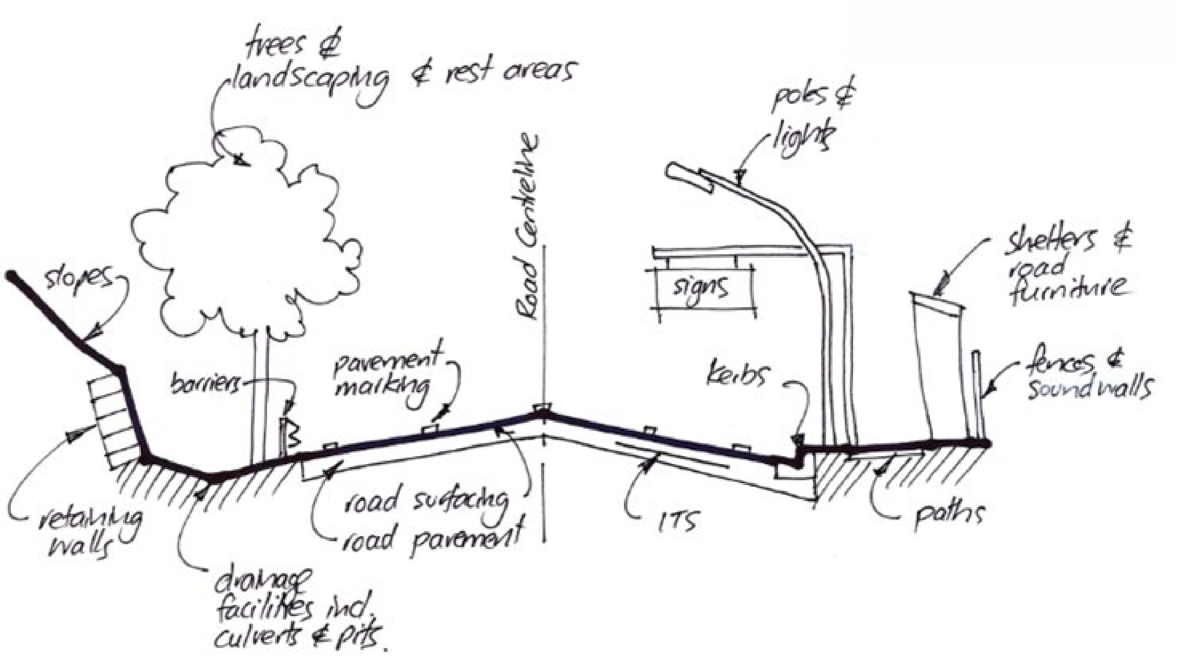

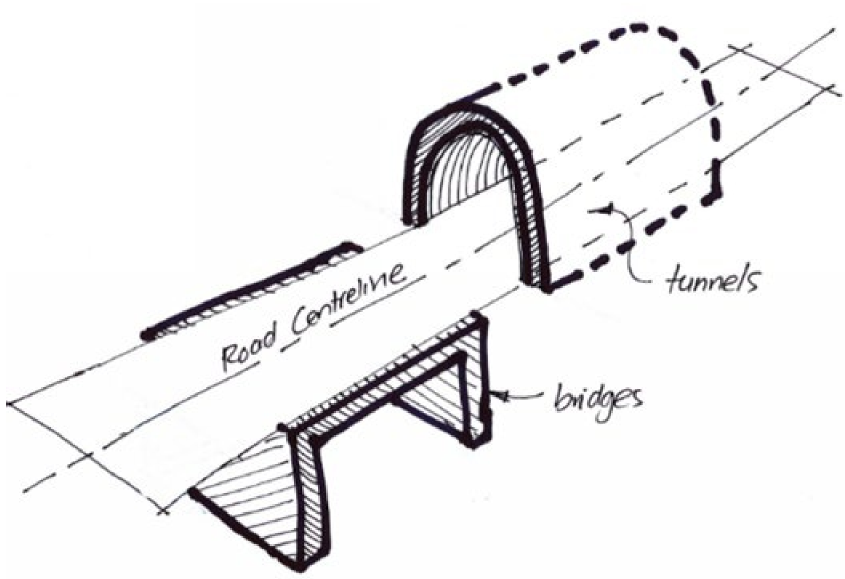

The following sets out the assets and asset components that are to be managed in RAMM.

Pavement & Surfacing

- Pavement Layer (AMDS)
- Subgrade Layer (AMDS)
- Surfacing Later (AMDS)

Road Structures

- Bridge (AMDS)
- Bridge Span (PNG)
- Mahor Culvert (PNG)
- Retaining Wall (AMDS)

- Sea Wall (AMDS)
- Causeway (PNG)
- Tunnel (AMDS)

Drainage System

- Chamber (AMDS)
- Channel (AMDS)
- Culvert (PNG)
- Headwall (AMDS)
- Water Area (AMDS)

Amenities

- Cultural Installation (AMDS)

Street Lights

- Luminaire (AMDS)

Intelligent Transport Systems (ITS)

- Camera (AMDS)
- Controller (AMDS)
- Electronic Sign (AMDS)

Traffic Signals

- Aspect (AMDS)
- Target Board (AMDS)
- Traffic Signal (AMDS)

Support Structure

- Pole Structure (AMDS)
- Outreach (AMDS)
- Gantry (AMDS)
- Mast (AMDS)

Pathway

- Pathway (AMDS)

Barrier

- Barrier (AMDS)
- Barrier Terminal (AMDS)
- Crash Cushion (AMDS)

Traffic Services

- Rail (AMDS)
- Sign (AMDS)
- Delineator (AMDS)

Geotech

- Ground Treatment (AMDS)

Assets that could be Managed in AWM in the Future

[WIP]

- Stopping Place (AMDS)

Network & Other Information to be Managed in AWM

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The following sets out the network information that are to be managed in AWM.

Core Network Information

- Road Names
- Carriageway

Other Network Information

- Intersections
- Restrictions
- RiverCrossing

Other Infromation

- Points of Interest
- PNG Useful Areas
    - Provinces

Geometry Guidance

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Introduction

Geospatial information is vital to PNG DoWH, as it underpins the management, analysis and reporting of land transport assets now and into the future.

Transport assets are often located close together and beside other physical objects. Having confidence in the recorded location of assets is important, as it can enable assets to be located and identified more efficiently, and for faults to be found and remedied promptly.

This guidance provides a framework for recording the location of transport assets with sufficient accuracy for future needs. It will help to ensure consistency and confidence in the positional information of assets to assist maintenance and support planning.

Unlike some other practice documents and standards, which provide clarification on how to determine positional measurements, the underlying focus of this guidance is on specifying a relatively simple and generic way of recording the position of transport assets.

Purpose of the guidance

This guidance establishes a specification for the positional accuracies for recording transport assets. It is intended to be used when collecting information on the location of assets, such as when preparing an 'as built' record. This will enable the surveyed spatial information to be recorded in RAMM accurately in three dimensions (X, Y, Z).

The guidance is not expected to be applied to existing records, as this could create a significant burden and expense for PNG DoWH. Instead, it provides a framework that can be used whenever there is physical interaction with the asset, such as during maintenance or fault repair.

The guidance is intended to enable the assets to be located and relocated at any time, using GNSS (Global Satellite Navigation System) technology such as GPS. The accuracy obtainable from various products using this technology continues to increase and become more affordable.

It also provides for the recording of accurate invert levels. More accurate technologies may be required to determine these levels.

Target audience and users

The guidance is intended to be used by PNG DoWH, contractors, surveyors and engineers who undertake work on the assets.

PNG DoWH and asset managers will be able to specify (e.g. in contracts) that this guidance should be used when recording the location of new or maintained assets.

Scope

The guidance is limited to the position associated with an asset (i.e. the X, Y, Z coordinates).

Datums and Projections

This section of the document has not been populated and needs to be confirmed. Some resources from *The Association of Surveyors of Papua New Guinea* has been found that may be relevant to this topic: http://www.aspng.org/techinfovert.htm and http://www.aspng.org/techinfopng94.htm

This section outlines how the horizontal and vertical positions should be reported, suggested asset geometries, and the capture and use of the Z location.

Horizontal Position

All horizontal positions should be reported in TBC.

Vertical Position

All vertical positions should be reported in TBC.

Suggested Asset Geometries

Geometry Type	Lat/Long	Start Lat/Long	End Lat/Long	Z	Asset Information
Point	Yes			Yes	Yes
Polyline, Polygon and Voxel	Yes	Yes	Yes	Yes	Yes

Accuracy

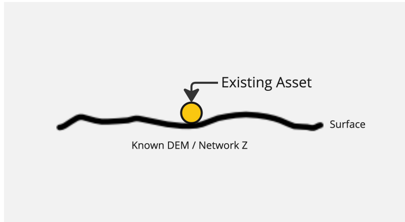
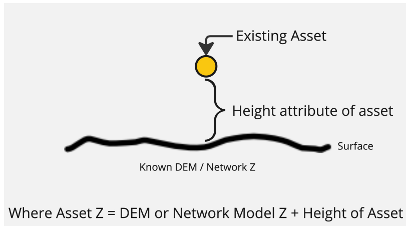
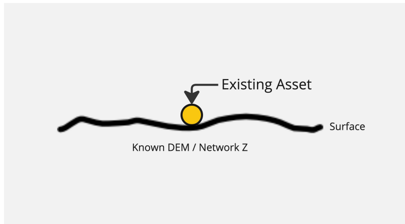
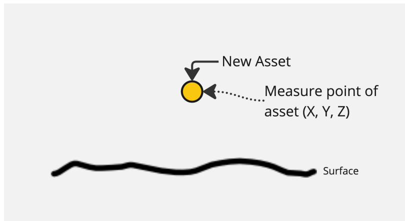
Specifying the level of accuracy is important, and this is to be assessed based on the method of collection used for both horizontal and vertical reference systems. Options include:

- draped
- LiDAR
- survey
- nothing

The capture and use of the Z location

New assets should have their Z location collected with a high level of accuracy. Where this information is not available or feasible to collect, the Z location could be calculated using appropriate software applications that can leverage the Network Model as a base point / DEM.

The accuracy level for DEM calculated Z geometry will only be as good as the DEM and Network Model that is currently available. Some common scenarios are outlined below.

Asset Status	Does the asset sit flush on the surface?	Guidance	Guidance Diagram
Existing Asset	Yes	If the asset has no previous Z geometry information, then the Z value defaults to the surface level of the DEM/Network Model.	
	No	The Z value is calculated from the DEM/Network Model and the the asset height field.	
New Asset	Yes	Record the Z for the new asset with the data collection device placed on the ground.	
	No	Record the Z for the new asset with the measurement taken from the base of the asset at its start height from the surface.	

Reference / Attribution

This guidance document has been adapted under the Creative Commons Attribution 4.0 International license, from the Waka Kotahi NZ Transport Agency (www.nzta.govt.nz); Asset Management Data Standard Geometry Guidance v1.0 document.

Background to Development of the Standard

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- This data standard has been created by Simon Gough (GHD), Scott McIntyre (Datastack - supporting GHD), Stuart Trounson (GHD) and Elliot McBride (GHD) as part of the PNG Transport Sector Support Programme.
- The following standards have been used as source information to provide some of the inputs for the creaton of the PNG RMS data standard:
    - The NZ Asset Management Data Standard (AMDS)
    - Auckland Transport Database Operations Manual (ATDOM) - partly written by Simon Gough and Scott McIntyre
    - Austroads Asset Data Standard

Data Standard Background Information

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Data Standard Development

1. The AMDS (see below) has recently been developed in New Zealand as a current data standard and RAMM are progressively rolling out data tables that align to this standard.

2. As AMDS is a thorough standard for roading requirements AND RAMM is providing data tables already aligned to this standard, it was logical to use AMDS as the base data definition for assets that are going to be managed in the PNG RAMM database.

3. Modifications have been made to the AMDS requirements where it was felt that they did not suit PNG requirements

4. The PNG RMS Data Standard is aligned to the data structure (tables) in RAMM so that it is pratical and simple to use. It can therefore be considerd a data requirements and a data structure standard.

> The data requirements for networks follow the RAMM 'core' tables (standard tables that can't be changed) as opposed to any separate data standard.

External Data Standards

The NZ Asset Management Data Standard (AMDS)

The AMDS is currently being implemented into all road authorities in NZ. I will provide a few links below. I am not expecting you to read all of this, but just in case you want to know where this standard comes from.

- Overall information on the project: https://www.nzta.govt.nz/roads-and-rail/asset-management-data-standard/
- Latest release of the standard: https://www.nzta.govt.nz/roads-and-rail/asset-management-data-standard/development/data-standard-releases/

Austroads Data Standard

Austroads also have a data standard for roading information. This is not so tightly aligned to RAMM, hence why AMDS was chosen as the base data standard.

- Information on their latest version 4 release can be found here: https://austroads.com.au/latest-news/fourth-edition-of-austroads-road-asset-data-standard

> Austroads (represented by Sarah Jones (sarah@drivenstrategyandpolicy.com) as the Project Manager) has rovided approval that PNG DoWH can include portions of the Austroads standard in their standard.

Network Type

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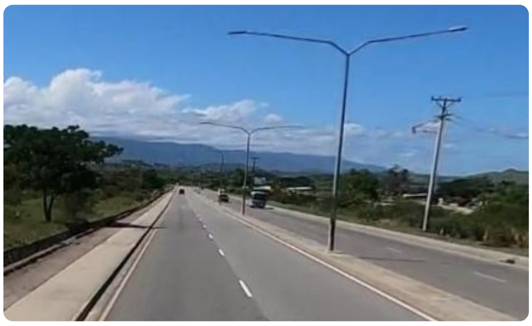
AWM Table:	**Carriageway**
Attribute:	**Network Type**
Purpose:	To provide road categorisation that differentiates the current level of service provided by the road section (carriageway). This closely aligns to accessibility, the type of vehicle that can be used and comfort experience of the road users.

Value	Description	Photo Example
Sealed Road	A ***sealed road*** is one which has been formed to a *recongnised construction standard* using surface treatments such as tar, bitumen, concrete or asphalt. Therefore it has been permanently "sealed". This provides a 'waterproof' cover for the pavement beneath.	 
Unsealed Road	An ***unsealed road*** is one which a pavement has been formed and constructued with some type of compacted basecourse material and to a standard that ideally allows all year round access by all vehicle types.	

Value	Description	Photo Example
Track	A ***track*** is a road that has limited or no constructed pavement and may have had some metal applied as a surface layer but not as a pavement with any depth.	
Proposed Road	A road that has not been formed, but has been proposed to be built in the future.	Not Applicable

Deteriating Conditions

Note: a sealed road may revert to an unsealed road if the sealed surface is not maintained and / or renewed, to the point where there is effectively no surface remaining for the majority of the road section.

Note: an unsealed road may revert to a Track if the pavement is not maintained and / or topped up, to the point where there is effectively no pavement remaining for the majority of the road section.

The above scenarios are not when there is a backlog of maintenance but rather a decision to let the road revert to unsealed or a track.

Carriageway Types

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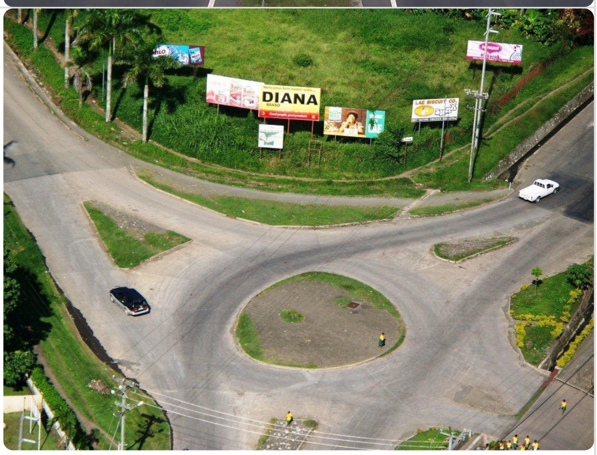
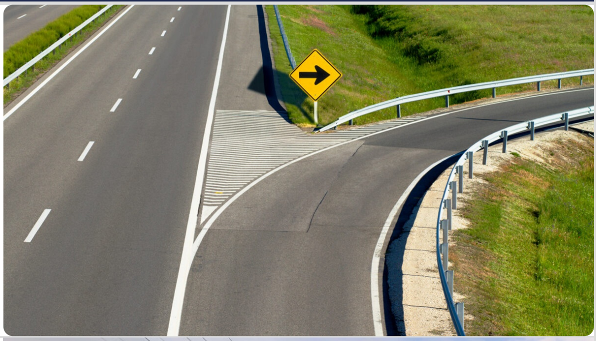
RAMM Table:	**Carriageway**
Attribute:	**Carriageway Type**
Purpose:	To provide road categorisation that identifies different types of road sections (carriageways) that allow analysis to report on dual carriageway, roundabouts, ramps and other special types separate from normal single carriageway roads.

Value	Description	Photo Example
Standard Network	A ***standard network*** road is a regular two-way road with one lane in each direction, used for general traffic movement.	
Dual Carriageway	A ***dual carriageway*** road is a road with two separate lanes or carriageways for traffic in opposite directions, usually divided by a median.	
Roundabout	A ***roundabout*** is a circular road layout where traffic moves in one direction around a central island, used to manage intersections. Major roundabouts provide approaches that have splitter islands.	

Value	Description	Photo Example
Ramp (On or Off)	A ***ramp*** is a short road section that allows vehicles to enter (on-ramp) or exit (off-ramp) a larger road, such as a highway.	
Accessway	An ***accessway*** is a small road or driveway that connects properties or local roads to the main road network, often used for local or private access.	

Road Classification (Hierarchy)

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RAMM Table:	**Carriageway**
Attribute:	**Hierarchy**
Purpose:	To provide road categorisation that represents the hierarchy of the road section (carriageway) as set out in official policy and / or strategies.

Value	Description	Photo Example
National Route	Main roads that link population centres in two or more Provinces and/or main road traversing the entire length of an Island Province that acts as a collector road.	
National Main Road	Roads that link major population centres and districts to National Routes, and/or strategically important centres (main towns, harbours, and airports).	
National District Road	Roads within a single district that link population centres (villages) to areas of importance (large town centres, harbours, airports, markets, and hospitals) within the district.	
National Institutional Road (not currently captured in RAMM)	Roads within National Institutions (Army barracks road, or University compound roads etc…). These roads can include roads required for reasons of National defence and/or security reasons.	
National Accessway		
Provincial Road	These are roads that fall under the jurisdiction of the provincial governments and are primarily intended to connect various parts of the province and facilitate local transportation.	
Private		
Unknown		

Urban Rural

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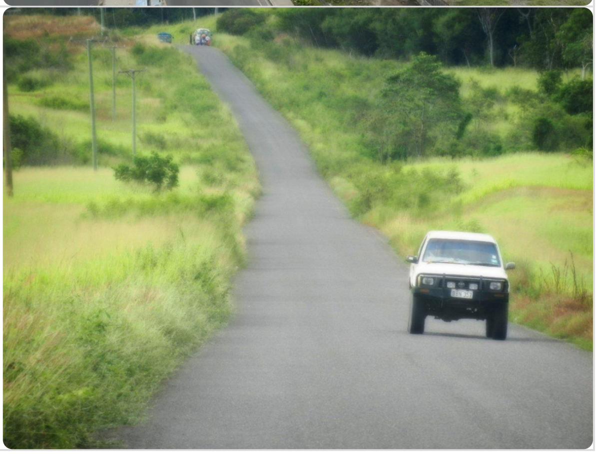
RAMM Table:	**Carriageway, Carriageway View, MC Cyclic Cost, Traffic by Carriageway View, Treatment, Treatment Length, Treatment Length View**
Attribute:	**Urban Rural**
Purpose:	To provide road categorisation that differentiates the current level of service provided by the road section (carriageway). This closely aligns to accessibility, the type of vehicle that can be used and comfort experience of the road users.

Value	Description	Photo Example
Urban	Purpose is to connect neighborhoods, commercial districts, and major transportation hubs within a city or town.	
Rural	Purpose is to connect villages, farms, and remote areas to markets, towns, and other rural communities.	

Speed vs. Urban / Rural

It is a sweeping generalisation to say that high speed open roads must be rural, and low speed must be urban roads.

However, the intent of this classification is to understand the broader surrounding environments so an open road that might slow down (speed signs) for a small village or shops, does not need to change to urban for that short stretch. The overall nature of the environment is still rural.

In the opposite situation, a high-speed motorway or expressway does not automatically become rural due to its speed limit. The surrounding environment is still urban.

Network Model

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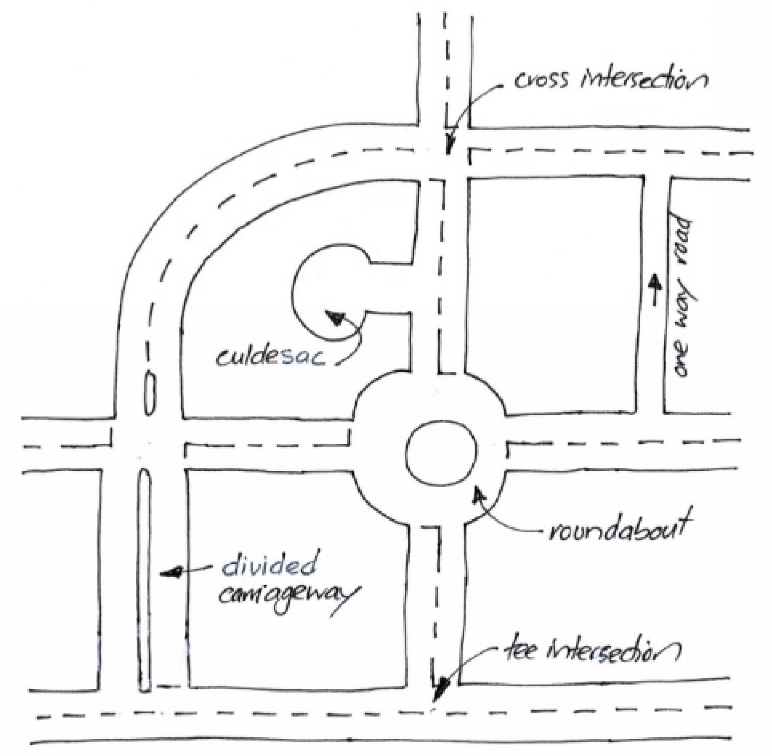
This article describes how the network model is defined and then created and managed in AWM.

Network Model Overview

Within a road and transport context, a network supports and enables the movement of vehicles, goods and people. The road network, for example, is a collection of many connected roads, with each road comprising one or more road segments.

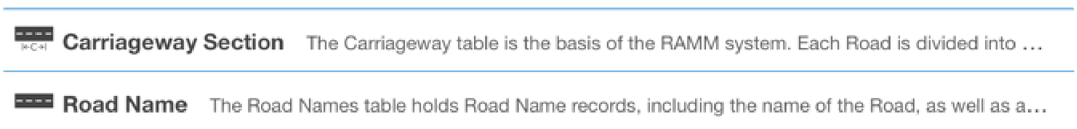


Road network definition model – example road configuration

In AWM, there can be different types of networks defined. Each network is characterised by a network type, which represents the network's primary function e.g. Road, Pathway, Carpark. Differentiation between these various network types is necessary for operational, management, funding and reporting requirements.

The AWM Network Model

Networks are defined in AWM, using a combination of the Road Name (*roadnames*) and Carriageway Section (*carr_way*) tables.



The Carriageway Section and Road Name tables in the AWM Menu.

The term *road* is a common base term in AWM, and it is referenced in multiple places within the Network Model.

This includes core attributes such as the Road Name, Road ID and Road Type.

It is worth noting that all network types defined in AWM utilise the Road Name table. Therefore, even though the term "road" is used, it applies equally to other networks such as Path. For instance, a single pathway, while not being a road, will still be partially defined by a Road Name record and will have its own unique Road ID, Road Name, and Road Type.

The RAMM fields used to record each component of the network model are discussed further in the sections below.

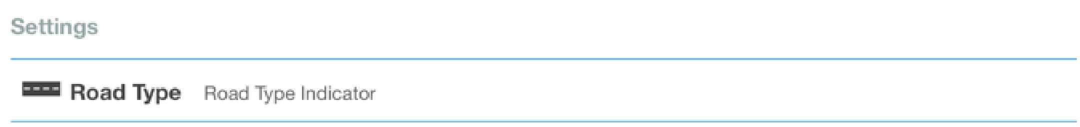
Network Types

The standard Network Types that have been set up for use in AWM include the following;

Code	Network Type
R	Road
A	Proposed Road
P	Path
C	Carpark
U	Public Space
W	Accessway
B	Bus Station

'Local Authority' (L) and 'State Highway' (S) are default Network Types in RAMM and should not be used.

These network types are defined for each road using the road_type field in the Road Name table. The master list of Network Types is managed in the Road Type settings table.



The Road Type settings table holds the master list of Network Types.

This model separates the concept of ownership away from the network type where possible. This is expanded on further below in the Network Ownership section.

Network Ownership

The following AWM Carriageway Section attributes are used to record different types of ownership:

Ownership Type	RAMM Table	RAMM Attribute
Asset	Carriageway	asset_owner
Land	Carriageway	controlled_by
Maintenance	Carriageway	maintained_by

These ownership types are explained further as follows;

- **Asset Ownership** - The owner of the primary asset that allows for the network to achieve its purpose (e.g: the owner of the pavement if the network (road) type = Road)
- **Land Ownership** - The owner of the land that the network uses to achieve its purpose (usually directly beneath the primary asset).
- **Maintenance Ownership** - The organisation that is responsible for the maintenance of the primary asset.

The Carriageway Section 'Owner_Type' attribute is a mandatory attribute in AWM. This needs to be related to the Asset Owner (*asset_owner*) attribute (this relationship can be automated).

Network Classifications

Breaking the road network down into different classifications underpins critical business reporting as well as supporting key network analysis.

The table below describes the classifications being used in the current AWM Network Model and where these are defined in the database:

Name	Description	RAMM Table	RAMM Attribute
Road Type	Defines the primary purpose of a network segment.	Road Name (*roadnames*)	Road Type (*road_type*)
Network Hierarchy	Hierarchy in AWM is used to manage the National Road Network Classification	Carriageway Section (*carr_way*)	Hierarchy (*cway_hierarchy*)
Region	Provides the PNG Region that the road sits in.	Carriageway Section (*carr_way*)	Area (*cway_area*)
Province	Provides the PNG Province that the road sits in.	Carriageway Section (*carr_way*)	Sub-Area (*cway_sub_area*)
Priority Corridor	Provides the PNG Priority Corridor that the road sits in. These are also called the Economic Corridors.	Carriageway Section (*carr_way*)	Priority Corridor (*cway_group_4*)
Road Priority	Provides whether the road is classified as; priority core, priority non-core or non-priority.	Carriageway Section (*carr_way*)	Road Priority (*cway_group_1*)
Network Type	Provides whether the road is classified as; Sealed Road, Unsealed Road, 4 Wheel Drive Track or Pathway	Carriageway Section (*carr_way*)	Network Type (*cway_group_2*)
Vehicle Access	Defineswhether the road is classified as; All vehicles, Limited 2 Wheel Drive or 4 Wheel Drive Only	Carriageway Section (*carr_way*)	Vehicle Access (*cway_group_3*)
Pavement Type	Defines the primary pavement type of the road. Thin surface flexible (sealed) or Unsealed. Supports the Network Type	Carriageway Section (*carr_way*)	Pavement Type (*pavement_type*)

National Network Road Classification

See this article Road Classifications, for more information on the Road Classification System to be followed.

Road Setup and Conventions

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A register of all Roads (including Highways) is maintained in the RAMM Road Name (*roadnames*) table.

Road Name The Road Names table holds Road Name records, including the name of the Road, as well as a...

The AWM Road Name table can be accessed from the AWM Menu.

The Road Name table contains information about the road name records, including the type of network the record belongs to (see AWM Network Model for more information).

Specifically, key attributes managed in the RAMM Road Name table includes:

- The **Road ID** (*road_id*); which is a unique database road identifier for each road.
- The **Road Name** (*road_name*); which is typically the road name as vested to PNGDoWH. The AWM name may have an additional abbreviation or suffix appended to it to provide further context about the road or avoid duplication of names.
- The **Road Type** (*road_type*); which is used to classify the network the road belongs to.

The Road ID is the most critical information in the AWM database as it supports a location for every object managed in the database as well as forming the link for converting between linear and spatial information. Even if assets are to be managed spatially in RAMM, they must have a Road ID at a minimum.

What Data Should be Managed to Define a Road?

Refer to the Data Standard that sets out all of the data expected to be managed in AWM to define a road.

Road Naming Convention and Abbreviations

For consistency, the names of roads in AWM must adhere to the following naming conventions.

1. All road names must be entered into the AWM Road Name (*roadnames*) table. This is locked to upper case characters only e.g. use "BUKA ROAD" instead of "Buka Road".

road_id	road_name
10037	AFORE ROAD
10057	AINBAI ROAD
10058	AIRPORT ROAD ACCESS
10059	AIYURA ACCESS ROAD
10052	AROPA ROAD
10060	ASEKI ROAD
10196	ASINIMBU HIGHWAY

Road names are written in upper case characters in the AWM Road Name table.

2. All National Roads (NR) are to have a road name that ends in "Highway".

3. All roads below a National Road (NR) class cannot have a road name that ends in "Highway". They will usually end in "Road".

4. The standard abbreviation to use when naming a roundabout in RAMM is “RAB”. This is to be appended as a suffix to the road name. For more information on naming roundabouts in RAMM, please refer to the Roundabout Naming Convention section below.

road_id	road_name
10160	BARUNI/KANUDI RAB
10161	BARUNI/LANDFILL RAB
10162	BARUNI/NAPANAPA RAB
10159	BARUNI/SIVARI RAB
10163	BARUNI/UNIVERSITY RAB

Roundabouts in AWM using the RAB abbreviation.

5. Road names may have additional naming elements added in RAMM to help provide further context and clarity about the road e.g. adding a suffix of NORTH or SOUTH. If this naming element is not part of the actual road name, it must be placed in brackets as a suffix to the road name, e.g., CAMERON ROAD **(WESTBOUND)**. This rule applies to all suffixes that may need to be added to names in the Road Name (*roadnames*) table, but excludes the “RAB” abbreviation for roundabouts.

road_id	road_name
10199	CAMERON ROAD (WESTBOUND)

The (WESTBOUND) suffix for CAMERON ROAD.

6. All road names in the AWM Road Name (*roadnames*) table must be unique. Where a road name is to be added which would be a duplicate of an existing name, then the Province, Town or Suburb name shall be included in brackets as a suffix, to create a unique road name e.g., MAGI HIGHWAY (MILNE BAY)

road_id	road_name
10018	MAGI HIGHWAY
10033	MAGI HIGHWAY (MILNE BAY)

The (MILNE BAY) suffix has been applied to create a unique set of road names for the two MAGI HIGHWAY RAMM roads.

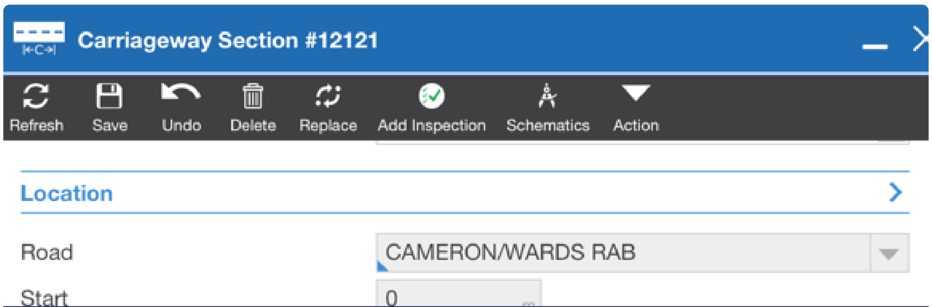
Roundabout Naming Convention

Roundabouts are named in such a way that clearly identifies and distinguishes each roundabout from the others.

In almost all cases, a roundabout has more than one road associated with it, and one of those roads will be more 'major' than the other road (e.g. a road may be more major than another road when considering factors such as carriageway section hierarchy and traffic volumes).

Please refer to Road Classifications for more information on the road classification system.

The naming convention for roundabouts is for the major road to be named first, followed by the next major road. For example, if CAMERON ROAD was the major road, and WARDS ROAD was the minor road, then the roundabout name in AWM would be CAMERON/WARDS RAB. If a roundabout has more than two roads associated with it, typically only two roads are referenced in the name.



The Roundabout Naming Convention applied to the Cameron/Wards RAB.

When naming a roundabout, the ROAD component is removed from each contributing road name to reduce clutter. In the example above, the word ROAD has been omitted from both CAMERON ROAD and WARDS ROAD when naming the roundabout.

Roundabouts can be numbered if, when following this naming convention, there would be more than one roundabout with the same name e.g. CAMERON/WARDS RAB (No.1), CAMERON/WARDS RAB (No.2).

Road Numbering Conventions

The road number is managed adn maintianed in the cariageway table. This is allows mamangement of the Road Number across region and provincal boundaries.

Road Numbers are a setup as a:

1. Combination of prefix A, B, C,

2. Followed by a sequential number.

3. In some caes this is furhter suffixed with a letter where road section(s) in questions have signifcant section changes. This is gernally aligned to the known geographical oreintation of the road.

The specific rule to the Road Numbering process is that

1. all NATIONAL ROUTES are prefixed by the letter 'A' in all cases.

2. Road numbers must be unique across the full road network.

3. A road number can only be used for one road name and vice versa.

> Note: this will require carriageways to be split at provincial boundaries so that it can have a new road number.

Carriageway Setup and Conventions

11/12/2024 7:49 am +10

This article sets out the role of carriageways in defining the network in Asset & Work Manager (AWM) and how they should be used consistently for different network situations that might be encountered.

Each road is split into one or more sections and in AWM these are called Carriageways. A carriageway holds information about the given segment of road, including ownership, dimension data, pavement type, hierarchy (road classification), network type and terrain.

Need for Change of Carriageway

A road shall be broken into separate carriageways when the following characteristics change:

1. At all intersections with side roads, unless multiple intersections are within 30 metres of each other. Note under this basis, the main road going through an intersection would not require a carriageway change at each slip road.
2. Carriageway Region and Province
3. Road Hierarchy - Following the national road classifications
4. Number of Lanes - For example, from 2 to 3 (at the start of a passing lane)
5. Urban / Rural change - Usually, this is done when the speed limit changes to greater than 70km/hr when exiting an urban road.
6. Road Width - Width changes by more than 2.5m over a significant length (typically >100m)
7. Pavement Type - When the surface/pavement changes between sealed granular, unsealed, structural asphalt, concrete and bridge (significant bridges greater than 50m bridge length)
8. Pavement Use - When traffic volumes or the traffic composition changes significantly, such as at major institutions (e.g., universities) or commercial operations where the traffic volume is significantly different on either side of the entrance.
9. Asset Owner - When the owner of the road (the pavement) changes, for example, between the national and provincial governments.

After applying the above reasons to create carriageway changes, if the length of the carriageway exceeds the maximums specified below, you will need to introduce some further splits. This supports workers in the field by providing more regular known locations with a given chainage length from the start of the road.

Additional splits shall be at physical locations that won't change easily and can easily be found and identified. For example, at a bridge, intersection with a driveway to a major institution (e.g., school) or at a well-known waterway.

Watching out for situations when the location isn't clear. For example, the school you use has two entrances, or the local village calls the waterway a different name to the provincial work team.

Linear Reference Points

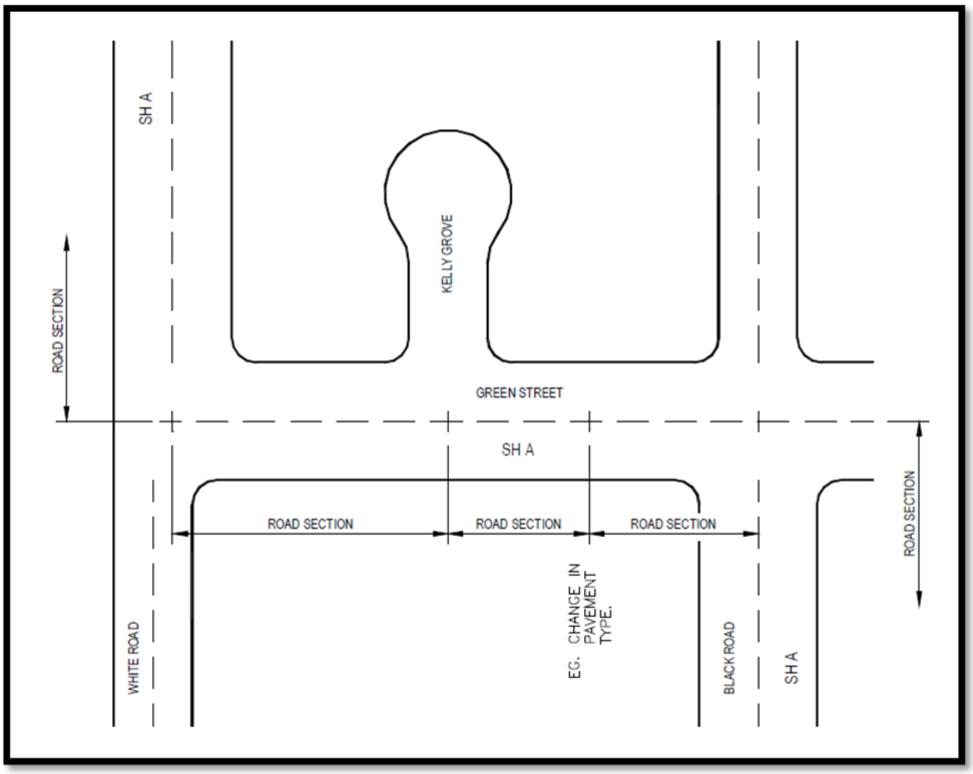
Linear Reference Points shall be created and maintained at the start and end of every carriageway section, except when intersections are close together in an urban environment.

Linear Reference Points are expected to be an interim dataset that supports the development of the carriageway dataset across the whole network. Once the carriageways have been created, then they will no longer be required.

Refer to [insert Article Link] for more information on Linear Reference Points best practice.

Creating Carriageway Sections

An example of sectioning of a road network:



Methods to Update the AWM Carriageway Data

- Manual updating of some data within the sections where changes are required. In AWM this is the preferred method for making those changes such as changes to start and end names)
- Use RAMM Network Manager for all manual major or significant changes to dimensional-related data, including adding new sections, splitting, joining and deletion
- Use RAMM Network Manager for unsealed to sealed changes to carriageway sections

Management of network and carriageways is quite advanced and forms the critical base information set which most other information is related to. On that basis it is essential that and changes are carried out by people with adequate training or experience.

Carriageway Direction & Lengths

Use the following guidance as a reference when carrying out activities that affect the AWM Carriageway updates.

Survey Direction

General convention for the direction of roads (increasing linear reference) are *roads should be surveyed from the major traffic end to the minor traffic end*, as follows:

- Arterial road to collector road.
- Collector road to local road.
- Local road to the end of the road or to the cul-de-sac end.

Exceptions to this are one way roads where traffic flow dictates the survey direction.

Minimum and Maximum Carriageway Lengths

To avoid short carriageway sections (such as changes to number of lanes around signalised intersections, or short bridges) the following guidelines apply:

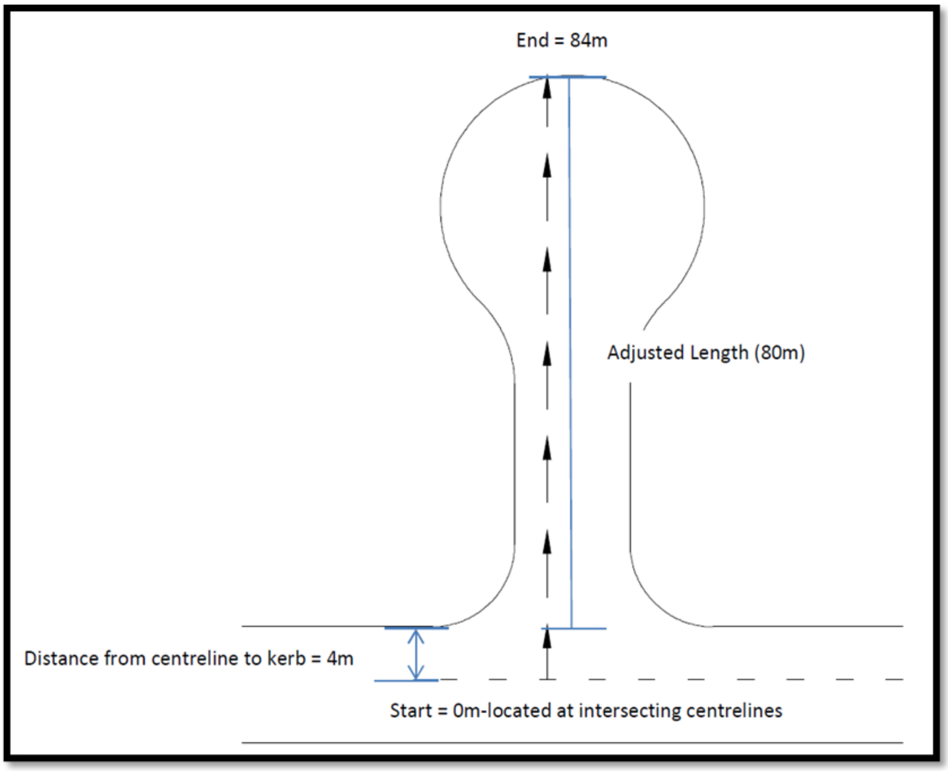
- Urban area - minimum carriageway length 30m, maximum carriageway length 1500m
- Rural area - minimum carriageway length 50m, maximum carriageway length 10,000m
- Typically, bridges longer than 50m have their own carriageway section

Exceptions to these should be avoided but will be required in certain circumstances.

Adjusted Carriageway Lengths

Generally, the length of a carriageway section is equal to the end meters minus the start meters. However, for first carriageway section of most roads starting from an intersection, the length needs to be adjusted to be the "end meters minus the start meters" less the distance between the intersecting centerline of each road to the kerbline. This length adjustment needs to be completed using the length adjustment option.

This also needs to be done for roads that end at an intersection.



Carriageway Scenarios: Divided / Dual Carriageways

Divided Carriageways (Full length)

Where a road has a physical median that separates each direction of travel over the full length of the road then each side has a separate road name and road id. The road name is suffixed in brackets with the travel direction for that road i.e. TE IRIRANGI DR (WESTBOUND) and TE IRIRANGI DR (EASTBOUND).

Single Divided Section (Not full length of road)

If the physical median is not present for the full length, then the increasing direction carriageway sections are contiguous (with no direction suffixed in brackets after the road name), i.e. TE IRIRANGI DR and decreasing section are added as required (with the direction suffixed in brackets after the road name) i.e. TE IRIRANGI DR (EASTBOUND).

Multiple Divided Sections

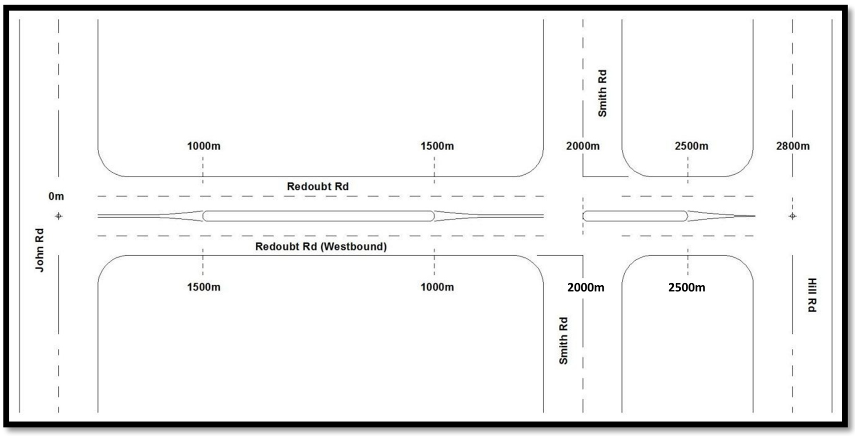
In the case where there is more than one divided section along the length of the road, then the running distance continues from the end of the first divided section through to the end of the last divided section. This will result in there being gaps between the divided sections, as the running distance is contiguous from the start of the first divided section.

Example: The table below shows an example of a road that has multiple divided sections along its length.

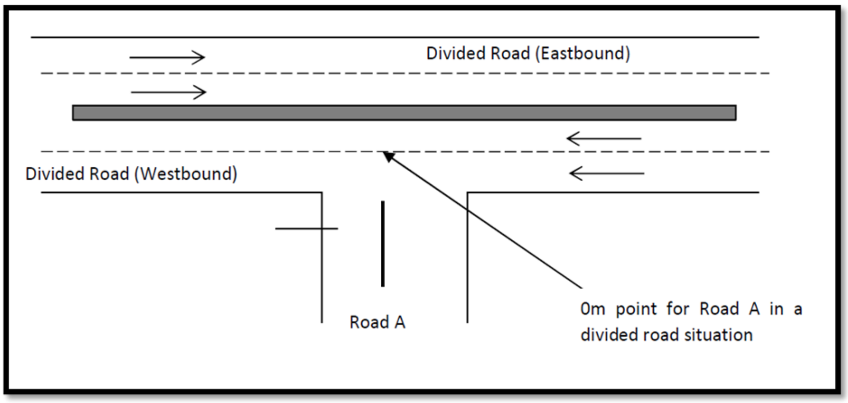
Roadname	Start m	End m	Start name	End name	No. lanes	Width
Redoubt Rd	0	1000	John Rd	Start divided median	4	20
Redoubt Rd	1000	1500	Start divided median	End divided median	2	10

Roadname	Start m	End m	Start name	End name	No. lanes	Width
Redoubt Rd	1500	2000	End divided median	Smith Rd (Start divided median)	4	20
Redoubt Rd	2000	2500	Smith Rd (Start divided median)	End divided median	2	10
Redoubt Rd	2500	2800	End divided median	Hill Rd	4	20
Redoubt Rd (Westbound)	2000	2500	Start divided median	Smith Rd (End divided median)	2	10
Redoubt Rd (Westbound)	1000	1500	Start divided median	End divided median	2	10

Note that Redoubt Rd (Westbound) is still measured in the same direction as Eastbound.



Example of Multiple Divided Sections



Zero Point for Side Road onto a Divided Road

Carriageway Scenarios: Roundabouts

All large roundabouts are surveyed as a separate road. Roundabouts are deemed large if approach islands are present. Small roundabouts, such as small domes or roundabouts with painted traversable islands are treated like standard intersections.

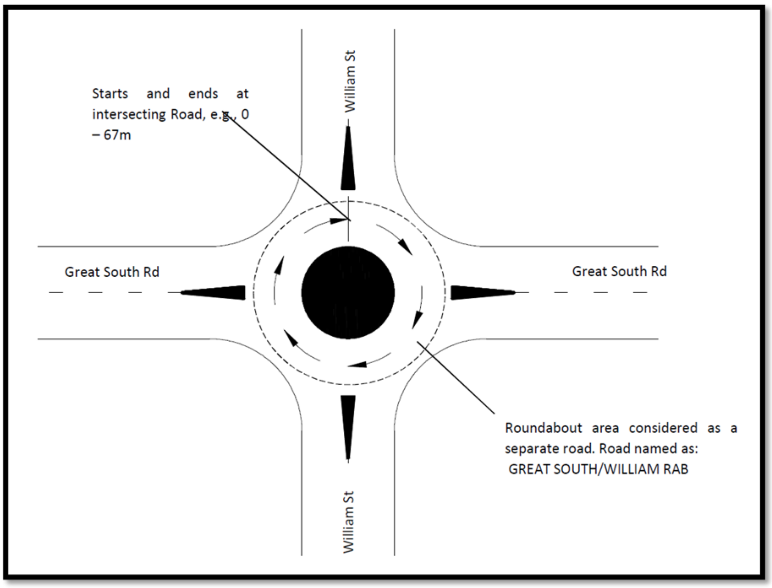
Roundabouts are named as follows:

"MAJOR ROAD NAME/MINOR ROAD NAME RAB", e.g. "GREAT SOUTH/WILLIAM RAB Note that the street suffixes are excluded in the road name. The start and end names are e.g.: "WILLIAM ST – WILLIAM ST" and include the suffixes. For two major roads, or roads of the same hierarchy, naming is ordered alphabetically.

Number of RAB identified where only the main road has name/details - in these cases suggest using the following (in order of preference):

1) ROAD/SITE RAB - where the RAB is associated with a nearby site such as a school, shopping centre or stadium, MAGI/6 MILE MARKET RAB

2) ROAD/RP RAB - where no better way of identifying, use the route position (approximate) of the RAB - e.g. MAGI HWY/10.5 RAB if RAB ~ 10500 RP.



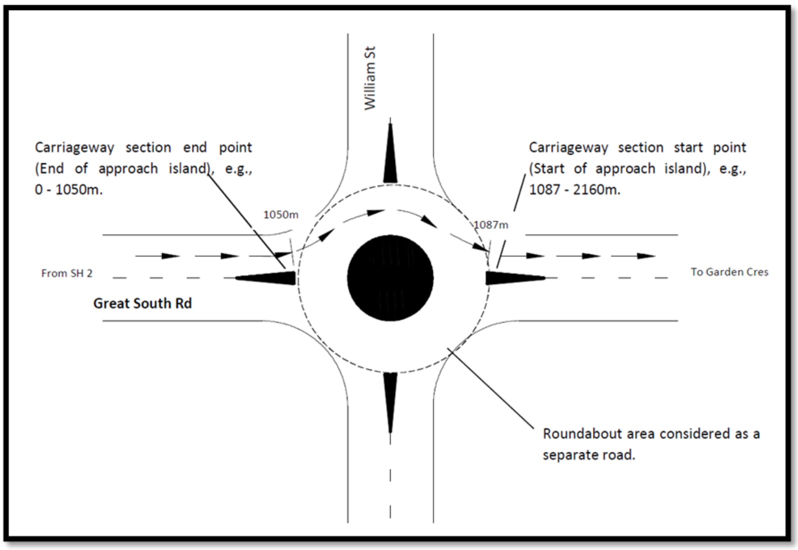
Roundabout Treated as a Separate Road

Additional Notes: Great South Road is the major road, so the naming convention is GREAT SOUTH/WILLIAM RAB, with start/end names 0 – 67, WILLIAM ST (NORTH) – WILLIAM ST (NORTH).

Roundabout Intersecting Roads:

Where roads start, end or intersect a roundabout, the carriageway sections will start/end at the roundabout approach islands. The island nose closest to the roundabout itself is used as the start/end point.

Where a road passes through the roundabout, the displacements are measured between the approach islands and a gap is in the displacements. The "gap" allows high speed data to be continuous when passing through the roundabout. This is illustrated in the diagram below:



Example of Carriageway Sectioning of a Road Through a Roundabout

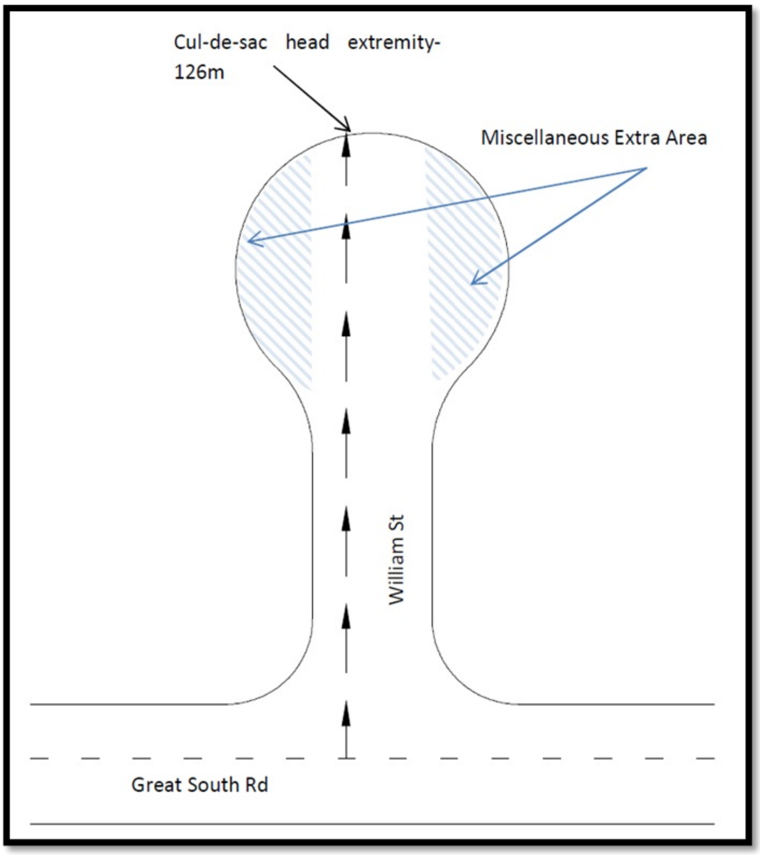
Example:

GREAT SOUTH RD, carriageways 0 – 1050m, SH 2 – WILLIAM ST and 1087 – 2160m, WILLIAM ST – GARDEN CRES. Note that a gap exists between the displacements. Any other roads that start or end at roundabouts start/end at the approach islands do not encroach on the roundabout area.

Carriageway Scenarios: Cul-De-Sacs:

The following describes how cul-de-sacs are surveyed, with respect to end position of the last carriageway section. Cul-de-sacs with small islands are treated like standard cul-de-sacs, measuring the extreme most point.

Cul-de-sacs with large islands are surveyed by splitting the carriageway at the start of the island nose when approaching the cul-de-sac, driving around the loop, and ending the carriageway at the same point when exiting the cul-de-sac head.



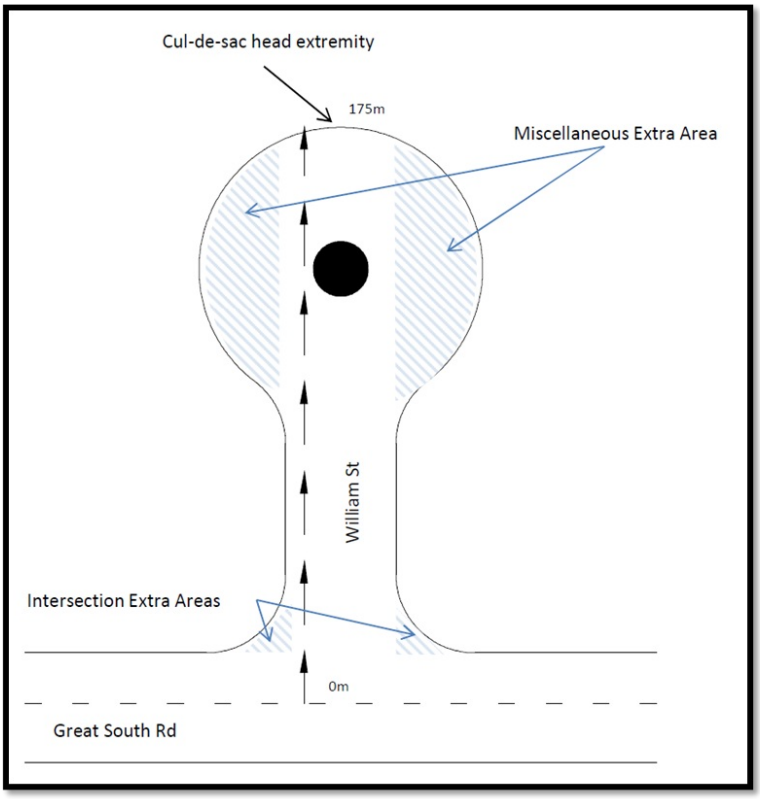
Definition of a Cul-de-sac Carriageway Section

The carriageway section for William Street will be as follows:

0 – 126m, GREAT SOUTH RD – CUL-DE-SAC

Cul-de-sac Head with Small or No Island

Cul-de-sacs with small islands that can be driven past without deviation through the cul-de-sac turning area to the end of the road will be treated like a normal cul-de sac.

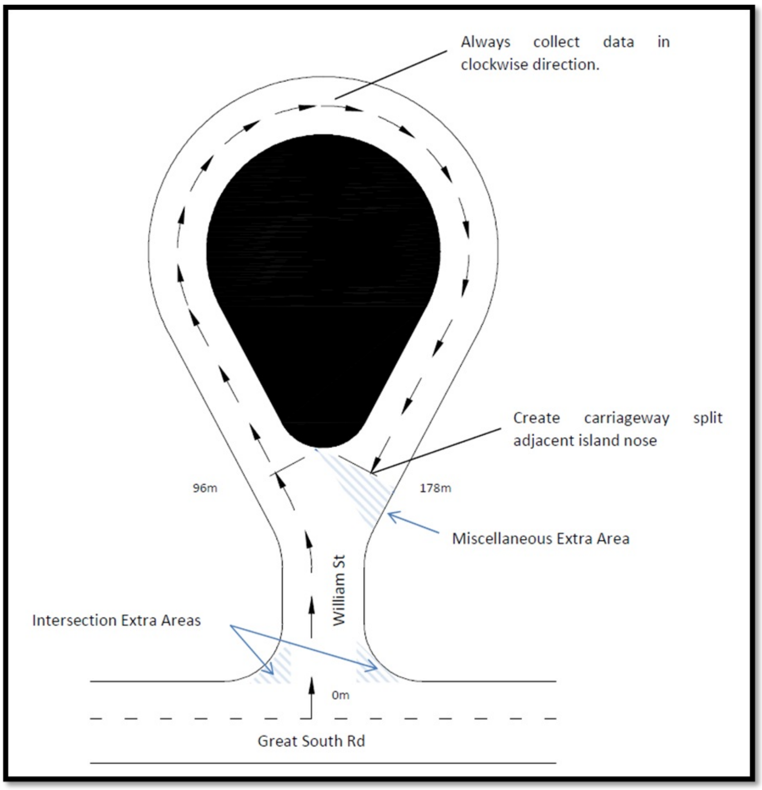


Definition of a Cul-de-sac With Small Head Island Carriageway Section

The carriageway section for Williams Street will be as follows:

0 – 175m, GREAT SOUTH RD – CUL-DE-SAC.

Cul-de-sac Head with Large Island



Definition of a Cul-de-sac With Large Head Island Carriageway Section

The carriageway section for Williams St will be as follows:

0 – 96m, GREAT SOUTH RD – START ISLAND RHS

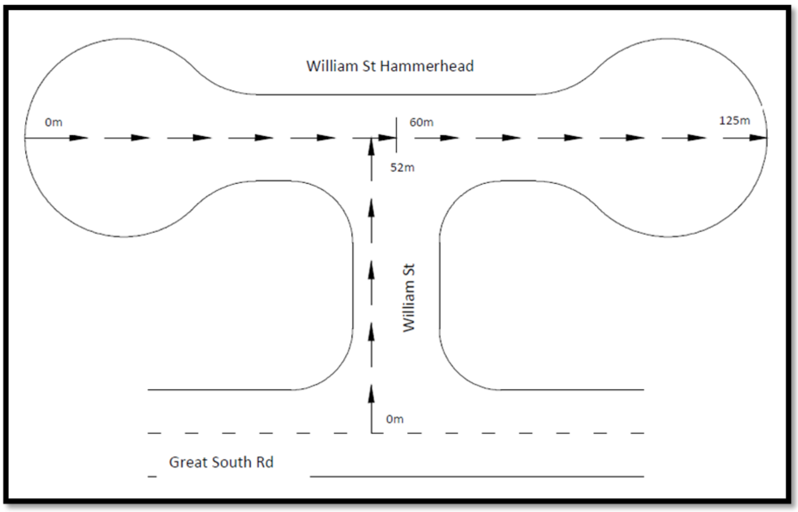
96 – 178m, START ISLAND RHS – END ISLAND RHS

Note: The last carriageway section is usually only one lane.

Hammerheads

For roads with hammerheads, set the main access road and hammerhead up as separate roads, e.g., WILLIAM ST and WILLIAM ST HAMMERHEAD. Survey the main access road from the road origin to the centreline of the hammerhead. Survey the hammer head from one cul-de-sac through to the other, describing the start and end points, e.g., CUL-DE-SAC (SOUTH). It is also desirable to create a carriageway split where the main road intersects to avoid any confusion regarding which end to start the survey. This is shown in the diagram below.

If the orientation of the hammerhead section is not obvious (i.e.: hammerhead does not run from east to west or north to south) then house numbers may be used to describe the start end and name fields of the hammerhead.



Definition of a Hammerhead Carriageway Section

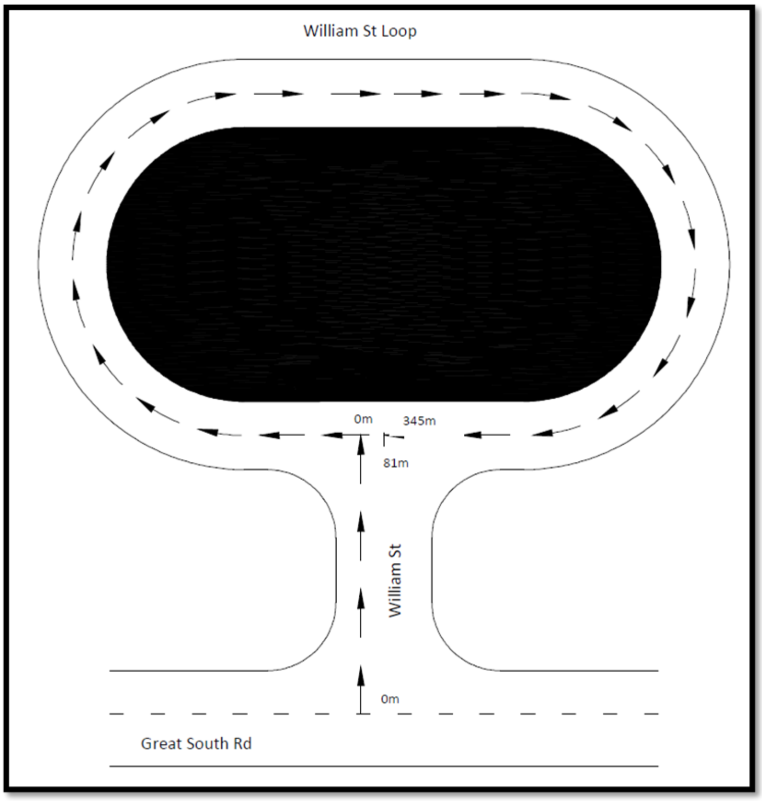
The carriageway section for Williams Street will be as follows:

Road 1: WILLIAM ST 0 – 52m, GREAT SOUTH RD – WILLIAM ST HAMMERHEAD

Road 2: WILLIAM ST HAMMERHEAD, 0 – 60m, CUL-DE-SAC (WEST) – WILLIAM ST and 60 – 125m, WILLIAM ST – CUL-DE-SAC (EAST).

Loops

This case is similar to hammerheads with the loop section being set up as a separate road, e.g., WILLIAM ST LOOP. Separating these elements into individual roads allows clear identification of each element, and the start and end locations for each section.



Definition of a Loop Carriageway Section

The carriageway section for Williams Street will be as follows:

Road 1: WILLIAM ST 0 – 81m, GREAT SOUTH RD – WILLIAM ST LOOP

Road 2: WILLIAM ST LOOP 0 – 345m, WILLIAM ST – WILLIAM ST

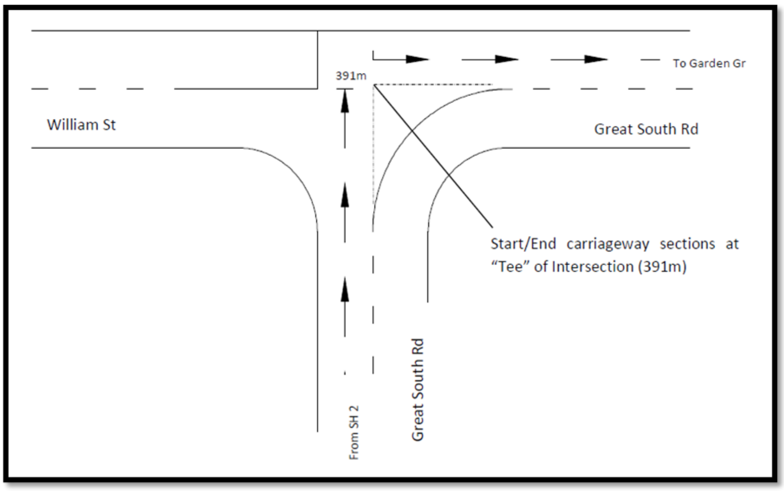
Defining Carriageways Start and End Points: Intersections

Use the following rules when determining carriageway start/end points:

- For both marked and unmarked intersections approaching at a right angle, the centre of the intersection is used
- For both marked and unmarked intersections approaching at a small angle, the centre of the intersection is used
- For marked intersections approaching at an acute angle, the point of the marking (or middle of the median island) will be projected at a right angle to the road being measured
- For unmarked intersections approaching at an acute angle, the middle of the intersection will be projected at a right angle to the road being measured.
- At all poorly defined intersections, well defined and easily locatable features such as sumps or power poles may also be used to further define the node, e.g. SMITH ST (SUMP LHS) – means that the node is located at Smith St adjacent a sump on the left hand side.

The following diagrams show methodologies for dealing with typical carriageway start and end point situations

Right Angle Intersection



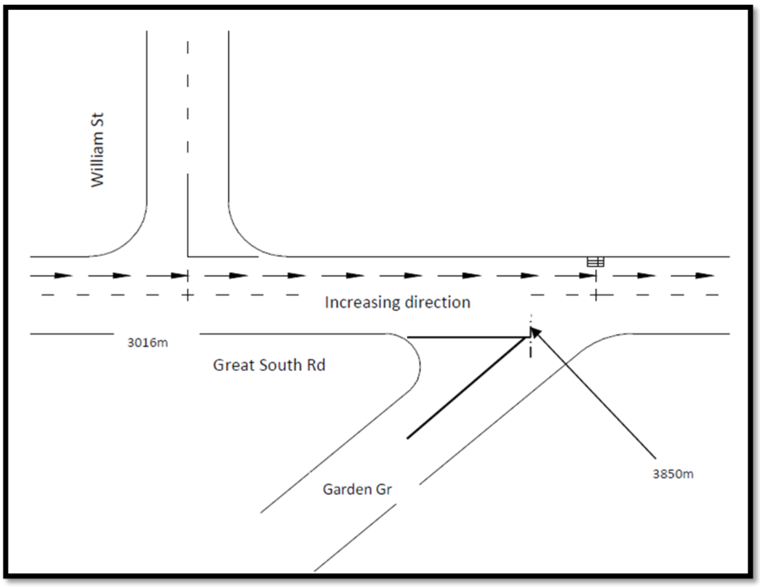
Carriageway Section Definitions for a Through Road Making a Right Angle Turn in an Intersection

The carriageway sections for Great South Road will be as follows:

0 – 391m, SH 2 – WILLIAM ST (AT TEE)

391 – 689m WILLIAM ST (AT TEE) – GARDEN GR

Acute Angled Intersection

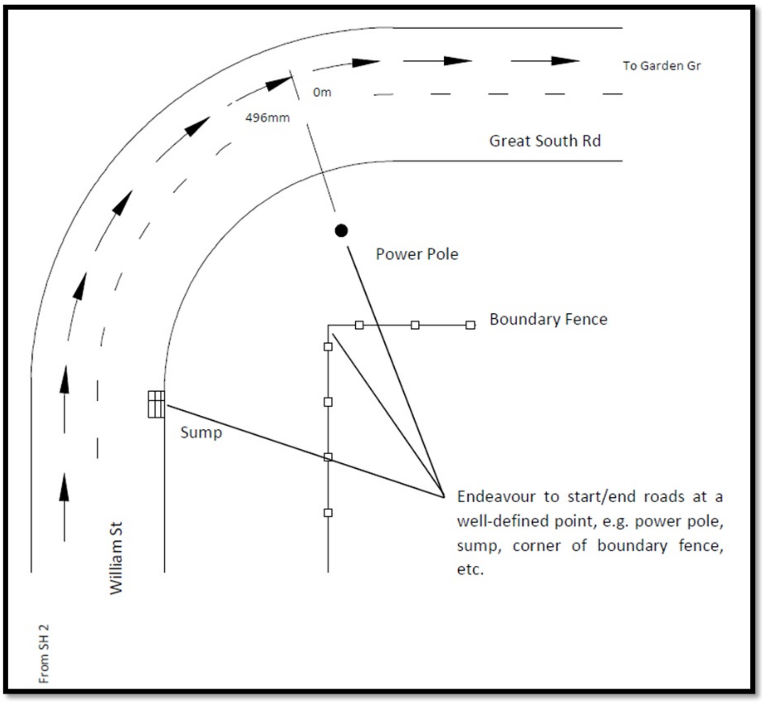


Carriageway Section Definitions for Intersections at an Acute Angle

The carriageway sections for Great South Road will be as follows:

3016 – 3850m, WILLIAM ST – GARDEN GR

Two Roads Starting/Ending on Curve



Carriageway Section Definitions for Two Roads Starting and Ending on a Curve

The carriageway sections for both roads will be as follows:

Road 1: WILLIAM ST, carriageways 0 – 496m, SH 2 – GREAT SOUTH RD (POWERPOLE RHS)

Road 2: GREAT SOUTH RD, carriageways 0 – 1065m, WILLIAM ST (POWERPOLE RHS) – GARDEN GR

Road Classifications

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This article sets out the available classifications for the road network.

The National Road Classification is managed as 'Hierarchy' in RAMM which is an attribute of the road carriageway

National Network Road Classification (Hierarchy)

Code	Class Name	Class Description
NR	National Route	Main roads that link population centres in two or more Provinces and/or main road traversing the entire length of an Island Province that acts as a collector road.
NM	National Main Road	National Main Road: Roads that link major population centres and districts to National Routes, and/or strategically important centres (main towns, harbours, and airports).
ND	National District Road	National District Road: Roads within a single district that link population centres (villages) to areas of importance (large town centres, harbours, airports, markets, and hospitals) within the district.
NI	National Institutional Road	National Institutional Road: Roads within National Institutions (Army barracks road, or University compound roads etc...). These roads can include roads required for reasons of National defence and/or security reasons.

Provincial Network

Code	Class Name	Class Description
PT	Provincial Trunk Road	Provincial Trunk Road: Major provincial roads connected to the National Road Network. Main links between different districts and between major provincial population centres within the same province. Links to provincial harbours, airports, and industrial areas. These roads have economical importance to the Province and the traffic usually includes heavy trucks. Trunk roads are usually sealed (or at least gravelled).
DF	District Feeder Roads	District Feeder Roads: District links to the Provincial Capital and to other population centres inside the District. Links to minor ports and airstrips. The traffic consists mainly of personal vehicles and PMVs. District feeder roads are usually gravelled.
LA	Local Access Roads	Local Access Roads: Local links to the population centres in Local Level Government areas. Links between different villages. Local access roads are usually earth roads, often only accessible by 4WD. The main purpose of these local links is to allow access of the rural population from Villages to health centres, schools and markets.

Code	Class Name	Class Description
OR	Other Roads	Other roads not included in the National and Provincial networks, may include Private Roads (and later some of the present Institutional Roads). Other Roads also includes local town roads located within a Local Level Government Area, but not otherwise classified in the National or Provincial networks.

Proposed National Road Network Classification (Hierarchy)

As at August 2023 there is a proposal (as part of a Gazettal Process) to reclassify the National Roads into the categories in the following table. This article will need to be updated once the gazettal process has been completed.

Code	Class Name	Class Description
NR	National Route	Main roads that link population centres in two or more Provinces and/or main road traversing the entire length of an Island Province that acts as a collector road.
NM	National Main Road	National Main Road: Roads that link major population centres and districts to National Routes, and/or strategically important centres (main towns, harbours, and airports).
PT	Provincial Trunk Road	Provincial Trunk Road: Major provincial roads connected to the National Road Network. Main links between different districts and between major provincial population centres within the same province. Links to provincial harbours, airports, and industrial areas. These roads have economical importance to the Province and the traffic usually includes heavy trucks. Trunk roads are usually sealed (or at least gravelled).

Currently there is no mention of what happens to National Institutional Roads. In addition the reclassification has only been completed for Roads in the Priority Corridors, All other National Roads (outside of the priority corridors) will need to be reclassified so that they align to this new model.

Network Centrelines

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This article sets out the detail around the centrelines as the spatial representation of the network.

A centreline is the polyline spatial representation of an individual network segment or section. When combined together, these individual segments create a connected centreline network. Within the context of the RAMM, each defined road_id should have a spatial centreline representation in the database.

The Centreline network is important as it provides the principal spatial framework for all assets, datasets and activities to be spatially located on the network. Some RAMM applications are heavily reliant on the centreline network for core functionality, such as RAMM Mobile.

Centreline Rules

Use RAMM Network Manager to manage all centrelines and follow the following principles:

- Digitise centrelines along the length of the network segment, either aligned with the marked centre of the asset e.g. painted centreline, or the approximate centre of the pavement asset if no markings are visible.
- The orientation of the centreline should be in alignment with the increasing direction of the network segment as defined in the carriageway table.
- The spatial representation must be in the local map projection.

Within RAMM, the centreline data is stored in the map_road_layer table, however this is not directly accessible or editable through the RAMM application or SQL.

File formats supported for centreline management include;

- Well Known Text (WKT) File format
- Text file
- Spatial File (TAB file or Shape file)

Network Segments and Intersections

Each centreline should be made up of one or more line segments, which break at intersection points.

RAMM has an automated process in place to manage programmatic calibration between carriageway data and the associated centreline representation. This process attempts to match centreline breaks to carriageway section start/end points. Therefore, to facilitate this process it is necessary to break centrelines at intersection points.

For example, in the screenshot below, the blue centreline has been created with breaks at the intersection points with the existing centrelines, which are represented by the yellow polylines.

The centreline for a road_id with multiple intersection points, would have multiple segments, to create a spatial representation of the model.

In the example below, the road_id centreline would consistent of 5 line segments, to represent each component of the line between intersection points.   Each segment has been colour coded to show the extents of the individual line segments;

Well Known Text (WKT) File Format

The Well Known Text (WKT) file requires centreline data to be provided in a specific structure, to enable the RAMM Network Manager application to interpret the information and create a spatial representation in the database.

The required format includes the road_id, sequence number and northing and easting details, as a pipe delimited string; *road_id|sequence|coordinates*

It is important the coordinates in the linestring, are defined and ordered in the increasing direction of the road. An example of this is below, for a centreline with two segments for a single road:

30002|05|LINESTRING (1756266.85 5919213.1, 1756352.16 5919253.86)

30002|10|LINESTRING (1756352.16 5919253.86, 1756410.4 5919282.18)

If measures are known for points in the linestring, these can be embedded in the WKT file as well, in the following format;

road_id|sequence|coordinates measure

An example of this is below, for a centreline with two segments, with measures, for a single road:

30002|05|LINESTRING (1756266.85 5919213.1 0, 1756352.16 5919253.86 92)

30002|10|LINESTRING (1756352.16 5919253.86 92, 1756410.4 5919282.18 155)

Each sequence is representative of the network segment between two intersecting points on the centreline. For consecutive segments, the start point of a segment should be the same as the end point of the preceding segment.

This is illustrated in the example below, where the end point of the first segment is the same as the start point of the second segment;

30002|05|LINESTRING (1756266.85 5919213.1, **1756352.16 5919253.86**)

30002|10|LINESTRING (**1756352.16 5919253.86**, 1756410.4 5919282.18)

Calibration Points

The centreline network is a flat two-dimensional representation of the network. As the physical world is three-dimensional, some alignment discrepancies between linear and spatial measurement systems can occur.

This is particularly common in scenarios where there are gradient changes in the vertical alignment of a network section. In these situations, the straight-line distance between two points does not reflect any additional centreline length resulting from these changes in gradient, therefore resulting in a difference between the spatial length and measure linear length.

A calibration point allows for a specific node on the network, to have both a defined northing and easting and measured linear displacement associated at the same location.

RAMM will automatically recalibrate all linear asset against the spatial network, to factor in any calibration points that have been added.

Calibration Point Management in RAMM

The map calibration points that are user definable are stored in the map_calibration_ud table. These points can be added through the Pocket RAMM application and loaded through RAMM Manager. The required fields for calibration points include;

- road_id - the road_id for which the calibration point is being added

- ramm_location - the linear displacement of the point, from the road_id's origin point
- easting - NZTM easting coordinate
- northing - NZTM northing coordinate

System generated calibration points are stored in the map_calibration_cw table, although this is not directly accessible by RAMM users.

Calibration points are added to the database either through Pocket RAMM or via a loadfile through the RAMM Manager application.

Calibration Points and Roundabouts

(*also see the Carriageway section*) Where a road passes through a roundabout, the displacements are measured between the approach islands, and a corresponding carriageway gap is created between these displacements.

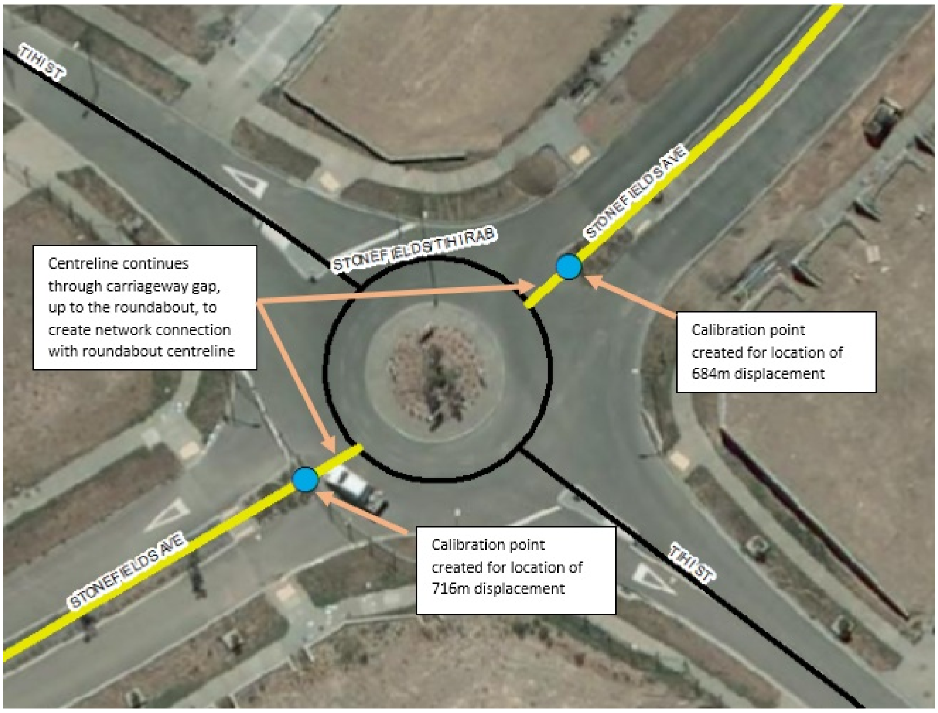
However, for the purposes of the centreline network, and to achieve a connected network model, it is necessary to create a spatial join between any adjacent roads and the centreline of the roundabout. Therefore calibration points are used to model these network features to make adjustments for these differences.

For example on Stonefields Avenue, there is a roundabout and subsequent carriageway section break at the Tihi Street Roundabout:

Road ID	Road Name	Start m	Start name	End m	End name
35983	STONEFIELDS AVE	0	MORRIN RD RAB	247	COLLEGE RD
35983	STONEFIELDS AVE	247	COLLEGE RD	423	STONEMASON AVE RAB
35983	STONEFIELDS AVE	451	STONEMASON AVE RAB	684	TIHI ST RAB
35983	STONEFIELDS AVE	716	TIHI ST RAB	829	ARUHE ST
35983	STONEFIELDS AVE	829	ARUHE ST	919	KAURIKI TCE

The 684m and 716m displacements are recorded at the approach islands, not at the intersection with the roundabout centreline.

Therefore calibration points shall be inserted at the point of the approach islands, to reconcile these coordinates with the start_m or end_m locations of the carriageway sections.


TIHI ST
STONEFIELDS AVE
STONEFIELDS TIHI RAB
Centreline continues through carriageway gap, up to the roundabout, to create network connection with roundabout centreline
Calibration point created for location of 684m displacement
Calibration point created for location of 716m displacement
STONEFIELDS AVE
TIHI ST

River Type

06/06/2025 3:12 pm +10

Purpose: To group rivers by type (like straight, meandering, or steep) so we can plan, maintain, and report on them more accurately,

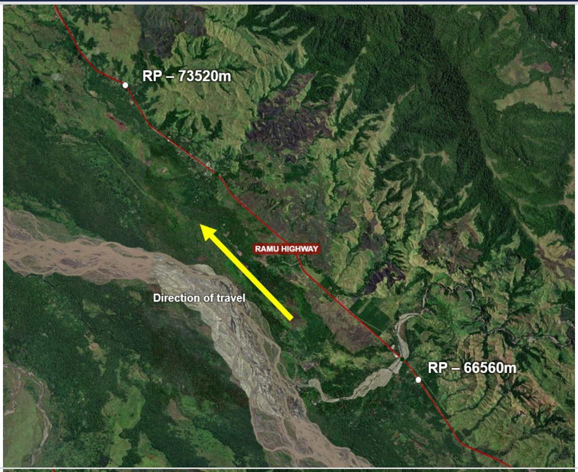
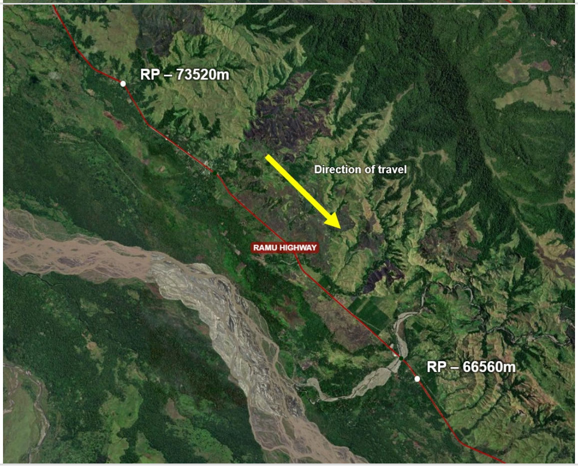
Value	Description	Photo Example
Braided	A braided river is a type of river channel that consists of a network of many small, shallow channels that split and rejoin repeatedly, creating a pattern that looks like a braid.	
Meandering	A meandering river is a type of river with a single, winding channel that forms large, looping bends called meanders as it flows across a flat or gently sloping landscape.	
Straight	A straight river is a river channel that follows a relatively linear path with minimal curves or bends. These are rare in nature and are usually short in length.	

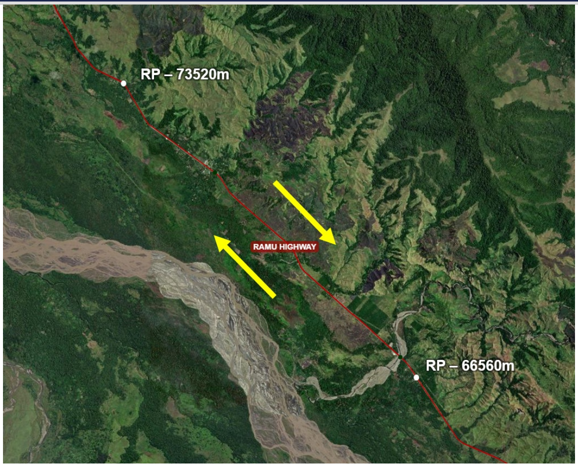
Value	Description	Photo Example
Other	Rivers can be classified into various other types based on their shape, origin, and flow patterns, including anastomosing, tidal, mountain (youthful), mature, old, glacial, rain-fed, spring-fed, perennial, intermittent, and ephemeral rivers.	
N/A	Not Applicable	

Traffic Direction

10/06/2025 12:38 pm +10

AWM Table:	**Bridges, Causeway, Major Culvert, Tunnel**
Attribute:	**Traffic Direction**
Purpose:	To support consistent recording and management of road data, inspections, and maintenance by clearly defining increasing, decreasing, and both directions of travel.

Value	Description	Photo Example
Increasing	The direction along the road where the chainage (distance markers) increase. This is usually from the start of the road (e.g. 0 km) toward the end.	
Decreasing	The direction where the chainage decreases, going from higher to lower chainage values.	

Value	Description	Photo Example
Two-way	Two-way traffic refers to both the increasing and decreasing direction on a carriageway.	

Design Loading

27/11/2024 9:28 am +10

AWM Table:	**Bridges**
Attribute:	**Design Loading**
Purpose:	To provide...

Value	Description	Photo Example
Bailey - Compact 100		
Bailey - Compact 200		
Bailey - Other (Describe)		
Bailey - Standard		
Bailey - Super		
Bailey - Universal		
Other (Describe)		
Other, Modified (Describe)		
Unknown		

[Supporting Note Header]

[Supporting Notes to further explain any exceptions or special situations or to help provide further clarity]

Latest Rehabilitation Type

27/11/2024 8:40 am +10

AWM Table:	**Bridges, Causeway, Major Culvert, Tunnel**
Attribute:	**Latest Rehabilitation Type**
Purpose:	To provide....

Value	Description	Photo Example
Major Repair		
Strengthened		
Reconstruction		
Other (notes required)		

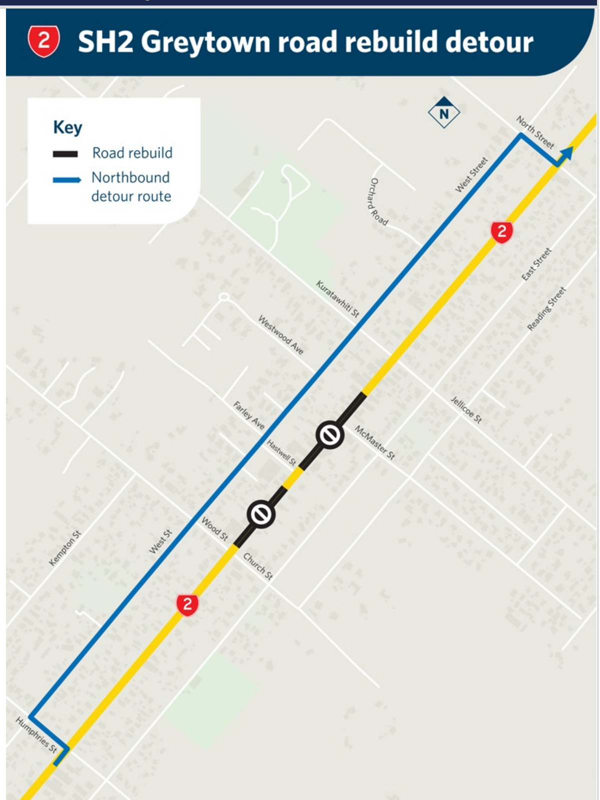
[Supporting Note Header]

[Supporting Notes to further explain any exceptions or special situations or to help provide further clarity]

Has Viable Detour

10/06/2025 12:50 pm +10

AWM Table:	**Bridges, Causeway, Major Culvert, Tunnel, Wet Crossing**
Attribute:	**Has Viable Detour**
Purpose:	To support effective planning, communication, and decision-making during road closures by clearly identifying whether a safe and usable detour is available.

Value	Description	Photo Example
Yes	A temporary route exists that directs traffic away from a closed or blocked road section so vehicles can reach their destination using a different path.	
No	The road is closed, and no alternate route has been set up to redirect traffic.	
Unknown	It is unknown if there is an alternative detour route.	

Access Method

18/06/2025 11:46 am +10

AWM Table:	**Bridges, Culvert, Major Culvert, Retaining Wall, Tunnel**
Attribute:	**Access Method**
Purpose:	To provide clear definition to assist in correctly identifying and using appropriate tools and techniques to access any assets.

Value	Description	Photo Example
Binoculars / GoPro	**Binoculars**: A handheld tool that helps you see distant parts of a road, bridge, or structure more clearly without getting close. **GoPro**: A small, waterproof video camera often used to record inspections of roads, bridges, or drains, especially in hard-to-reach places.	 
Boat / Punt	A small watercraft used to access or inspect road structures like bridges or culverts from rivers, lakes, or the sea.	

Value	Description	Photo Example
Breathing Apparatus	Safety equipment that provides clean air to the user when inspecting areas with poor air quality, such as inside culverts, drains, or confined spaces.	
Bridge Inspection Unit	A special vehicle with a movable arm or platform that helps workers safely access hard-to-reach parts of a bridge, like underneath the deck.	
Confined Space Entry	A method used to safely enter small or enclosed spaces, like culverts or drainage pipes, where there is limited air, movement, or exit options.	

Value	Description	Photo Example
Dingy	A small, lightweight boat used to reach structures over water, such as bridge piers or causeways, especially in shallow or calm water.	
Drone	A small flying device with a camera used to inspect roads, bridges, and other structures from the air, especially in hard-to-reach or dangerous areas.	
Helicopter	A flying vehicle used to quickly reach and inspect remote or difficult-to-access road structures, such as bridges in mountainous or forested areas.	

Value	Description	Photo Example
Rope Access	A method where trained workers use ropes and safety gear to climb and reach difficult parts of bridges or structures for inspection or maintenance.	
Scaffold	A temporary structure made of metal or wood that provides safe access for workers to inspect or repair parts of a road or bridge.	
Traffic Management	The planning and control of vehicle and pedestrian movement around roadworks or inspections to keep everyone safe and reduce delays.	

Value	Description	Photo Example
Waders	Waterproof boots or suits worn by workers to safely enter and work in shallow water during inspections of bridges, culverts, or drains.	
Other	Access method that does not fit in the above categories.	
No Equipment Required	No equipment is required to access the asset.	
To be determined	Equipment required to access the asset is still to be determined.	

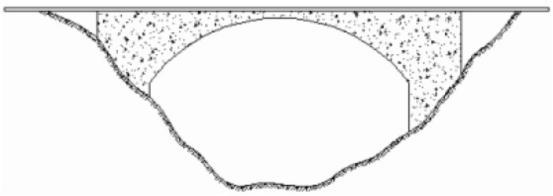
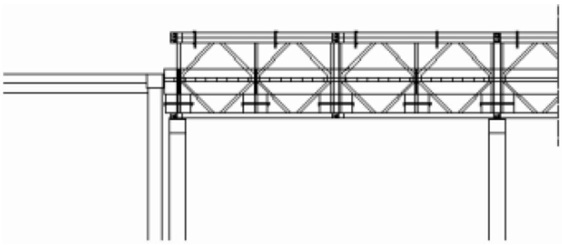
[Supporting Note Header]

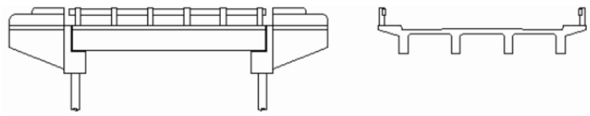
[Supporting Notes to further explain any exceptions or special situations or to help provide further clarity]

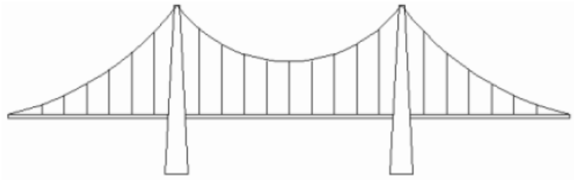
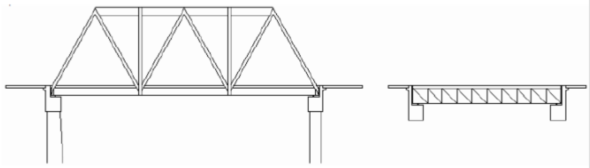
Bridge Type

27/06/2025 9:52 am +10

AWM Table:	**Bridge**
Attribute:	Bridge Type
Purpose:	To provide bridge categorisation that differentiates the structure and support provided by the bridge.

Value	Description	Photo Example
Arch	An Arch Bridge is a curved structure that supports a vertical load mainly by axial compression.	 
Bailey	A bailey bridge consists of three main parts. There are side panels that are cross-braced panels, usually made of steel. The floor of the bridge is the second feature, which is made up of horizontal wooden beams. Then lastly, bailey bridges contain stringers (long steel slates) along the bottom.	 

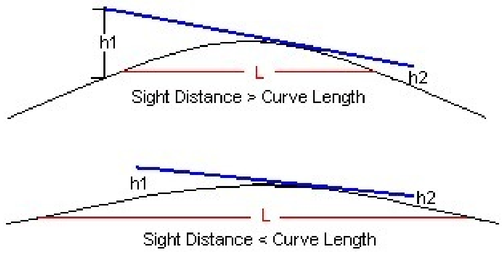
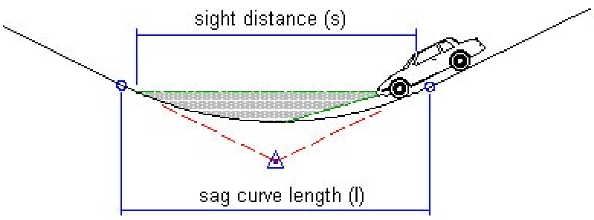
Value	Description	Photo Example
Beam & Slab	A beam and slab bridge is a type of concrete bridge made up of precast beams that are placed on supporting piers or abutments.	
Girder	A girder is a horizontal structural member supporting vertical loads by resisting bending and shear. It is a larger beam often built-up of multiple metal plates, usually bolted, riveted, or welded together; precast or cast-situ, reinforced or prestressed concrete structure.	
Log	A log bridge is a timber bridge that is constructed using longer logs closely spaced together to form a flat surface. These logs can be supported by wooden columns or a handrail.	
Portal Frame	This bridge consists of in-situ concrete foundations and seals are included between successive units to ensure a water-tight structure.	

Value	Description	Photo Example
Suspension	A suspension bridge consists of a bridge floor held below suspension cables that are attached to larger cables above, which are strung across the bridge from one end to the other.	 
Truss	A truss bridge is a type of structure made mainly of pin-connected members supporting vertical loads through axial tension and compression actions of its members. It is often made of a top and a bottom chord connected to slender web members placed in between them.	
Unknown	The bridge type is unknown.	
Other	The bridge type is not listed in this table.	

Curvature

27/11/2024 8:39 am +10

AWM Table:	**Bridges**
Attribute:	**Curvature**
Purpose:	To provide....

Value	Description	Photo Example
Horizontal Curve	A horizontal curve is a section of roadway that changes the direction or alignment of the road. Horizontal curves are used to gradually transition between two roadways that intersect, allowing vehicles to turn smoothly instead of making a sharp cut.	
Vertical Crest Curve	A vertical crest curve is a type of vertical curve that connects two inclined sections of a roadway to form a crest. Vertical crest curves are used to gradually transition between different grades of a roadway, allowing vehicles to negotiate elevation changes smoothly.	
Vertical Sag Curve	A vertical sag curve is a gradual change in the slope of a roadway that connects descending grades to form a bowl shape. Vertical sag curves are used to gradually transition between different grades of a roadway, allowing vehicles to negotiate elevation changes smoothly.	
Horizontal and Vertical Crest Curve	A horizontal and vertical crest curve is a combination of a horizontal curve and a vertical crest curve on a roadway. A horizontal curve changes the alignment or direction of a road, while a vertical curve changes the slope. A vertical sag curve is a type of vertical curve that occurs when a positive grade changes to a negative grade.	

Value	Description	Photo Example
Horizontal and Vertical Sag Curve	A horizontal and vertical sag curve is a combination of a horizontal curve and a sag vertical curve on a roadway. A horizontal curve changes the alignment or direction of a road, while a vertical curve changes the slope of a road. A sag vertical curve is a type of vertical curve that occurs when a negative grade changes to a positive grade.	
Multiple Horizontal Curve	A series of two or more back-to-back horizontal curves that are tangential.	
Multiple Vertical Curve	A series of vertical curves that join multiple sloped grades along a highway.	
Straight	Contains no horizontal or vertical curvature.	

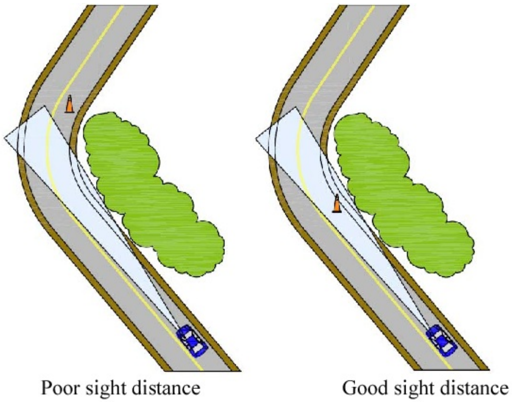
[Supporting Note Header]

[Supporting Notes to further explain any exceptions or special situations or to help provide further clarity]

Hazard

27/06/2025 9:55 am +10

AWM Table:	**Bridges**
Attribute:	**Hazard**
Purpose:	To identify features on or near the road that may increase the risk of accidents or reduce driver awareness, so they can be considered in safety assessments, maintenance, and road design improvements.

Value	Description	Photo Example
Abrupt Change in Carriageway Width	An abrupt change in carriageway may involve a reduction in width of the trafficable roadway, which presents a potential hazard to road users.	
Deceptive Horizontal Curve	A horizontal curve or bend in the road that you cannot see around as you are driving	
Deceptive Vertical Curve	A vertical curve or bend in the road that you cannot see around as you are driving	
Restricted Sight Distance	Restricted sight distance is when a driver's view is limited, making it difficult to see ahead and react to potential hazards. Horizontal and vertical curves can limit a driver's stopping sight distance, which is the distance a driver needs to see to stop safely.	
Combination of Hazards	Combination of the above hazards.	

Value	Description	Photo Example
Other	Alternative hazard not listed above.	
Unknown	It is unknown what the hazard is that exists.	

Failure Mode

27/11/2024 8:39 am +10

AWM Table:	**Bridges**
Attribute:	**Failure Mode**
Purpose:	To provide...

Value	Description	Photo Example
Ductile	Ductile failure occurs when a material is loaded beyond its yield strength. This causes the material to become deformed for a period of time before eventually failing.	
Non-Ductile	Non-ductile failure refers to inflexible or brittle breaks in materials. Materials like cast iron fail in this way when tensile load occurs.	
Unknown		

[Supporting Note Header]

[Supporting Notes to further explain any exceptions or special situations or to help provide further clarity]

Analysis Method

27/06/2025 9:56 am +10

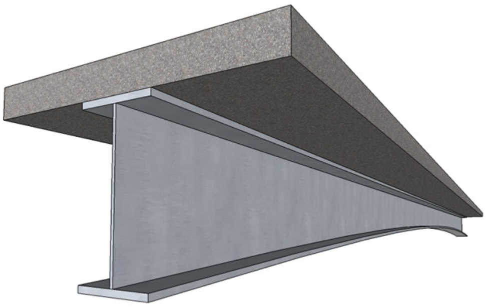
AWM Table:	**Bridges**
Attribute:	**Analysis Method**
Purpose:	To record the level of assessment applied to the road or structure, helping users understand the reliability and detail of the information used for planning, design, or condition evaluation

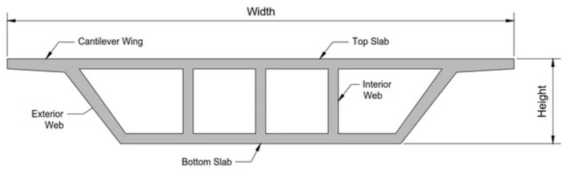
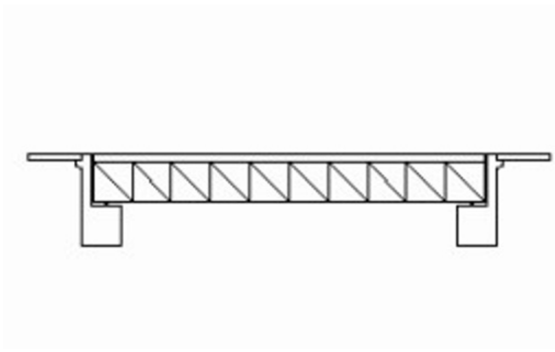
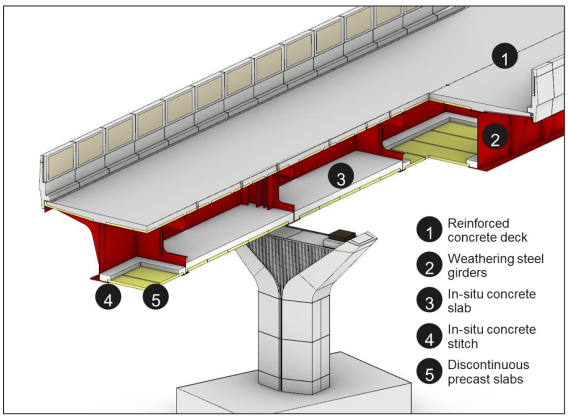
Value	Description
Preliminary	A basic or early-stage assessment using limited data or assumptions; suitable for initial planning or screening
Rigorous	A detailed and thorough analysis using site measurements, calculations, or technical modelling.
Not Analysed	No analysis has been carried out for this asset or section.
Other	The assessment method used does not fit into the listed categories and may involve alternative or non-standard approaches.
Unknown	The type or level of analysis is not recorded or cannot be determined.

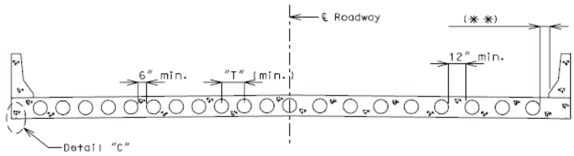
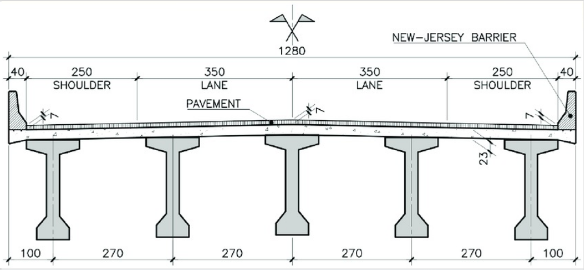
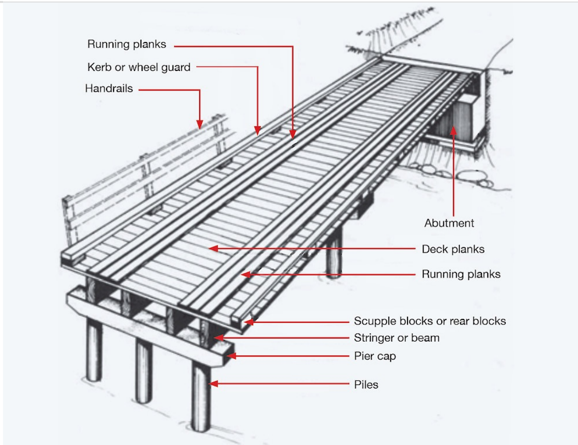
Superstructure Cross Section

27/06/2025 11:47 am +10

AWM Table:	Bridges, Bridge Span
Attribute:	**Superstructure Cross Section**
Purpose:	To describe the type of structure used to carry the road or pathway across a span (such as a bridge), which helps with design classification, maintenance planning, and structural assessment.

Value	Description	Photo Example
Beam and Slab (Composite)	A beam-slab composite is a construction technique that combines a concrete slab with a steel beam to create a strong and stiff structure. The technique takes advantage of the strengths of both materials, with concrete being strong in compression and steel being strong in tension.	
Beam and Slab (Non Composite)	The precast beams are placed on the supporting piers or abutments, usually on rubber bearings which are maintenance free. An in-situ reinforced concrete deck slab is then cast on permanent shuttering which spans between the beams.	
Beam Deck	A beam deck typically involves a combination of beams and a deck that work together to support the loads from traffic and transfer them to the bridge supports. Beams can be made of steel, concrete, or a combination of both (composite beams).	

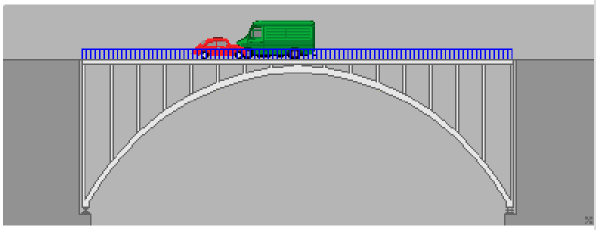
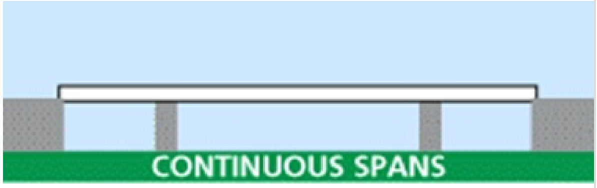
Value	Description	Photo Example
Box Girder	A girder that forms an enclosed tube with multiple walls.	
Slab	Slab bridges are flat concrete beams with twisted or roughened reinforcing steel rods concentrated in the lower portion and at either end of the slab, where tensile forces and sheer are the greatest.	
Truss, Deck	A bridge which carries its deck and traffic entirely on top of the truss structure.	
Truss, Through	This bridge involves portal frames which increases their span capability. In doing so, the vertical clearance above the bridge's roadway sets the truss height.	
Units with Slab	A superstructure cross section with a slab typically involves a combination of beams (or girders) and an embedded concrete slab.	

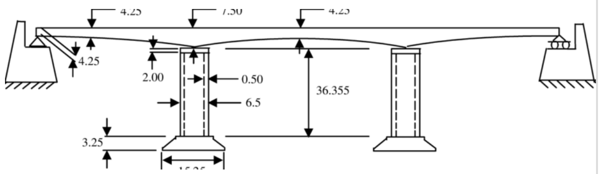
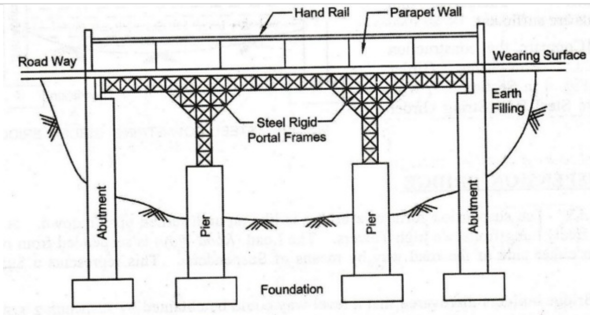
Value	Description	Photo Example
Units without Slab	A superstructure cross section without a slab typically involves the primary load-carrying elements, such as beams or girders, and other structural components that provide stability and support.	
Void Slab	A concrete slab with hollow spaces (voids) inside to reduce weight while still supporting loads.	
Girder	A large horizontal support beam that carries loads from the bridge deck to the supports or piers.	
Log Beam Deck	A basic deck made from logs or tree trunks placed side-by-side, usually for temporary or low-traffic bridges.	
Unknown	The type of structural form used to carry the deck is not recorded, visible, or cannot be identified from available information.	

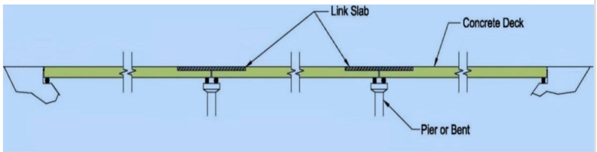
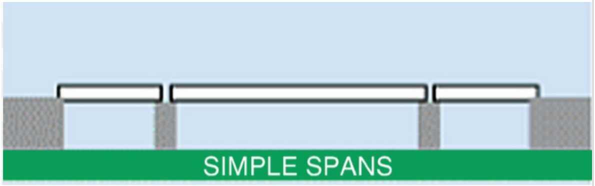
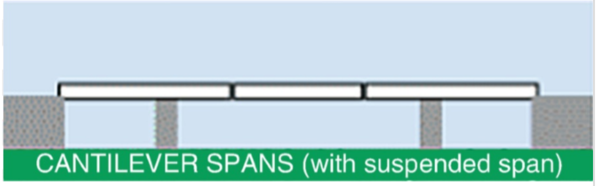
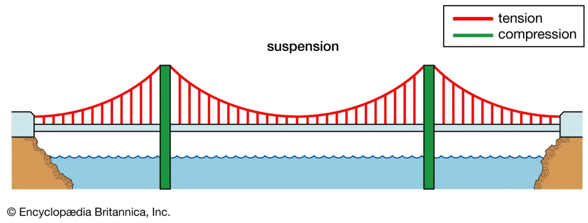
Superstructure Long Section

27/06/2025 12:06 pm +10

AWM Table:	**Bridges, Bridge Span**
Attribute:	**Superstructure Long Section**
Purpose:	To provide superstructure categorisation that differentiates the span and support provided by the longitudinal section of the bridge, as opposed to the cross section.

Value	Description	Photo Example
Arch, Deck	Abutments at each end shaped as a curved arch. Arch bridges work by transferring the weight of the bridge and its loads partially into a horizontal thrust restrained by the abutments at either side, and partially into a vertical load on the arch supports.	
Arch, Earth Filled	Earth filled arches support the roadway on earth fill that is contained between the spandrel walls.	
Arch, Through	Bridge in which the base of an arch structure is below the deck but the top rises above it.	
Continuous Span	A superstructure which extends as one piece over multiple supports.	

Value	Description	Photo Example
Hinged Span	A hinged bridge span is a bridge with a hinge that allows the bridge to move or be lifted.	
Integral Span	An integral bridge is a structure where there are no expansion joints in the superstructure between spans and between spans and abutments.	
Partially Continuous	A bridge where some spans are joined to share loads, but not all – allowing some movement while still improving strength across sections.	
Portal Frame	The portal frame bridge system comprises of a precast portal frame which interlinks on precast structural base sections. A joint is created between the frame and the base units.	
Rigid Frame Fixed End	A bridge where the superstructure and supports are built as one stiff unit, with no movement at the ends – making it very strong but less flexible.	 FIG. 11 SECTION OF STEEL RIGID FRAME BRIDGE

Value	Description	Photo Example
Semi-Integral (Link Slab Over Pier)	A semi-integral span bridge with a link slab over a pier is a bridge design that uses link slabs to connect bridge decks without traditional deck joints.	
Simple Span	Simple span bridges cross from one support to another and can be joined together to create a longer span.	
Suspended Span	Span in which the arms do not meet in the center; instead, they support a central truss bridge which rests on the ends of the cantilever arms.	
Suspension	A suspension bridge is a type of bridge in which the deck is hung below suspension cables on vertical suspenders.	
Unknown	The shape or form of the bridge in the lengthwise (longitudinal) direction is not recorded or cannot be determined from available information.	

Superstructure Material

27/06/2025 12:11 pm +10

AWM Table:	**Bridges, Bridge Span**
Attribute:	**Superstructure Material**
Purpose:	To identify the primary material used in the bridge superstructure, supporting decisions related to maintenance, structural performance, durability, and replacement planning.

Value	Description	Photo Example
Aggregate	Crushed rock or gravel used in combination with cement to form concrete, or as a standalone fill material in some simple structures.	
Armco	Corrugated steel used primarily in culverts or low-span bridges, known for being lightweight and easy to install.	 

Value	Description	Photo Example
Concrete	A hard, durable mixture of cement, water, and aggregates, widely used for strong and long-lasting bridge decks and beams.	
Earth	Compacted soil or fill material used in very basic or low-load crossings, such as causeways.	
Gabion	Wire cages filled with rocks, stacked to form a supporting structure, often used for retaining walls or low-level bridges.	
Log	Tree trunks or large timber beams used as simple structural members, often in rural or temporary crossings.	

Value	Description	Photo Example
Masonry	Stone or brick units laid and bound together, typically used in older or traditional bridge structures.	
Polyethylene (PE)	A type of plastic material, lightweight and resistant to chemicals and corrosion, used in modern small bridges or culverts.	
Polyvinyl Chloride (PVC)	A rigid plastic material occasionally used in small or temporary structures due to its resistance to moisture and low cost.	
Steel	Strong metal used for beams, girders, and reinforcement, common in medium to long-span bridges.	

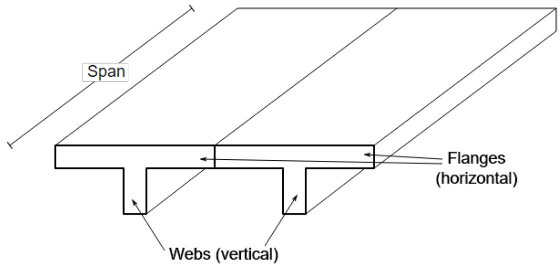
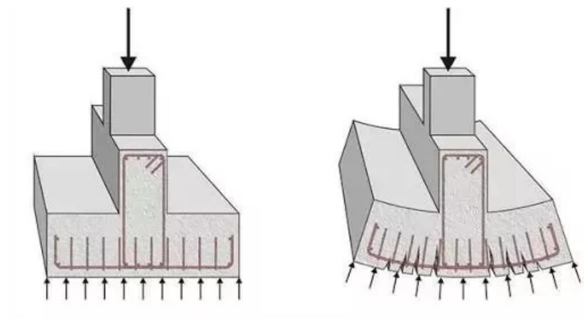
Value	Description	Photo Example
Timber	Processed wood used for beams, decks, or full bridge structures, especially in rural or remote areas.	
Unknown	The material has not been identified or recorded.	

Beam Type

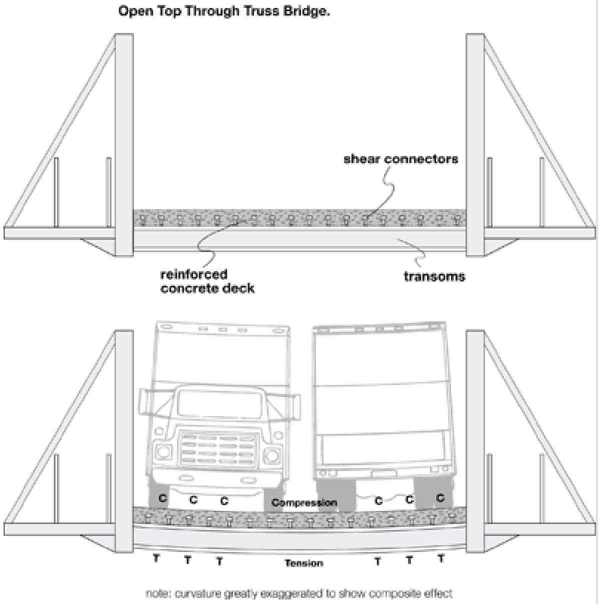
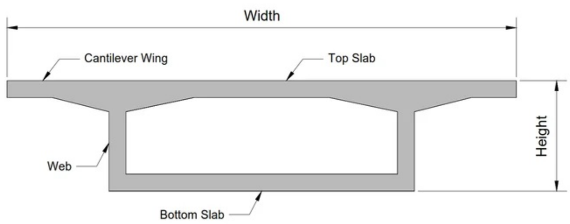
27/06/2025 12:18 pm +10

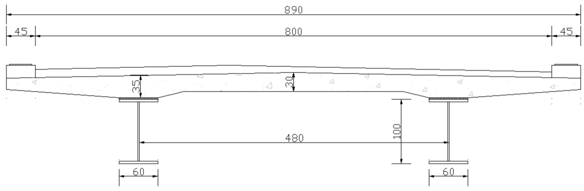
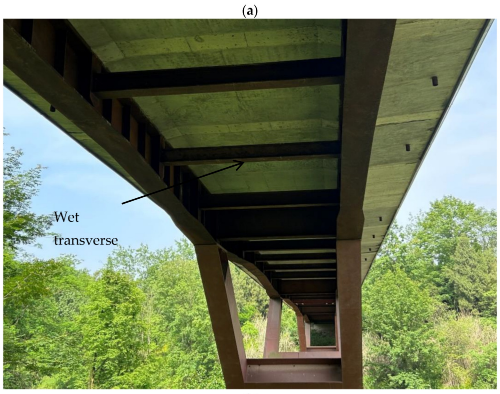
AWM Table:	**Bridges, Bridge Beam, Bridge Span**
Attribute:	**Beam Type**
Purpose:	To identify the specific shape or form of beams used in a structure, which supports design classification, structural assessment, and maintenance planning.

Value	Description	Photo Example
Double Core Unit	A precast concrete beam with two hollow cores running through it, used to reduce weight while maintaining strength.	
I Beam	An I-beam is a structural steel member with an I-shaped cross-section that's used in many construction projects. These beams have the capacity to withstand various types of loads.	

Value	Description	Photo Example
U Beam	A type of steel beam, which is a structural steel product with multiple uses mainly in the construction sector. U-Beams are also known as a parallel flange channel or C Beams. They typically can be welded together to form I-Beams.	
T Beam	T beam bridges have cast-in-place, reinforced concrete beams with integral deck sections to either side of the tops of the beams.	
Inverted T Beam	An inverted T-section concrete beam is a type of beam that has a cross-sectional shape that resembles an inverted letter "T". The top of the beam is flat, while the bottom of the beam has a flange that extends out on either side. Inverted T-beam is used when the beam is subjected to hogging moments.	

Value	Description	Photo Example
Log Beam	A large piece of wood, or log, that is used to create a structure.	
Plate Girder	A structural element made of welded or bolted steel plates that is used to support heavy loads and spans in bridges.	
Precast Concrete Panel	A bridge deck made of a series of prefabricated concrete panels that are cast off-site and then installed at the bridge site.	
RSJ and U Beam	Rolled Steel Joists and Universal Beams are are both types of steel beams used for structural support in construction and engineering.	

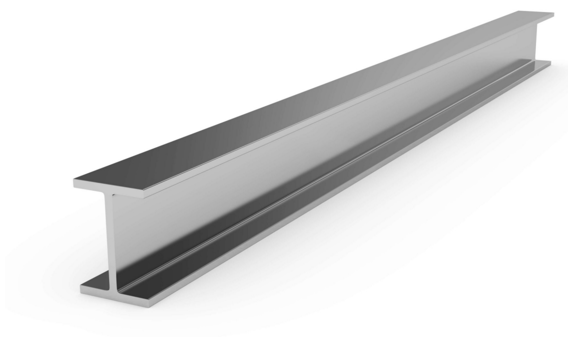
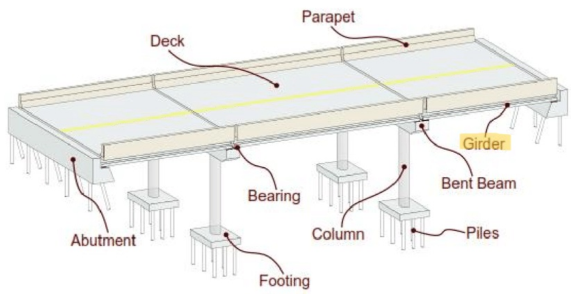
Value	Description	Photo Example
Stringers and Transom	Steel beams which span under the roadway and carry the loads of the roadway to the trusses or beams.	
Bailey	A type of pre-fabricated, modular steel truss bridge used for temporary or emergency crossings; quick to assemble without heavy equipment.	
Box Girder	A hollow, rectangular beam—often made of steel or concrete—that provides high strength and stiffness, used for longer spans.	

Value	Description	Photo Example
Truss	A beam made from a connected framework of triangles, efficiently distributing weight across long spans.	
Frame	A beam system where horizontal and vertical members form a rigid structure, typically seen in rigid frame bridges.	 (a)  (b)
Girder	A large, solid horizontal support beam (usually steel or concrete) that holds up the bridge deck and transfers loads to the piers or abutments.	
Unknown	The beam type is not recorded or cannot be identified based on available information.	
Not Applicable	No beams are used in the structure, or the structure type does not involve beams.	

Secondary Member Type

17/06/2025 9:22 am +10

AWM Table:	**Bridges**
Attribute:	**Secondary Member Type**
Purpose:	To describe the type of structural elements that support or connect the main parts of a bridge or crossing, helping with structural assessment, repair planning, and material classification.

Value	Description	Photo Example
Beam	A beam is a structural element that primarily resists loads applied laterally across the beam's axis.	
Girder	A large beam or compound structure used for building bridges. It is the main horizontal support of a structure which supports smaller beams.	
Log	A large piece of wood, or log, that is used to create a structure.	

Value	Description	Photo Example
Truss	A structure of connected elements, usually forming triangular units. These members are structured and connected in a way such that they only incur axial force. The members of a truss are considered two-force members because the forces are only applied at either end of the member, resulting in either a compression or tension force.	
Other	A secondary structural element that does not fit into the listed types.	

Secondary Member Material

17/06/2025 9:23 am +10

AWM Table:	**Bridges**
Attribute:	**Secondary Member Material**
Purpose:	To record the material used for the secondary structural elements of a bridge or crossing, which helps assess durability, maintenance needs, and structural performance.

Value	Description	Photo Example
Bailey	Bailey bridges are made of modular steel elements and standard steel alloys. The parts are interchangeable, and the bridges can be used to restore road blocks, construct bridges, or reinforce existing bridges.	
Bitumen	Bitumen is the liquid binder that holds asphalt together. A bitumen-sealed surface is a layer of bitumen sprayed and then covered with an aggregate. This is then repeated to give a two-coat seal.	
Concrete	Concrete bridge decks can be constructed using precast or cast-in-place methods.	

Value	Description	Photo Example
Steel	Steel bridge members are easy to fabricate and are widely used in bridge construction due to the high tensile strength of steel materials.	
Timber	Wood is the raw material. Maintenance costs are significantly lower for timber bridges, as they are less prone to corrosion and require less frequent inspections and repairs compared to steel bridges.	
Other	The material used does not match the listed categories.	

Super Restraint

17/06/2025 9:28 am +10

AWM Table:	Bridges
Attribute:	Super Restraint
Purpose:	To record the material or system used to restrain the superstructure (bridge deck or beams), which helps assess stability, durability, and maintenance needs of the bridge.

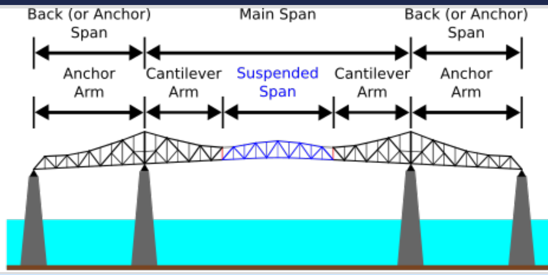
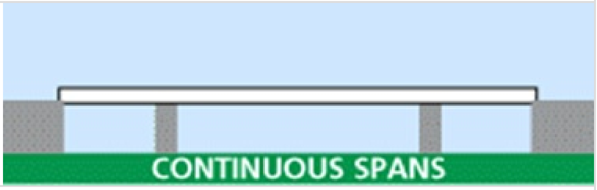
Value	Description	Photo Example
Cables/Bolts	Most bolted connections in bridges will transfer the forces between the plates using shear connections and tensile connections.	
Concrete	Concrete elements such as blocks, keys, or encasements are used to restrain movement of the bridge superstructure.	
Steel	Steel components, such as plates, angles, or fabricated connections, are used to restrain or secure the bridge deck.	
Other	A restraint method or material not listed, such as composite systems, timber, or unconventional anchoring techniques.	

Value	Description	Photo Example
Unknown	The type of superstructure restraint is not recorded or cannot be identified from available information.	

Deck Type

18/06/2025 11:45 am +10

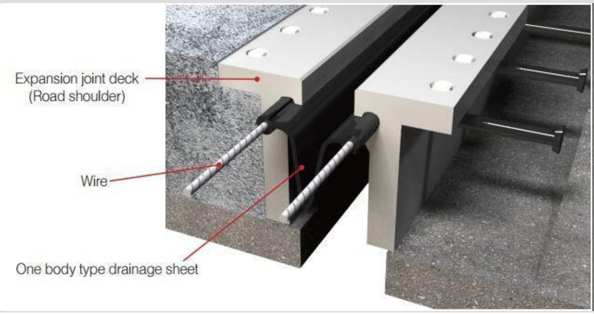
AWM Table:	**Bridges, Bridge Deck**
Attribute:	**Deck Type**
Purpose:	To describe how the bridge deck is supported and connected to the rest of the structure. This helps engineers and asset managers understand load paths, movement behaviour, and maintenance needs.

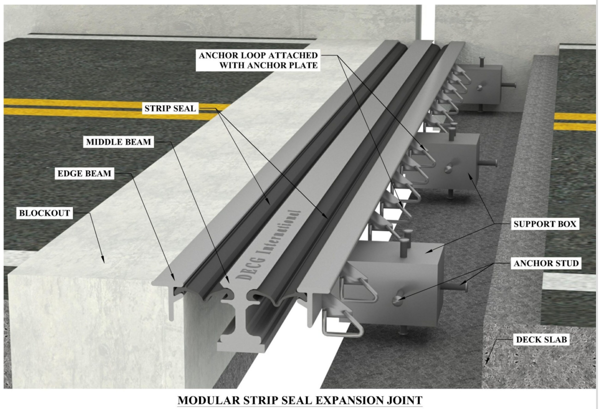
Value	Description	Photo Example
Cantilevered & suspended	The deck has parts that extend beyond the supports (cantilevered) and sections that hang between them (suspended).	
Continuous	The deck is made of spans that are joined and act as a single unit over multiple supports, without hinges or breaks.	
Fixed end	The deck is rigidly attached to its supports at both ends, restricting movement and rotation.	
Simply supported	The deck rests freely on supports at each end, allowing rotation and slight movement.	
Earth	The deck is made from compacted soil or natural ground, not a constructed structure (e.g. earth embankment crossing).	
Prestressed Concrete	The deck is made of concrete that has internal tensioned steel cables to make it stronger and span longer distances.	
Other	A deck type that does not fit the listed categories, such as composite decks or unusual designs.	
Unknown	The deck type is not recorded or cannot be determined from available information.	

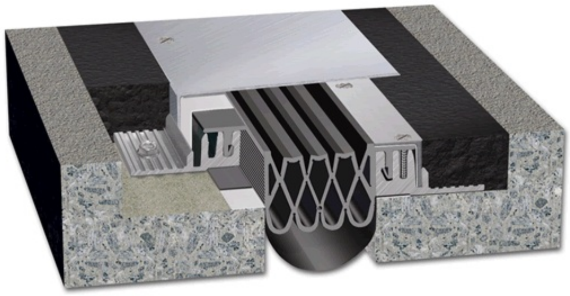
Expansion Joint Type

18/06/2025 12:01 pm +10

AWM Table:	**Bridges**
Attribute:	**Expansion Joint Type**
Purpose:	To identify the type of expansion joint used in a bridge, which helps assess how the structure accommodates movement caused by temperature changes, traffic loads, and foundation shifts. This supports effective inspection, maintenance, and replacement planning.

Value	Description	Photo Example
Air Gap	A simple open space between deck segments with no filler, allowing free movement but offering no protection against debris or water.	
Bitumen Filled Gap	To prevent water and debris from entering bridge joints, they need to be sealed with an air-tight, waterproof, and flexible material. Bitumen filled gaps, also known as asphalt plug joints, are good quality closed joint solutions for new bridge construction or bridge rehabilitation.	
Metal Finger Joint	Also known as finger expansion joint, consists of symmetrical or non-symmetrical elements (such as comb or saw-tooth or sinusoidal plates) which are anchored on one side of the deck joint gap and interpenetrate to bridge deck joint gap.	

Value	Description	Photo Example
Metal Sliding Plate	It's made up of two overlapping steel plates that are attached to the bridge deck on either side of the expansion joint opening. The plates are usually bolted to timber decks or embedded into concrete decks.	
Modular Joint	The Modular Expansion Joint System (MEJS) is a mechanical device installed in bridge expansion joint openings. The primary function of the MEJS is to allow vehicle traffic to travel smoothly across large expansion joint openings.	
Rubber Extrusion Reinforced	A rubber expansion joint is a flexible connector to absorb noise, shock, vibration, physical and thermal energy. Made of natural or synthetic elastomers it may be internally reinforced with fabrics and metal for strength and pressure resistance whilst metal reinforcement may be used externally for movement control.	

Value	Description	Photo Example
Rubber Extrusion Unreinforced	A rubber joint shaped to fit the gap, without internal reinforcement, used to absorb movement and keep out water and dirt.	
Rubber Seal (Solid)	A solid piece of rubber fitted into the joint, allowing minor movement and providing a seal against moisture.	
Rubber Seal and Vertical Metal Plate	A rubber seal and vertical metal plate bridge expansion joint typically includes a flexible elastomer encased around a steel bridging plate system and steel angles.	

Value	Description	Photo Example
Rubber Strip Seal	A mechanical device adapted for sealing an elongated gap formed between two adjacent road slab sections by providing a continuous support for vehicles crossing the gap while allowing the desired temperature responsive movement of the road slab sections.	
Other	Any type of expansion joint not listed, such as fabric joints, modular systems, or custom-made solutions.	

[Supporting Note Header]

[Supporting Notes to further explain any exceptions or special situations or to help provide further clarity]

Parapet Type

18/06/2025 12:03 pm +10

AWM Table:	Bridges
Attribute:	Parapet Type
Purpose:	To identify the type of parapet used on a bridge, which helps assess safety features, containment capability, and maintenance needs. Parapets provide edge protection for vehicles and pedestrians.

Value	Description	Photo Example
Rails and Posts	A parapet made of horizontal rails supported by vertical posts, often metal or timber. It allows visibility and provides basic barrier protection.	 
Wall	A solid parapet structure made of concrete, masonry, or other rigid materials, offering strong containment and a physical barrier.	
Unknown	The type of parapet is not recorded or cannot be identified from available information.	

Parapet Material

18/06/2025 1:01 pm +10

AWM Table:	**Bridges**
Attribute:	**Parapet Material**
Purpose:	To record the material used for bridge parapets, which helps assess durability, safety performance, and maintenance requirements over time.

Value	Description	Photo Example
Aluminum	Lightweight metal parapets made from aluminum, typically used for corrosion resistance and ease of handling.	
Concrete	Parapets made entirely of concrete, offering strong impact resistance and low maintenance.	
Masonry	Parapets constructed from stone or brick, usually seen in older or decorative bridges.	

Value	Description	Photo Example
Steel	Parapets made from steel components such as beams, posts, or rails, offering high strength and flexibility in design.	
Timber	Parapets built from wood, often used on rural, low-traffic, or older structures.	
Steel and Concrete	Parapets combining steel elements (like rails) with concrete (like posts or bases), providing both strength and mass.	

Value	Description	Photo Example
Steel and Timber	A hybrid of steel and timber components, offering both flexibility and traditional materials.	
Timber and Concrete	Parapets that use timber rails with concrete posts or supports, typically in transitional or budget-conscious designs.	
Other	Parapet materials not covered above, such as plastic composites, fiberglass, or experimental designs.	
Unknown	The parapet material has not been recorded or cannot be identified from available data.	

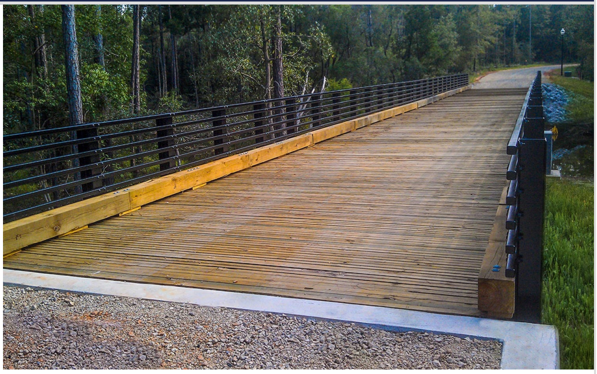
Deck Wearing Surface

18/06/2025 1:47 pm +10

AWM Table:	**Bridges**
Attribute:	**Deck Wearing Surface**
Purpose:	To identify the material used as the top surface layer of a bridge deck. This helps assess skid resistance, ride quality, drainage, durability, and maintenance needs.

Value	Description	Photo Example
Asphalt	A smooth, black bituminous surface used to provide a durable, flexible driving surface on bridges.	
Ballast and rail	Crushed stone ballast supporting railway tracks laid directly on the bridge deck, used for rail transport bridges.	
Chip seal	A surface made by spraying bitumen and then covering it with small aggregate chips, offering a rough texture and skid resistance.	

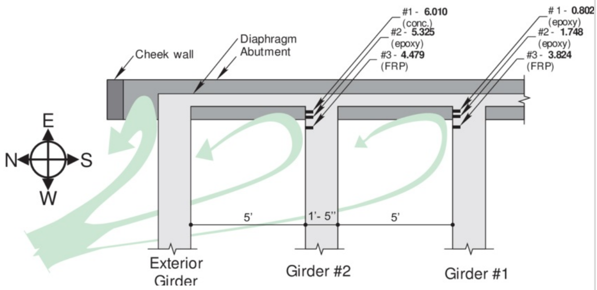
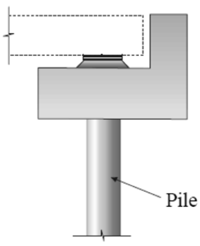
Value	Description	Photo Example
Cobble	Rounded stones set closely together, typically seen in older or decorative bridge decks.	
Concrete	A hard, durable surface made from poured or precast concrete, often used for long-term performance.	
Gravel	Loose stone aggregate placed as a simple surface layer, typically found on low-volume or temporary structures.	
Masonry	Built from stone or brick materials, often seen on historic or decorative bridges.	
Rail	Steel rails forming the main wear surface, usually for rail bridges where train wheels make direct contact.	

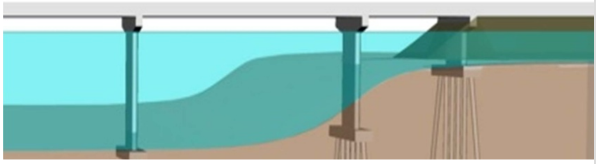
Value	Description	Photo Example
Wood - Deck Plank	Timber planks laid side-by-side across the bridge deck, used for lighter traffic or traditional bridges.	
Wood - Running Plank	Narrow timber strips placed only where vehicle wheels travel, commonly seen on timber bridges.	
Steel	A metal surface deck, often corrugated or plate, used where strength and minimal weight are needed.	
Other	Any surface type not listed above, such as synthetic materials or combinations of multiple materials.	
Unknown	The surface material is not recorded or cannot be determined from current data.	

Abutment Type

18/06/2025 2:01 pm +10

AWM Table:	**Bridges**
Attribute:	**Abutment Type**
Purpose:	To classify the structural form of abutments used to support the ends of bridges, helping guide inspection, maintenance, and future design choices.

Value	Description	Photo Example
Diaphragm wall	Diaphragm walls are employed in the construction of bridge abutments to provide stable support for the bridge deck and resist lateral earth pressures.	
Reinforced Earth	Reinforced earth is also known as Mechanically Stabilised Earth (MSE). This technique combines soil with artificial reinforcing elements to create strong, stable structures such as retaining walls.	
Gabions	A gabion abutment is a support or structure built from a gabion, which is a basket or cage of wire mesh filled with rocks or earth. Gabions are used to protect the soil around bridges, abutment slopes, and bridge piers.	
Pile bent	They consist of a group of piles. Piles are cylindrical-shaped elements driven or drilled in the ground and connected at their top with a cap to allow the bridge superstructure to be supported on seats. Above ground, pile bent abutments look like spill through abutments.	

Value	Description	Photo Example
Solid wall	A solid wall abutment is a solid wall that extends from its foundation, and is often used in bridge construction.	
Spill through	Spill-through abutments comprise an abutment column (a standard-stub column) at the end of an unconfined earth-fill embankment.	
Other	An abutment type that does not fit into the listed categories. This may include custom, experimental, or combined designs not commonly used.	
Unknown	The type of abutment has not been recorded, or there is not enough information available to determine it.	

Abutment Cap

18/06/2025 2:04 pm +10

AWM Table:	**Bridges**
Attribute:	**Abutment Cap, Pier Cap**
Purpose:	To describe the type of structure used at the top of abutments or piers, where the bridge superstructure rests. This helps with load assessment, maintenance planning, and understanding how the bridge transfers forces to the supports.

Value	Description	Photo Example
Concrete (cast in-situ)	Concrete poured and formed directly on the bridge site, allowing it to be molded to specific shapes as needed during construction.	
Concrete (Precast)	Concrete components made off-site in a controlled environment, then transported and installed at the bridge location.	

Value	Description	Photo Example
Steel	A metal cap made from steel sections or plates, valued for its strength, durability, and use in modular or high-load designs.	
Timber	Timber caps, also known as timber bent caps, are usually rectangular, constructed from large, solid timber beams securely connected to the piers or columns using bolts, metal plates or other fastening methods.	
Other	A cap type that does not match any of the listed standard options. It may be a custom or uncommon design.	
Unknown	The cap type is not recorded or cannot be identified based on available information.	

Abutment Bank Protection

18/06/2025 2:12 pm +10

AWM Table:	**Bridge**
Attribute:	**Abutment Bank Protection**
Purpose:	To identify the type of protective structure used around abutments to prevent erosion or scour from water flow. This supports the maintenance and safety of bridge foundations over time.

Value	Description	Photo Example
Concrete	A solid, continuous structure made from cast or precast concrete used to protect the bank from water damage.	
Gabions	Rock-filled wire cages placed along the bank to absorb water energy and reduce erosion.	
Mattresses	Thin, flexible layers (often wire mesh filled with stone) laid on the riverbed or slope to provide wide-area erosion protection.	
Paving	A surface layer made of flat stones, bricks, or concrete units arranged to protect the bank and maintain its shape.	

Value	Description	Photo Example
Rip rap	Loose stones or rubble placed on the slope of a bank to slow water flow and prevent erosion.	
Stone wall	A constructed wall made of stacked stones, often without mortar, used to hold back soil and resist water impact.	
Other	A type of bank protection that does not fit any of the listed categories, including unique or combined solutions.	
Unknown	The bank protection type is not recorded or cannot be determined from available information.	

Material Subset

18/06/2025 2:23 pm +10

AWM Table:	**Major Culvert**
Attribute:	Material Subset
Purpose:	To identify the specific material used in the construction of culverts, helping assess durability, maintenance needs, structural capacity, and compatibility with surrounding conditions like soil, water flow, and environmental exposure.

Value	Description	Photo Example
Corrugated	A material with a ridged or wavy surface, typically metal or plastic, used to increase strength and flexibility.	
Non-Corrugated	A smooth-walled material, typically used where flow efficiency is prioritised over structural flexibility.	
Cast iron - Cement Lined	Cast iron pipe with a cement layer inside to resist corrosion and improve flow characteristics.	
Steel Reinforced Concrete	Concrete that contains steel bars or mesh to increase its strength and durability.	
Unreinforced Concrete	Plain concrete without any internal steel reinforcement, suitable for lower-stress applications.	
Ductile iron - Cement Lined	A strong iron alloy with added cement lining for corrosion protection and smoother flow.	
Glazed Earthenware	A type of ceramic pipe with a shiny, sealed surface to resist water and chemical damage.	
Vitreous Earthenware	Ceramic pipe that is fired and coated with a glass-like surface to improve durability and impermeability.	
Carbon Reinforced Plastic	Plastic material strengthened with carbon fibres for added strength and chemical resistance.	
Glass Reinforced Plastic	Plastic reinforced with glass fibres, known for being lightweight and corrosion-resistant.	

Value	Description	Photo Example
PE100	High-density polyethylene pipe material rated for high pressure and strength.	
PE80	A slightly lower-grade polyethylene pipe compared to PE100, still suitable for pressure applications.	
Modified PVC (PVC-M)	Polyvinyl chloride that's been modified to enhance toughness and resistance to cracking.	
Oriented PVC (PVC-O)	PVC that has been stretched and aligned during manufacture, making it stronger and more impact-resistant.	
Un-plasticised PVC (PVC-U)	Rigid PVC without added softeners, commonly used in drainage and water systems.	
Stainless Steel (Grade 314)	A type of stainless steel known for moderate corrosion resistance and strength.	
Stainless Steel (Grade 316)	A high-grade stainless steel with excellent corrosion resistance, often used in marine or harsh environments.	
Corrugated Steel	Steel sheet with a rippled profile to add strength and reduce weight.	
Non-Corrugated	Smooth steel pipe or plate without any surface profiling.	
Cement Lined Steel	Steel pipe with a protective internal cement layer to reduce corrosion and improve flow.	
Epoxy Lined Steel	Steel pipe coated internally with epoxy to protect against corrosion and chemical attack.	

Road Structures - Overview

27/11/2024 8:23 am +10

Road structures are a key asset group in a road network. They often critical points of risk (a broken structure makes a whole road inaccessible) and require support from a specialist structural engineer to manage over the long term.

Types of Structures that Cross Water

Type	Definition	Photo Example
Bridge	A ***bridge*** is a structure that carries a roadway or over a physical obstruction, such as a river, lake, or even another road or railway.	
Major Culvert	A ***major culvert*** is a tunnel structure that allows running water to pass under a roadway or railway. Culvert is also useful for water drainage or bridging the gap over a physical obstruction. A major culvert is where the cross section area is greater than $3.4m^2$ and therefore managed as a structure.	
Causeway	A ***causeway*** (also known as a low-water crossing, low-water bridge or ford) is a low-elevation roadway traversing over a waterbody that stays dry above the water when the flow is low, but is designed to get submerged under high-flow conditions such as floods. Occassionally it is always wet with low flows.	

Type	Definition	Photo Example
River Crossing	A ***river crossing*** (also sometimes known as a ford or a wet crossing) is a shallow place with good footing where a river or stream may be crossed by a vehicle getting its wheels wet. A river crossing may occur naturally or be constructed. River crossings are likely to be impassable during high water. A River Crossing is not a structure but is often used to identify where a structure may be needed.	

Bridge vs. Culvert

A bridge is different to a culvert primarily because it is constructed of piers, abutments and a deck, where a culvert is all enclosed as either circular (tube) or rectangular with two sides, a floor and a roof.

Other Structures

Type	Description	Photo Example
Tunnel	A ***tunnel*** is a passage built underground, for example to allow a road or railroad to go through a hill or under a river. A tunnel can be like an extra large culvert but for the purpose of carrying vehicles rather than water. While most tunnels are lined some tunnels can simply be a passageway dug through hard rock and requiring no lining.	
Retaining Wall	A ***retaining wall*** is a relatively rigid wall used for supporting soil laterally so that it can be retained at different levels on the two sides. Retaining walls are structures designed to restrain soil to a slope that it would not naturally keep to. Retaining walls incluse seawalls as they are fundamentally the same type of structure.	

Type	Description	Photo Example
Gantry	A ***gantry*** is a structure that crosses over an area and can be used to display, support or suspend objects (e.g. ITS equipment or cameras).	

Erosion Protection

Not strictly a structure but sometimes like a light retaining wall where its purpose is to stop erosion rather than retaining the earth behind it.

Type	Description	Photo Example
Erosion Protection	Erosion protection is an asset or assets that have been placed or constructed to limit or prevent soil from being washed away by water or blown away by wind.	 

Bridge Assets - Support Information

17/01/2025 7:11 am +10

What data should be collected for bridges?

The Bridge Data Dictionary outlines the data that must be collected and provided by suppliers carrying out activities that affect the Bridge table. This data is required to ensure that the objectives of the Bridge table can be met.

How long does a bridge need to be before in should be entered into the Bridge database?

All bridges need to be added to the bridge table, irrespective of their length.

Kerb Heights

The height of the kerbs should be measured from the top of the carriageway sealed surface to the top of the kerb.

Different Deck and/or Beam Constructions

For different deck and/or beam construction types, individual br_deck and/or br_beam table(s) should be recorded with associated data under the br_bridge table.

Measurement between Rail to Rail and Kerb to Kerb

The measurements to be taken at the NARROWEST width between each side of the railing or kerb.

Width of the Deck

The overall width of the deck should be measured as the outer edge of deck to the outer edge of deck. This width is often different from rail to rail, but should record the overall useable width of the deck for the road users.

Structural Rating/Restrictions

Any associated data in relation to structural rating and/or restrictions should be recorded following a structural review and assessment and should be populated by a CPEng Structural Engineer.

Moment/Shear/VAI

Any associated data in relation to moment/shear/VAI should be calculated/supplied by a CPEng Structural Engineer.

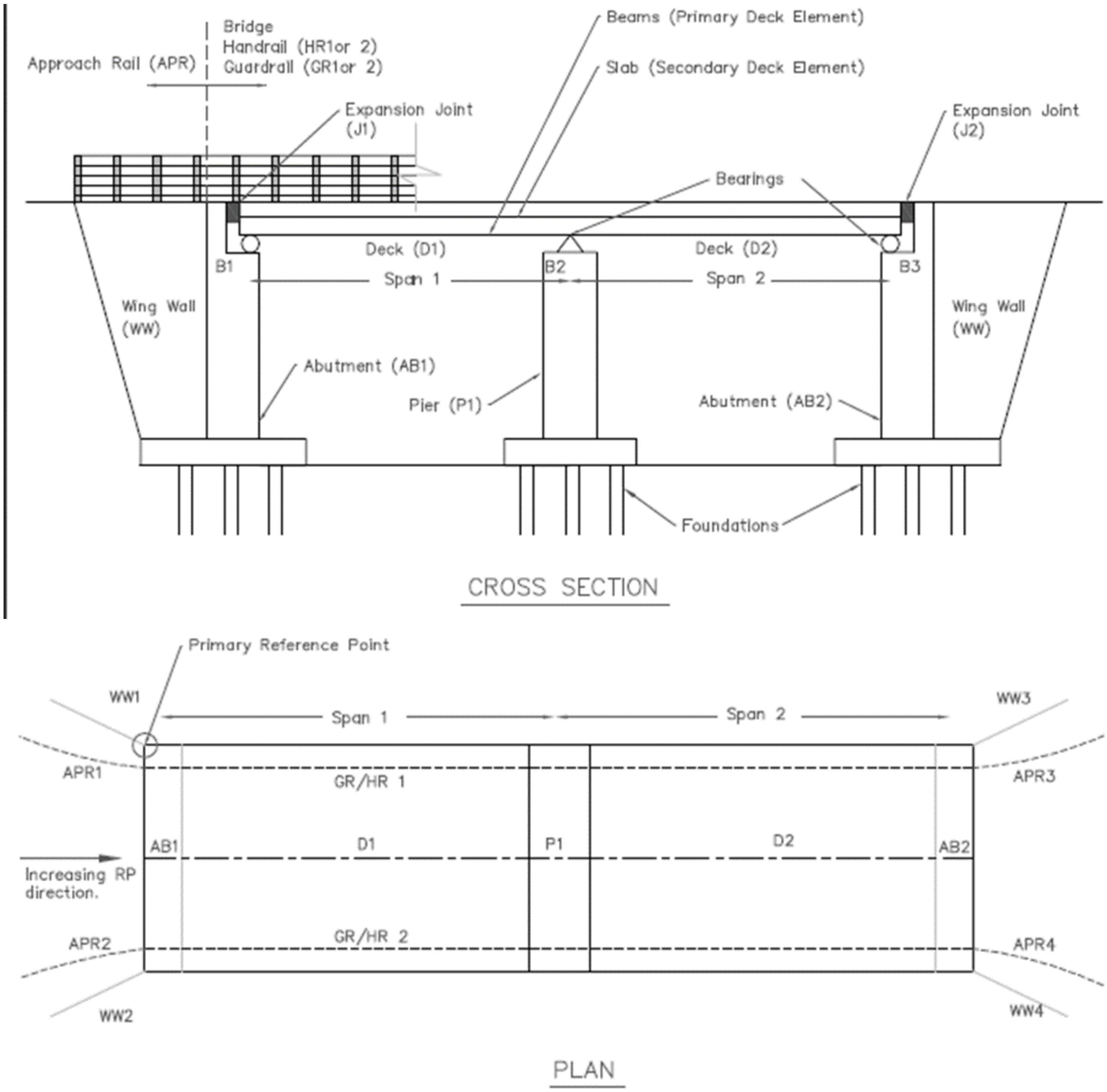
Plate Year

Where a plate is not available, a best guess is to be recorded with Guess recorded in status. When estimating dates based on a field inspection, use the format “01/01/YYYY” which shows that the date is estimated. Construction dates should never be estimated without going on site.

Beam, span, deck and pier numbering

This numbering should be as per requirements outlined in the database dictionary. Essentially, the numbering system for all elements increases in the increasing direction, and from left to right when looking at the bridge in the increasing direction.

Typical numbering and component identification are shown in the below figure.



Cross Section and Plan Component Numbering for Bridges (Source: Inspection Manual for Highways Structures, Volume 1, reference Manual may 2007)

We can see from the data there has not been a consistent approach with this numbering. We have included figure 4.2.1 for consideration, which should be consulted with the bridge consultants etc to ensue a consistent approach.

Where do I record railings that are associated with bridges?

All railings need to be collected and entered into the railings table. The bridge id should be entered into the railings record so that the railing record is linked to the bridge asset.

How do I collect footpaths on bridges?

> A decision will need to be made as to whether the footpath should be attached to the bridge, or just be included as part of the footpath table??? There are pros and cons for both, with a mix in the database.

When entering a bridge into the database a number of components can be added including a footpath. When entering a new bridge, and using the bridge wizard, the footpath table needs to be checked to see if an entry already exists for the footpath over the bridge. If one does exist, then a split will need to be created for the length to be associated with the bridge. Once the split has been created, the footpath can be added through the bridge wizard as a component for a new bridge. This footpath will then be inserted into the footpath table as part of the wizard process.

For an existing bridge that has a physical footpath, but it is not recorded as a component under the bridge the following steps should be undertaken:

- Select the bridge through RAMM
- Above the bridge name, in the left hand window, after the collapse all icon is the show all detached footpath/ railing. Once selected it will show all existing footpaths, and state whether they are detached to the bridge.
- You can then attach an existing footpath to the bridge by right clicking on the required section
- If a footpath does not exist, then one can be added, through the add component process

It should be noted the linking of footpaths works when adding it through the bridge table, however the reverse is not true when adding a footpath in the footpath table. The footpath will not automatically be linked to an existing bridge, through entering it via the footpath table.

How do I collect streetlights on bridges?

All streetlights (and their respective component data) need to be collected and entered into the streetlight table.

A bridge asset is typically composed of the following parts:

- ....

By definition, a bridge is a structure carrying a road, footpath, or canal across a river, ravine, road, railroad, or other obstacle. Auckland Transport categorise their bridges as follows (link terminology to ATCOP which links to the AMP. Can we get this information to ensure that we are being consistent):

Road Bridges – The road is carried over a river, estuary, waterway, railway line, other road, or other obstacle, by a bridge composing of one or more clear spans.

Major Culverts – One or many adjacent pipes or enclosed channels (with a combined cross sectional area > $3.4m^2$, as defined by NZTA) for conveying surface water, or a stream below formation level (Define data collection for the culvert, and how best the data is inputted into RAMM-think culvert/drainage table/bridges). Enter into drainage table first and then activate button to automatically upload into Bridge Table. Check this in the drainage table).

Footbridges – Typically passes over a road, but may also run parallel to the road. Footbridges may also carry bicycles as well as pedestrians. Note that footbridges are not designed for traffic.

Underpasses – A structure that can sometimes be similar to a major culvert (except that it does not carry water), constructed to permit the safe passage of pedestrians or stock beneath a road.

Condition Values

14/08/2024 12:37 am +10

RAMM Table:	*most asset tables*
Attribute:	**Condition**
Purpose:	To provide a standard approach todescribe 5 levels of asset condition.

Value	Number	Description
Excellent	1	– only planned maintenance required.
Good	2	minor maintenance required plus planned maintenance
Average	3	significant maintenance required
Poor	4	– significant renewal / rehabilitation required
Very Poor	5	physically unsound and/or beyond rehabilitation
Unknown	U	

New Assets

New assets should have their condition set to Excellent (1) when entered into the database for the first time.

Photo Examples

It is good practice to provide a photo guide to what each level looks like for each type of asset.

International Best Practice

The 1 to 5 scale is a an internationally accepted rating system of categorising assets based on condition. The International Infrastructure Management Manual, 2006 is often referenced in relation to the 1-5 scale, where 1 is 'Excellent' and 5 is 'Very Poor'.

Traffic Island - Support Information

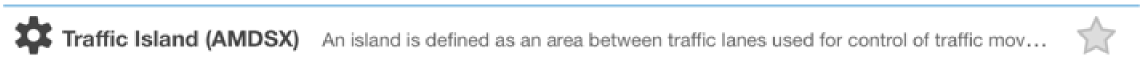
11/08/2024 11:50 pm +10

What is a Traffic Island?

A traffic island is defined as an area between traffic lanes used to control traffic movements. It is typically characterised as a marked-off area with a vertical displacement, located either in the centre of or to the side of a road.

Where can I find the Traffic Island data in RAMM?

Traffic Island assets are accessible in the **Traffic Island (AMDSX)** table.



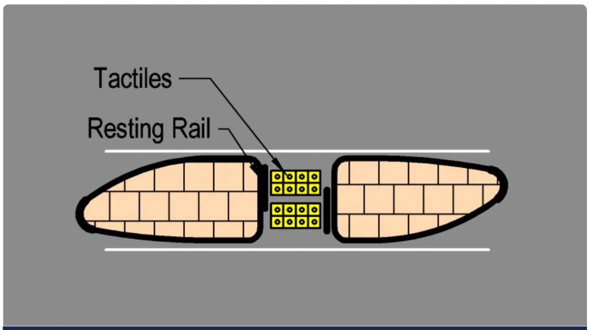
What are the common types of Traffic Islands?

The table below provides additional supporting information about the common types of Traffic Islands found in RAMM.

Type	Description	Examples / Additional Information
Splitter	A short island used near intersections to separate opposing traffic.	

Type	Description	Examples / Additional Information
Median	A long island used to separate lanes of traffic and potentially provide a stopping place for pedestrians.	
Rotary	A round island typically used within a roundabout intersection.	

Type	Description	Examples / Additional Information
Kerb Buildout	An 'island' typically connected to the kerb on the roadside for the purposes of narrowing the roadway.	
Slip lane	Separates the slip lane from the main road.	

Type	Description	Examples / Additional Information
Refuge	An island with a dedicated section or passage for pedestrians to stand on	 Source: Reference #3  Source: Reference #3

Frequently Asked Questions

None have been identified so far.

References

1. PNG DoWH 'Papua New Guinea' RAMM database

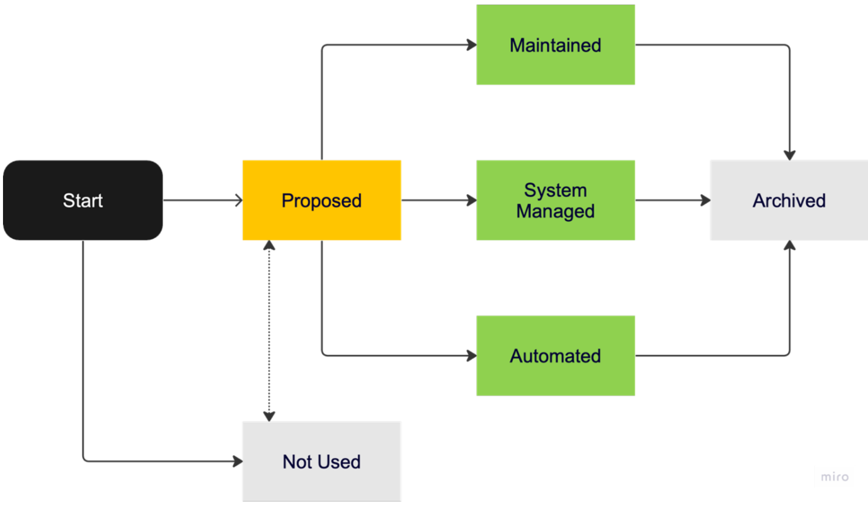
2. Waka Kotahi NZ Transport Agency; Asset Management Data Standard project documentation

3. Waka Kotahi NZ Transport Agency; Pedestrian / median refuges

Table Status - Table Register

29/11/2023 9:41 am +10

The **Table Status** column in the PNG Table Register describes the current operational status for tables in the RAMM system. The diagram below visualises the different status options. It shows how a table can progress through these options depending on the current operational state of the table.



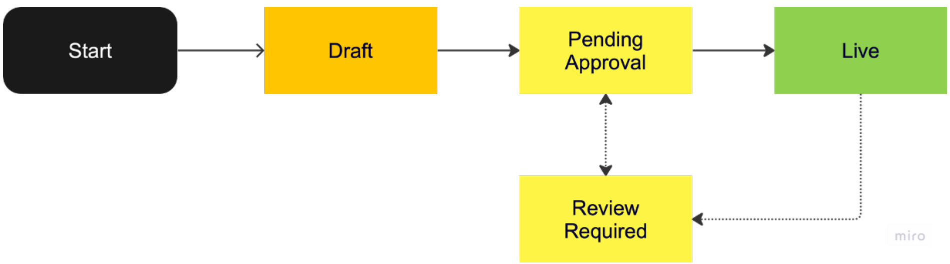
Each table status option can be described as follows;

Table Status	Status Description
Proposed	The table is in a work-in-progress state, either in the design/development stage for a new table(s) or an existing RAMM table being considered for active use.
Maintained	The table is in active use.
System Managed	The table is in active use and is primarily maintained by the RAMM system.
Automated	The table is in active use and is primarily maintained by an automated process.
Archived	The table was previously in use but is now no longer actively maintained.
Not Used	The table hasn't been used before, and there is no current intention for it to be used. There may be no information in the table, or it could be storing historical information migrated from other systems.
Not Used (AMDS)	A subvariant of the *Not Used* status. This option is used for Asset Management Data Standard (AMDS) tables that are not in use, and which have been set to Private in RAMM. The generic ***pngsys*** account has been given access permissions to these tables.

Attribute Metadata Status - Data Dictionary

21/09/2023 9:41 pm +10

The **Attribute Metadata Status** column in the PNG Data Dictionary describes the state of the metadata for each attribute. The diagram below visualises the different status options, and shows how each attribute's metadata can progress through these options.

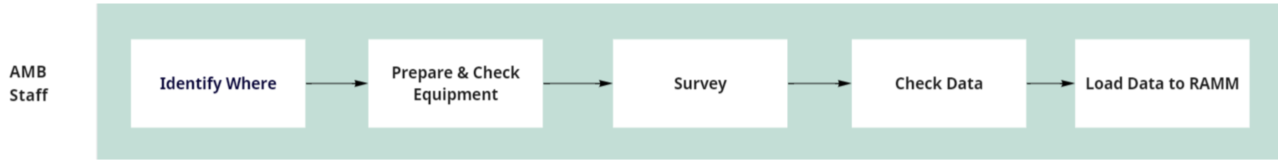


Each attribute metadata status item can be described as follows;

Metadata Status	Status Description
Draft	The metadata record is in a 'preliminary draft' or work-in-progress state.
Pending Approval	The metadata record is in a 'final draft' state and requires approval to be upgraded to *Live.*
Live	The metadata record has been reviewed and approved.
Review Required	The metadata record requires review and subsequent approval/reapproval, to be upgraded to *Live.*

Network Road Roughness Survey Process Introduction

12/09/2023 8:59 am +10



Purpose	To describe the steps for carrying out a road roughness survey
Process Owner	
Inputs	
Outputs	
Systems Involved	
Last Updated	

Procedure steps ....

Identify Where Survey Required

25/05/2025 5:56 pm +10

1. Look up Survey Programme
2. Determine the extents and type of survey required

You should maintain a long term road survey programme that sets out how often each road should be surveyed and with what type of survey.

If you get special instructions to undertake a survey, remember to adjust the long term programme so that you maintain the appropriate survey fequency per road section.

Prepare & Check Equipment

12/09/2023 9:06 am +10

1. Step 1
2. Step 2

> Enough time needs to be allowed for any required equpment callibration prior to the start of the survey

Carry Out Survey

22/09/2023 1:56 pm +10

1. Step 1
2. Step 2
3. Step 3

If the survey work is to be undertaken by external parties then provide them with this article.Dataset Overview: Road Roughness

This procedure belongs to the Network Road Roughness Survey Process

Check Data

12/09/2023 9:09 am +10

1. Step 1
2. Step 2

Load Data into RAMM

12/09/2023 9:10 am +10

1. Step 1
2. Step 2

Road Roughness - Dataset Overview

17/01/2025 6:40 am +10

Introduction

This article provides a brief introduction and overview of the **Road Roughness** dataset. It covers high-level details on the data collection process and where the data is stored in ASSET & WORK MANAGEMENT (AWM) database system (formally known as RAMM). There are links to relevant reference documents containing detailed discussions on this dataset's collection, use and analysis.

What is Road Roughness data?

Roughness primarily refers to undulations and unevenness in the surface of a road that can affect a road user's journey with regard to ride quality, comfort, safety and accessibility. The measurement of roughness is typically expressed in the form of the NAASRA Roughness Index (NAASRA) and/or the International Roughness Index (IRI), which are indices *"based on passenger car type response and are intended to reflect the roughness as observed by the occupants of ordinary passenger cars"* .

The Data Collection Contractor (DCC) shall use a smartphone app, bump integrator, roughometer, profilometer or similar, to measure the longitudinal roughness profile of paved roads. The accuracy of the roughness measurements shall be < 0.25 mm.

Readings shall be corrected in order to eliminate the effects of the vehicle suspension movements. Factors that may influence IRI shall be recorded during the survey and the data corrected accordingly. These include, but are not limited to, traffic congestion, pavement construction activities, change in pavement type and having to travel off the carriageway.

The Consultant is responsible for undertaking the survey in a manner that ensures that all survey products submitted are of high quality, accurate, complete and fit for the purpose required.

Specified deliverables, including the survey products from each Work Package, are to be submitted to DoW as electronic files. Unless agreed otherwise, the files shall be in the latest current versions of Word, Excel, JPEG or MP4 as appropriate for each type of data. Geospatial (mapped) data is to be submitted as shapefiles or other agreed formats compatible with QGIS software. Reports are to be submitted as PDF files, including all attachments and the original files (Word, Excel etc.) from which any attachments were created.

Roughness data is to be checked and validated by the Consultant and submitted as either CSV or Excel files formatted for uploading by AMB directly into DoWH's AWM database system.

What fields need to be included in the supplied data?

This excerpt is from the PNG DoWH AWM data dictionary showing the fields to be included in the data supplied. For more information refer to the full data dictionary document for a detailed data specification.

Where is the data stored in AWM?

The roughness data is stored in the **Roughness Reading** (roughness) table.

The Roughness Reading table in RAMM.

A survey header is also created to group together readings from the same survey. The survey header is created in the **Roughness survey header**(rough_hdr) table. Currently, this is only accessible in the classic RAMM Manager application.

References and Additional Reading

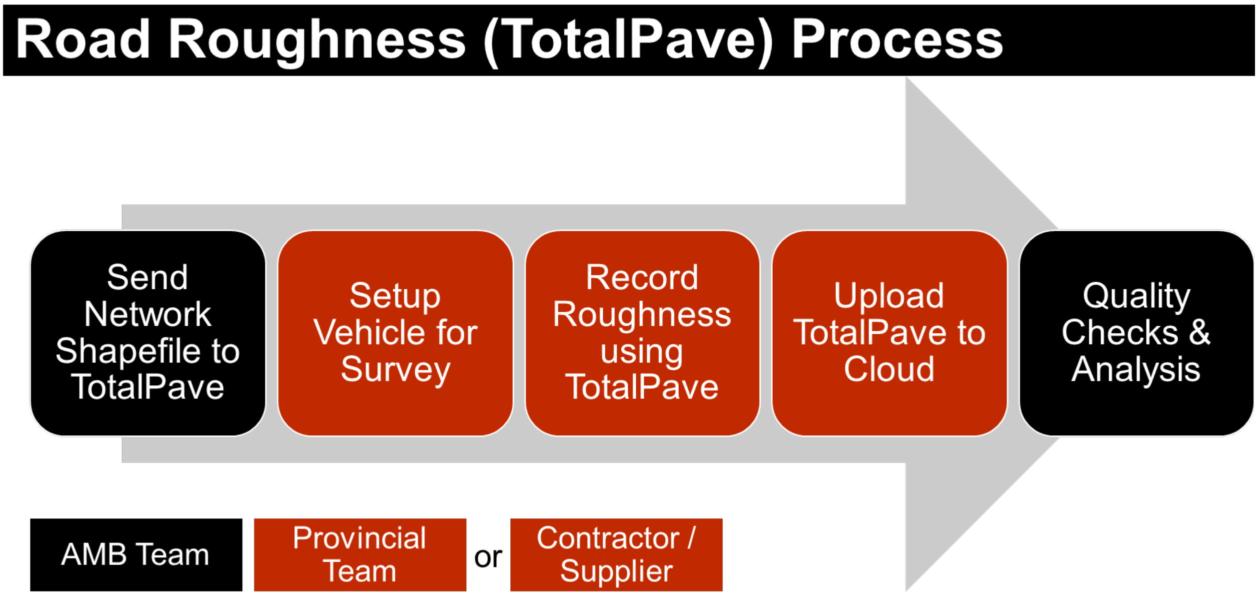
Links to further support documents, manuals, publications and other content are included in the table below.

Reference Name / Description
GHD MAX.amp Data Quality Management Plan (link TBC)
[1] Road Profile Characterisation (TNZ Research Report 29)

Reference Name / Description
Terms of Reference; Consultancy Services to Collect Visual Road Condition Data
PNG RAMM Data Dictionary

Road Roughness (TotalPave) - Collection Process

14/08/2024 10:29 pm +10



Sealed Road Roughness (TotalPave) - Specification for Data Collection Survey

17/01/2025 6:46 am +10

Article Purpose	To provide the technical requirements and specifications to undertake a survey for the collection of road roughness data using the TotalPave App.
Intended Users	Any one who is responsible for collecting Roughness data whether it be provincial staff, AMB staff or contracted suppliers.
Last Reviewed	1 October 2024

Background

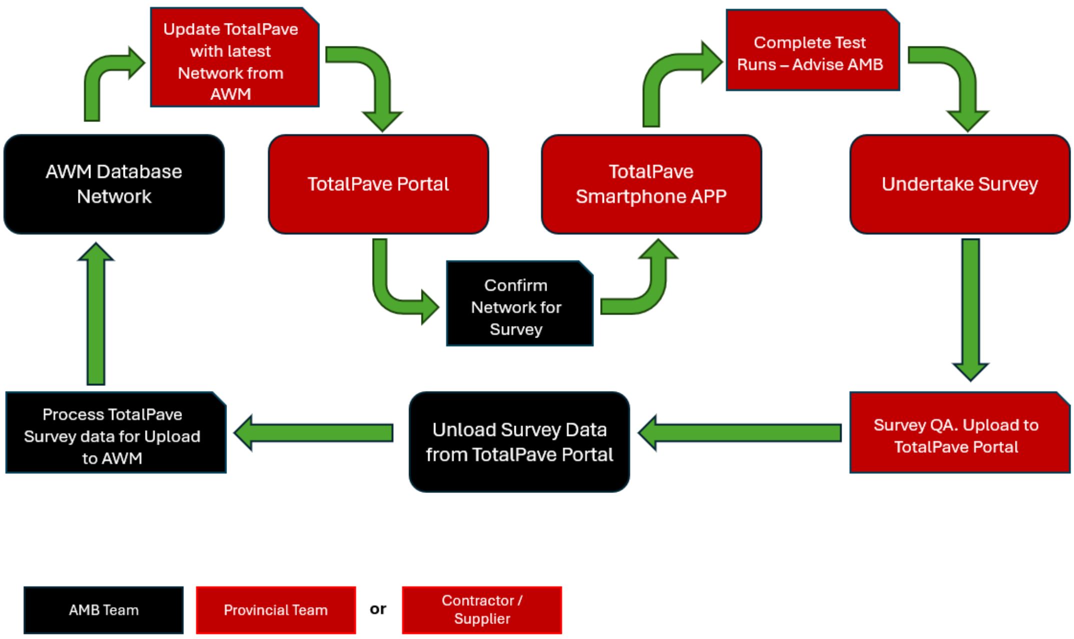
Information related to the PNG National Road Network is recorded in the AWM (ThinkProject ASSET & WORK MANAGEMENT - AWM formally RAMM) road manamgent system .

The AWM database system contains the master versions of the road network and all managed assets.

DoWH intends to maintain up to date knowledge of its pavement assets. To support this it undertakes road roughness surveys on an annual or bi-annual basis (depending on road hierarchy).

DoWH undertakes road condition surveys in order to have current and appropriate information to inform its road management plans and support its network planning and maintenance programming.

In gernal the Survey setup an delivery proess is as follows:

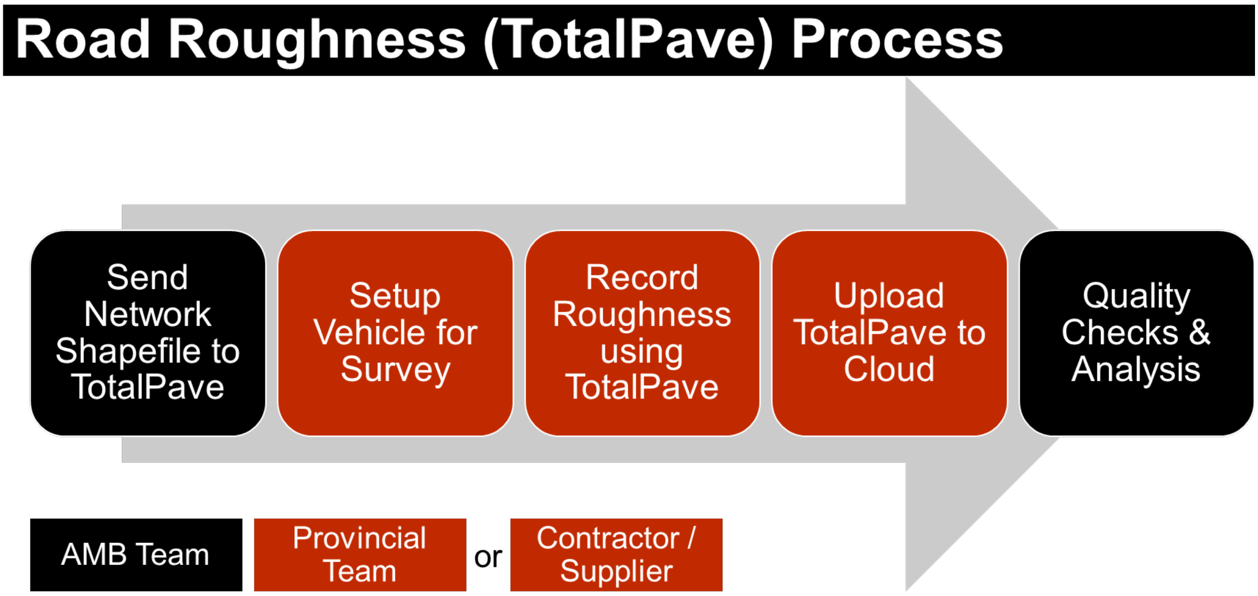


Scope of Work

Introduction

This road survey is to collect comprehensive and fit for purpose road roughness data (measured in IRI) for the nominated roads or road sections.

The following high level process provides broader context of the activities involved either side of the data collection work.



Requirements & Methodology

Step 1: Survey Preparation

To be Provide by DoWH Asset Management Branch (AMB)

1. The DoWH TotalPave Administrator will assign and provide a login to TotalPave.
2. TotalPave Portal Access - https://portal.totalpave.com
3. Training on:
   a. DOW Site Safety procedures and protocols.
   b. Safe Traffic Control at Road Works DoWH Guide - PNG DoWH - Field Guide for Safe Traffic Control at Works.pdf
   c. TotalPave Portal features and survey verification methodology.
   d. TotalPave Survey app features, survey methodology and data upload.
4. Road sections to be surveyed (if not already provide in a contract or agreement)
   a. A list of the road names, including start and end chainages and lengths, from the AWM databse system to be surveyed.

Vehicle & Equipment

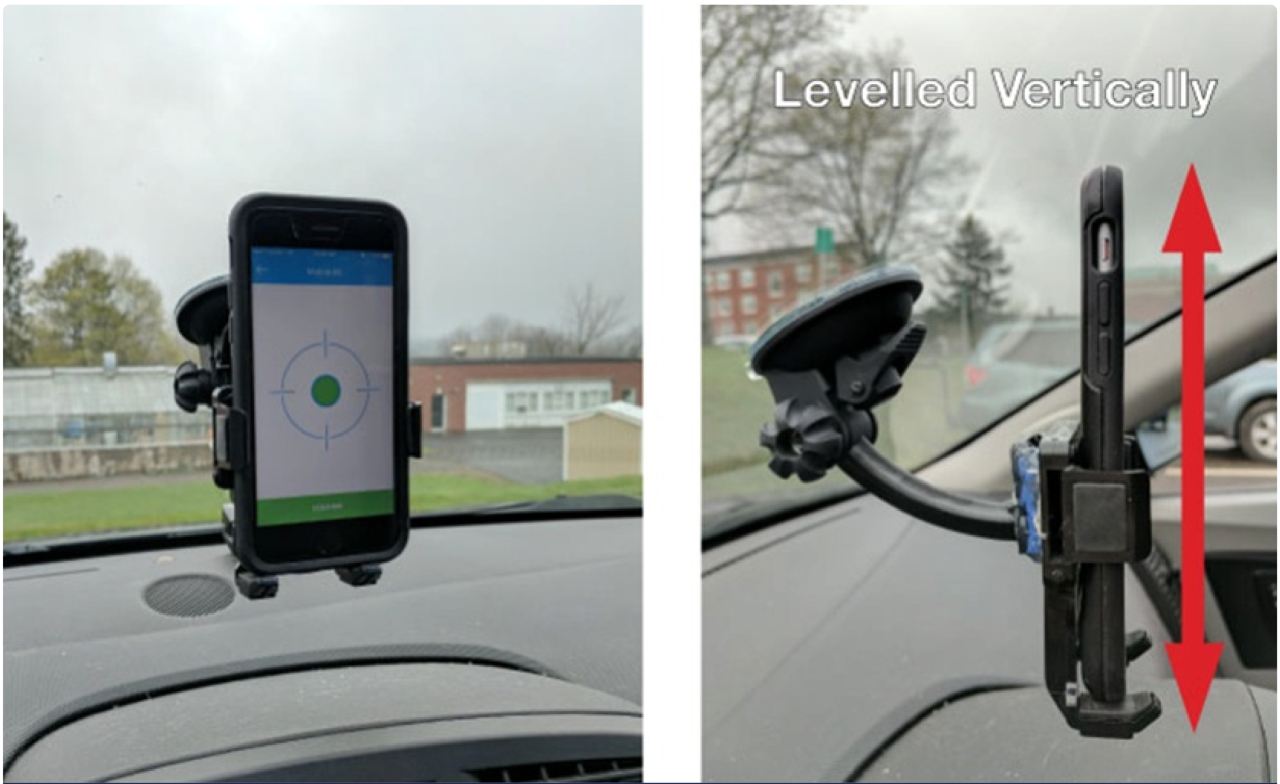
The Consultant is to provide all equipment and undertake the survey in accordance with the following requirements:

1. Advise the AMB of which vehicle(s) and smartphone model(s) will be used during the road survey and receive confirmation from AMB that these are acceptable. The following provides some guidance on what will be acceptable.
    a. Survey vehicle – Toyota Land Cruiser, 5 door, diesel, 2014 model year or later or approved equivalent. The surveyor may use more than one vehicle simultaneously to survey different roads provided the survey data from each vehicle meet all the requirements of this specification.
    b. Mobile Phone –Samsung Galaxy A71 or approved higher model, Android smartphone, with registered SIM Card and minimum 32 GB Micro SD Flash Storage.
2. Download the TotalPave IRI App from the Google Play Store or Apple App Store and install it on to the mobile phone that will be used during the survey.
3. Login to TotalPave IRI app and the TotalPave Portal with the login details provided by the AMB.
4. Setup the Phone mount inside the vehicle, using the following instructions.

Approved Car Phone Holder, compatible with the smartphone(s) being used. A model similar to the one in the image is acceptable. It must be mounted to the windscreen with suction caps and be as rigid as possible.

Typical Carphone Holder

Phone-holder Mounting Method



In Vehicle Placement and Setup

Test Runs

1. Conduct a road survey practice run, under DoWH supervision, on not more than 10km in length along a target road, easily accessible by road from the training location. Practice survey data upload to the TotalPave Portal and verify uploaded data on Portal, as basis of payment.

2. Conduct “Extended Trial Run”, under DoWH observation, approximately 100km in length (outbound and inbound) along a target road, easily accessible by road from the training location. The objective of this trial run is to demonstrate proficiency in data collection, data upload, using the TotalPave IRI app and verification using the TotalPave Portal.

Step 2 : Record Road Roughness using TotalPave

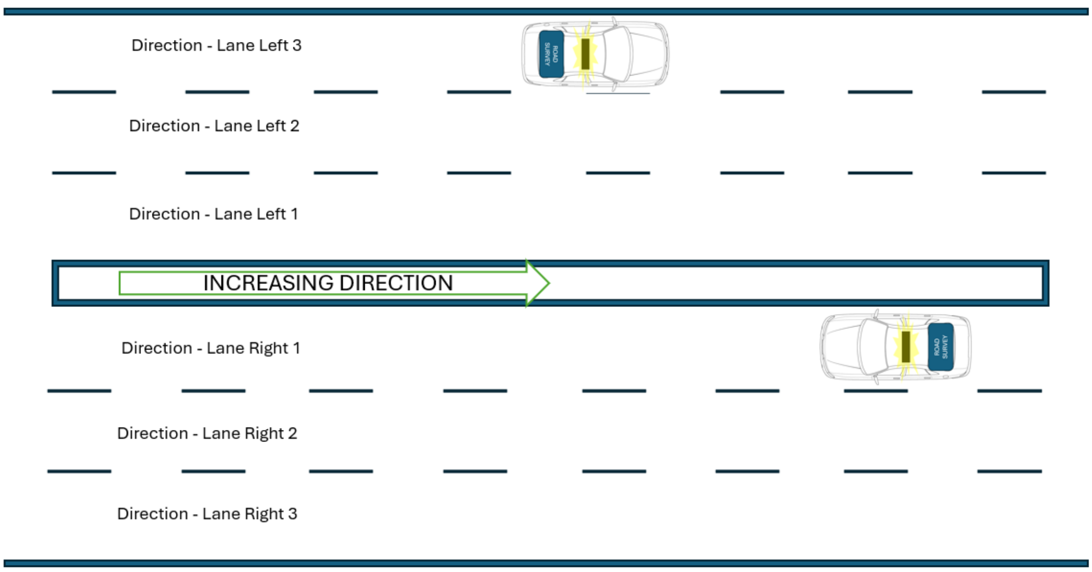
Following the istructions provided by TotalPave, start the survey in the TotalPave IRI app and drive the nominated road sections.

The surveyor must:

1. Communicate and coordinate with the DoWH Provincial Works Manager(s) before commencement of surveys in each province.

2. Survey each road section in both travel directions to capture the roughness of the lanes in both directions.

3. For dual carriageway/divided road sections, undertake additional surveys to measure each additional lane in both travel directions. Lane numbering convention is from centreline e.g. If multi lane carriageway Left Lane 1 is the lane closet to the the Centreline on the true left side, Left Lane 2 is the next lane and so on.



1. Maintain a steady course and constant speed which does not exceed the legal speed limit nor any lower speed, above which, it would be unsafe to travel. Where safe to do so, the survey travel speed shall be 45 km/hr.

2. Not survey at a speed less than 20 km/hr - where the TotalPave IRI App will enter “Slow Mode” and cease to take measurements.

3. As far as it is practicable and safe to do so, the survey vehicle should follow the wheel paths expected for normal traffic without deviating around potholes, damaged pavement or other minor obstructions.

4. Maintain a survey log, noting each road section completed and include notes on any issues encountered and in particular the reason any road sections couldn't be surveyed.

Step 3 : Upload Data to TotalPave Online Portal

Once the survey has been completed, the surveyor shall:

1. Upload the data to the TotalPave Portal using the upload function on the TotalPave IRI App.
2. Undertake quality assurance of the collected data in the TotalPave Portal
3. Once the surveyor is satisfied of the quality and completeness of the data collected, advise theAMB of the survey completion and submit their survey log to AMB via email.

> If the survey takes longer than a week, then it is good practice to upload the data to the TotalPave Portal and complete quality assurance on a weekly basis.

Quality Assurance

The surveyor is responsible for undertaking the survey in a manner which ensures that all data submitted are of high quality, accurate, complete and fit for the purpose required.

During the survey:

1. Ensure adequate road survey safety equipment and practices are implemented during the data collection.

As a minimum, the information is to be collected, analysed and uploaded to the TotalPave Portal in a manner that:

1. Is consistent, accurate, error-free, high-quality raw data
2. Is verifiable on the TotalPave Portal map
3. Is complete with no data gaps (all 100 m sections must have an IRI reading for the date of the survey run) showing on the TotalPave Portal map for each road section surveyed, in both directions.

> If the survey is being undertaken by a consultant, DoWH reserves the right for one AMB staff member to join the Consultant's on-site survey team(s) for quality review purposes. The Consultant is to allow for one (only) seating place in its primary survey vehicle to accommodate an AMB staff member and shall provide a minimum of five business days notice of any change of travel dates that have been previously agreed with DoWH (eg. through approval of the Consultant's Workplan). All direct costs (eg. travel airfares, accommodation, per diems etc) incurred by a DoWH staff member accompanying the Consultant's survey team are the responsibility of the client.

Stakeholders

Stakeholder	Role
DoWH AMB	The Asset Management Branch is responsible for this specification, uploading roughness data to the AWM database systtem and utilising the data for the support of programme development and further analysis.
Provincial Works Manager (PWM)	The PWM is the most senior DoWH role based in each province and should be advised of any surveying to be done on national roads in their province.

Support

Issues Data Collection (if required)

Data to be Collected

For the nominated roads or road sections collect the following data:

1. 'Issues' data, including photographic imagery and text description of notable issues for:
    a. pavements

    b. slope stability

    c. drainage structure

    d. road furniture

Use the TotalPave Tracker application installed on approved Android or iOS mobile smartphones to collect the 'issues' data.TotalPave Tracker and uploaded to the TotaPave Portal by the Consultant with accompanying notes to articulate the issue being tagged.

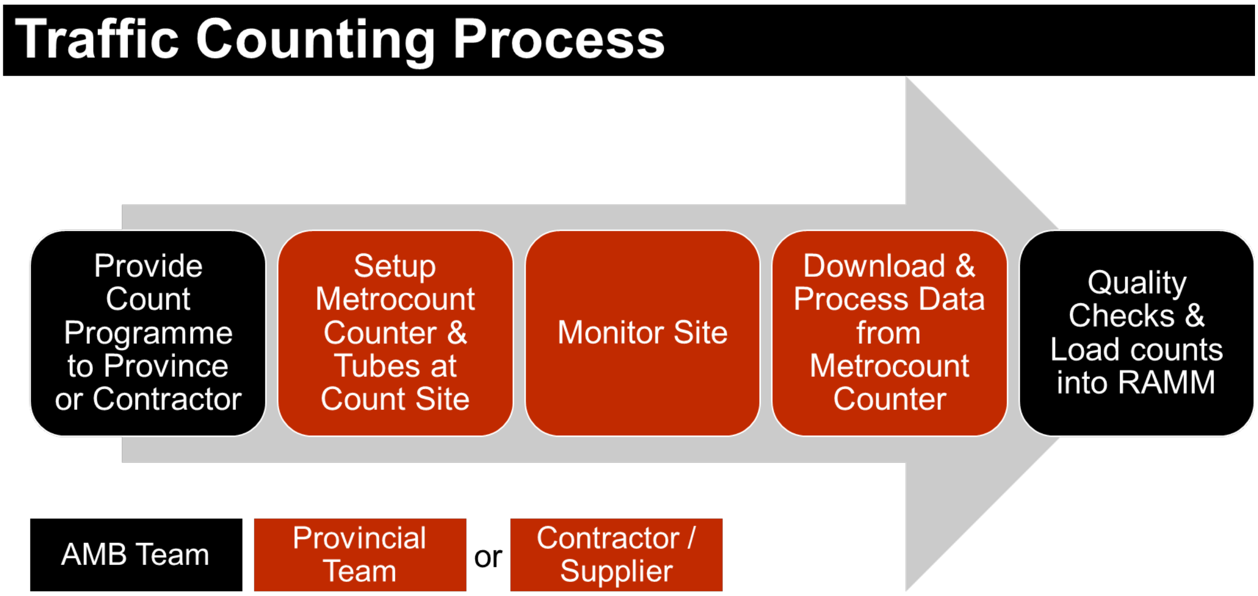
- TotalPave Tracker Android App, downloadable from Play Store and installed on both smartphones, shall be used to collect details of significant pavement, drainage structure, roadside and safety issues encountered during the survey run. Photographic data and relevant notes shall be submitted to the TotalPave Portal, using the second smartphone.

- TotalPave Tracker Android App for tracking and reporting issues on the road pavement, drainage structures, etc, downloadable from Play Store and installed on smartphones.

- Other Survey Data – The Consultant is to maintain and submit a running log of all field surveys undertaken. At a minimum the log is to record the date, time start and end, start, turn-around and end locations (if the return-leg of the survey is conducted during the same session as the outward leg, then the start and end location should be the same), names of significant bridges/junctions/LRPs passed and changes of pavement type (Sealed/unsealed/earth) along each surveyed road. Logged locations are to be referenced by both time (hh:mm) and vehicle odometer (trip meter) reading indicating the distance from a known Location Reference start point. The AWM chainage and GPS coordinates of each pavement surface change point (end of seal, start of seal etc) are to be taken from the georeferenced survey imagery and a list of the point coordinates (tagged by chainage, time and point type) submitted electronically.

Traffic Counting - Collection Process

14/08/2024 5:57 pm +10



Traffic Counting - Specification for Manual Data Collection

23/07/2025 8:32 am +10

Article Purpose	To provide specification on a safe and standard method for collecting Traffic Counting Data, specifically using the Manual Traffic counting "Tally Method"
Intended Users	Anyone who is responsible for setting up, monitoring, and/or uploading Manual Tally sheets traffic data whether it be provincial staff, AMB staff or contracted suppliers.
Last Reviewed	18th July 2025

Requirements & Methodology

Step 1: Site Preparation and Selection

Manual traffic count preparation starts in the office. Preparation should start with a review of the purpose of the count, count period, time intervals, and the placement of Observers (Tally Clerks), in order to accurately capture counts by direction of travel.

The AWM layer called 'Traffic Count Sites - Temp' can help to guide where the count locations should be.

This helps the project coordinator from the Asset Management Branch (AMB) determine the number of Tally Clerks required for each traffic count station and the specific field procedures to follow.

Tally sheets should be filled out as much as possible before heading to site. It's also important to assess available resources early, including how many people and what equipment will be required, the level of data quality needed, and ensuring there is enough budget to carry out the survey properly and efficiently.

Tally Clerks

Manual traffic counts involve having a trained person, known as a 'Tally Clerk' or 'Observer', record vehicles on a tally sheet as the vehicles pass a specific point on a designated road. This is a simple method often done by DOWH staff, but local community members can also be hired if needed.

When hiring local Tally Clerks, it's recommended to work with a councilor or village leader to find candidates with at least a Grade 10 education. All Tally Clerks must be trained by a supervisor to correctly identify and record different types of vehicles. Once trained, they should complete a 30–40 minute supervised trial count to confirm they are categorising and counting accurately. The quality of the data depends on how well the Talley Clerks are trained and prepared for the task.

Equipment required

The most important equipment that shall be used in manual traffic data collection is tally sheets (DOWH Traffic Count Tally Sheets) and the vehicle classification reference DOWH Traffic 12 Class .

The use of a tally sheet shall involve trained personnel to make a tick mark for every vehicle in a given classification. Separate tally sheets should be used for each direction of travel and this direction should be clearly stated on the tally sheet.

NOTE: Please make sure they have enough copies of the tally sheet to last the duration of the count period.

Other equipment needed is as follows:

- Necessary accessory equipment (flashlight, batteries, pens, etc.)
- Stopwatch and tally counter (if available/needed)
- Data collection forms (DOWH Traffic Counting Data Collection Form) (fill in as much data as possible before leaving the office e.g. site location should be known at a minimum)
- Extra pens and paper for taking notes
- Clipboard or writing surface
- A map of the site
- Weather equipment (Sunscreen, umbrella, jacket or warm coat, masking tape etc.)
- Safety equipment (road safety signs, safety vests, or other reflective materials)

Ensure that all equipment is in operational state and none of them has a fault.

Step 2: Traffic Data Collection

A Tally Sheet with 12 (13 for Class 0 being Pedestrians) road user classes will be used for manual traffic counting. It is required that manual traffic counts are classified according to the vehicle type, direction of travel and time (hour).

The Tally Sheet form used for manual traffic-counting is given in DOWH Traffic Count Tally Sheets .

This form shall be used by Tally Clerks to record the number of vehicles per hour. Upon completion of the counting period, the ticks can then be tallied and analysed back in the office.

Manual traffic count is categorised by a visual assessment of the vehicle size and configuration of axles. The 13 road user classes of vehicle categories to be tallied during the course of the traffic data collection are tabulated below.

Class	Description
Class 0	Pedestrians - People walking along the road
Class 1	Motor cycle
Class 2	Cars, Station Wagons, Sedans
Class 3	Utilities, Pick Ups, Small PMVS (<15Persons)
Class 4	Buses (25Persons), Light Trucks (Rigid Body) 2axles
Class 5	Medium Trucks (Rigid Body) 3axles
Class 6	Heavy Trucks (Rigid Body) 4axles
Class 7	Articulated Light Trucks (3 Axles)
Class 8	Articulated & Semi Trailer Trucks (4 Axles)
Class 9	Articulated & Semi Trailer Trucks (5 Axles)
Class 10	Articulated & Semi Trailer Trucks (6 Axles)
Class 11	B double (8 axles AT)
Class 12	Double & Triple Road Train (2 trailers,11 axles, 3 trailers,16 axles)

Traffic and Site Safety

Traffic safety during the Data Collection is mandatory and is the responsibility of the Officer in charge to ensure that appropriate safety measures are in place before a survey can be conducted to protect the observer at all times.

Whenever manual traffic surveys are in progress, appropriate signage should be in place for the safety of Traffic Counting Teams. The site should be inspected for safe use by supervisor who should also ensure that every tally counter wears a high visibility vests and no safety sign is removed from site until the survey is completed.

Step 3: Process Data

When the data collection period has ended and data has been collected from the field, it must be analysed and checked for accuracy. The thirteen classes tallies collected from the manual tally sheet shall be compiled and entered into its standard excel sheet. This spreadsheet shall be sent to Colleen.Jackson@pngroads.com and Remson.Maea@pngroads.com.

Initially the information shall be managed and owned by the Department of Works Asset Management Branch and held within the AWM database where it can then be disseminated to stakeholders via means of the current infrastructure managed by DoWH such as the website and intranet.

Quality Assurance

As a minimum all counts must be checked for accuracy and completeness prior to loading into the AWM database. The supplier must supply a quality check process through which each count must pass to be a successful count. As a minimum DoWH would expect that the following quality checks are completed:

- Must be a full 7 Day classified count.
- There is general balance on Directional split i.e. lane one / lane two is within +/- 5% of 100%.
- All report requirements identified in this specification are supplied in full with no missing data.

> If the data collection is being undertaken by a consultant, DoWH reserves the right for one AMB staff member to join the Consultant's on-site survey team(s) for quality review purposes. The Consultant is to allow for one (only) seating place in its primary survey vehicle to accommodate an AMB staff member and shall provide a minimum of five business days notice of any change of travel dates that have been previously agreed with DoWH (eg. through approval of the Consultant's Workplan). All direct costs (eg. travel airfares, accommodation, per diems etc) incurred by a DoWH staff member accompanying the Consultant's survey team are the responsibility of the client.

Stakeholders

Stakeholder	Role
DoWH AMB	The Asset Management Branch is responsible for this specification and utilising the data for the support of programme development and further analysis.
Provincial Works Manager (PWM)	The PWM is the most senior DoWH role based in each province and should be advised of any data collection to be done on national roads in their province.

Support

Contact Remson Maea: remson.maea@pngroads.com or remsonmaea@gmail.com

Contact Coleen Jackson: colleen.jackson@pngroads.com

References and Additional Reading

Links to further support documents, manuals, publications and other content are included in the table below.

Reference Name / Description
RIMS Guideline for Traffic Counting
RIMS Traffic Counting Guide Supplement
RAMM NZ Vehicle Classification Document

What is Traffic Count data?

Traffic counts help to measure, evaluate, and classify traffic volumes across the roading network. Traffic counts underpin the formulation of traffic flow estimates, which are used as inputs to many asset management and planning processes for the network.

The locations to be counted are strategically identified and defined within the PNG DoWH Traffic Count Programme. The traffic count data collected at these locations is subsequently used to update and inform the traffic estimates applied to all road sections in the network.

The latest traffic estimate dataset is leveraged by other processes such as traffic modelling, safety studies, traffic management plans, levels of service analysis, pavement deterioration modelling, forward work programming & responding to public enquiries.

A traffic-counting programme has been established for the PNG road network, which is based on the guidelines set out by the RIMS Group. The programme includes a 'core sample' of roads in the network which are counted annually and a sample of roads that are counted on a 'rotational basis'.

The Data Collection Contractor (DCC) shall record traffic counts in accordance with the sites listed in the traffic-counting programme, using approved MetroCount equipment. The count data that is required to be collected includes but not limited to Traffic Volumes, Classification and Speed.

The results of the counts are imported into AWM, and the data is used to calculate the latest traffic estimate for associated road sections. These estimates add to the accuracy of other asset management and planning processes, and build up the historical information of traffic data for the network.

The basis of the counting classification is the AP-G104-23_Austroads_Extended_Vehicle_Classification_Scheme.pdf . This sets out the classification scheme and 12 vehicle classes that count data is required to be collected, refer section Step 2: Traffic Data Collection.

Traffic Counting - Specification for Data Collection

13/02/2025 8:56 am +10

Article Purpose	To provide specification on a safe and standard method for collecting Traffic Counting Data using Maunal Traffic counting "Tally Method" and MetroCount equipment.
Intended Users	Anyone who is responsible for setting up, monitoring, and/or uploading Manual Tally sheets or MetroCount traffic data whether it be provincial staff, AMB staff or contracted suppliers.
Last Reviewed	2nd October 2024

Background

DoWH intends to maintain up to date traffic count records which are to be uploaded to ThinkProject, Asset & Works Management "**AWM**" (formerly known as "RAMM" Road Asset Maintenance and Management), which forms the core of the DoWH Road Management System.

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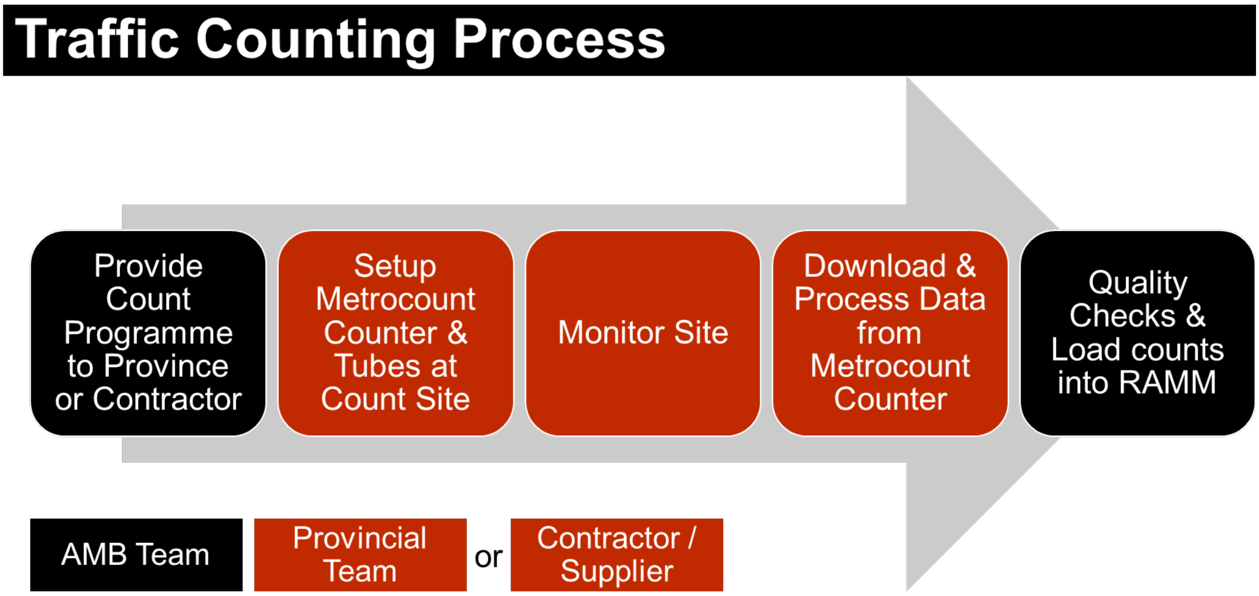
Scope of Work

The purpose of the traffic counting process is to collect up to date and accurate records for the nominated roads or road sections.

The following high-level process provides broader context of the activities involved in the traffic counting process.



Requirements & Methodology

Step 1: Site Preparation and Selection

An accurate and reliable count begins in the office. Traffic counting types fall in two main categories: manual counts and automatic counts. Preparation should start with a review of the purpose and type of count to be performed according to the count programme. This will consider the count period and time intervals and geometric layout of the site. This should help the project coordinator from the Asset Management Branch (AMB) to determine the type of equipment to be used, the field procedures and number of observers (tally clerks) required for each of the traffic count stations. Where obersevers are required all data forms (tally sheets) should be produced with all available information filled in before leaving the office.

Before survey is being conducted on any selected road, assessment of available resources is critical. The proper assessment of the extent or scope of the envisaged counting (quality level of data required) shall be undertaken. This is aimed at ensuring that the planned and organised exercise is achieved at optimal cost and with the expected accuracy. The exact number of persons to be involved in the execution of the traffic survey and equipment to be undertaken shall be defined and adequate funding allowed for.

Manual Traffic Count Preparation (Tally Clerks)

The manual count method consists of assigning a trained person to record traffic on a tally sheet as it passes on a designated road. This is the simplest form of recording data. This method of data collection can be employed in most cases where vehicles are to be classified with a number of movements recorded under different categories of vehicles; however, it is necessary where the recording of pedestrians is required.

Equipment required

The most important equipment that shall be used in manual traffic data collection is tally sheetsDOW Traffic Count Tally Sheets.pdf and the vehcile classification reference DOW Traffic 12 Class.pdf . The use of a tally sheet shall involve trained personnel to make a tick mark for every vehicle in a given classification. The tally sheet template can be found in . Other equipment needed is as follows:

- Necessary accessory equipment (flashlight, batteries, pens, etc)
- Stopwatch and tally counter (if available/needed)
- Data collection forms (fill in as much data as possible before leaving the office e.g site location shoud be known at a minimum)
- Extra pens and paper for taking notes
- Clipboard or writing surface
- A map of the site
- Weather equipment (Sunscreen, umbrella, jacket or warm coat, masking tape etc.)
- Safety equipment (road safety signs, safety vests, or other reflective materials)

> Ensure that all equipment is in operational state and none of them has a fault.

MetroCount Tube Counter Preparation

Equipment required

The suggested tool kit for proper survey procedure to capture quality data from the site are as follows:

- Traffic sign Cones x4
- Tape Measure (5m)
- At least 3 pieces of white chalk
- Large Tie cable - 2x pkts
- Small tie cable - 2x pkts
- Set of Padlocks with keys x2
- RSU device x1
- Enough Rubber sensor road tubes to complete programmaed count set out. Requires at least 2x 10m tubes for each counting site
- Pinch Bar x1
- 6 volt welded battery x1
- Stainless steel security strop x2
- Large road cleat - 10 pack
- Tube vent plugs 2 pack
- Tool Box x2
- Hammer x1
- Centre lane flap x2
- 4mm ball driver (screw driver)

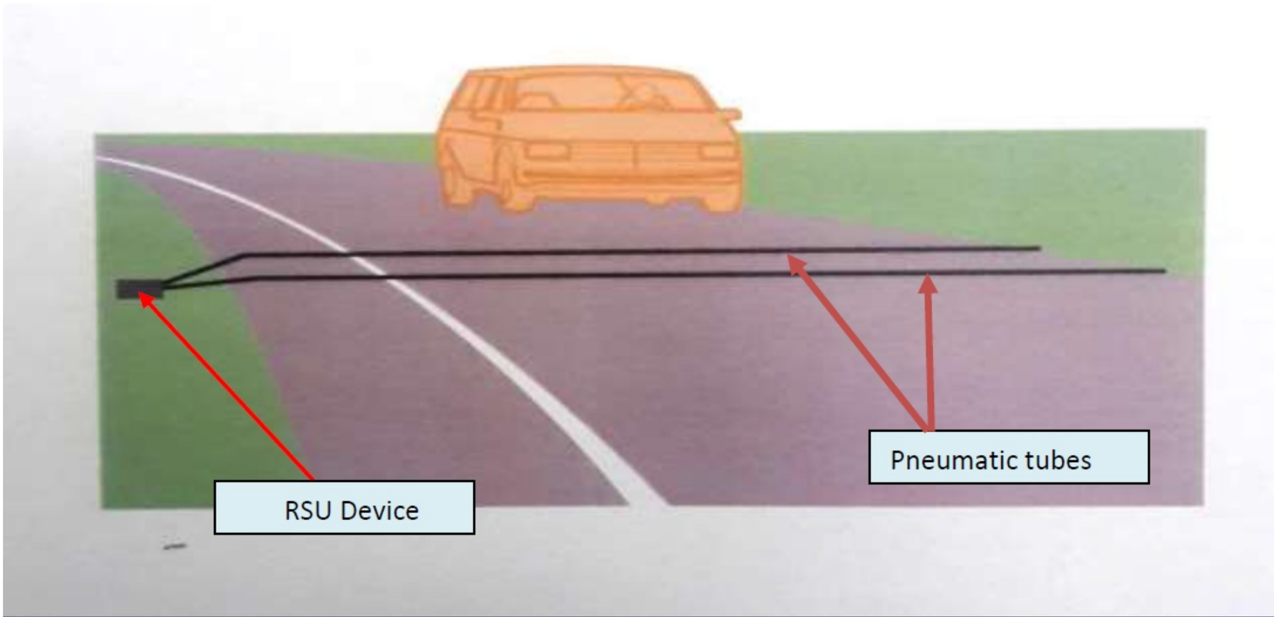
> Ensure that all equipment is in operational state and none of them has a fault.

MetroCount Device

Automatic counts in Papua New Guinea will be carried out with the use of MetroCount devices. A MetroCount device has pneumatic tubes stretched across a road where a vehicle's axle crosses the road tube, creating a pulse of air, which is recorded and processed by the traffic counter (device) known as Roadside Unit (RSU) which is shown below. All MetroCount Roadside Units (RSU) are designed to make the process of data collection as simple as possible, allowing focus on the task of analyzing data. The RSU stores data as time-stamped axle hits on each of the sensors, with better than millisecond accuracy, forming an axle stream.

Roadside Unit (RSU) MetroCount Device

RSU devices have two tubes placed on the road surface at locations where traffic counting is required. As vehicles pass over the tubes, the resulting compression sends a burst of air to an air switch, which is stored in the MetroCount device. Air switches provide accurate vehicle axle counts even when compressions occur more than 30 metres from the traffic counter. Utmost care should be exercised in placing and operating the system, to ensure its efficient operation and to minimise any potential error in the data. An example of MetroCount device is being used on the road where vehicle crosses over as shown below.



Vehicle crossing over pneumatic tube where air burst is being stored in the MetroCount device

Site Selection Criteria for MetroCount device installation

The quality of data depends on a thorough site selection and is extremely important. In this regard, sites must be located a reasonable distance away from intersections and other turning traffic, avoiding areas of where vehicles are stopped or moving very low speed. It is desirable place the RSU in areas where traffic is generally free flowing. Ensure that the tubes are secured perpendicular to the lane.

Some of the factors to be taken into consideration when choosing a suitable survey site for RSU MetroCount device installations are as follows;

- Areas where overtaking is not prevalent
- Lane discipline within the survey area
- Where acceleration or deceleration is not common
- Do not place sensor tubes across parking lanes.
- Avoid placing sensor tubes near sharp pavement edges or curves.
- Deploy sensor tubes at right angles to traffic flow.

- For directional counts keep at least 1/2 a metre of space from the centreline.
- Do not place sensors in transition areas, right/left turn bays.
- Fasten counting sensor tubes securely to pavement with nails and strops.
- Avoid laying sensor tubes across roads where the tubes will flex/whip due to deep wheel rutting.
- Avoid laying tubes where the pavement is in poor condition.
- Avoid locations close to driveways or intersections where turning vehicles may cause inaccurate counts.
- Place MetroCount device near signpost, utility pole or large tree so that it can be properly secured with a lock and chain to avoid theft of equipment and vandalism.
- Roll the extra tubing next to the counter. While it is advisable to have some extra tubing length, avoid having too much extra tubing that would reduce the pulse sent to the sensor. (over 7m extra is too much)
- Periodically check the counting equipment to ensure proper operation especially during poor weather conditions.
- Select areas with uniform speeds.

Site ID Registration

The site_id registration will allow collecting and recording data in a very consistent and repeatable manner when setting up the MetroCount device. This will also allow for the easy identification of data and site locations that the data will then be reported with appropriate location (site_id) records.

Keeping the data organized and labeled correctly is the key to proper data recording. This can be accomplished by inputting all needed information on the template (form) when setting up the site in the MetroCount RSU. Each data form should have the following information at the header: site, attribute, site description, operator's name, count location, start time and date. Make sure to complete all the required spacing when setting up the MetroCount device.

The traffic count AWM site_id convention is as follows:

"nnn_xxxxxx_yyyyyy"

where:

nnn is the 3 digit Traffic Count Site ID,

xxxxxx is the AWM 6 digit Road ID, and

yyyyyy is the 6 digit distance reference to the Road Side Unit from the start of the road in metres.

> Traffic Count Site ID is as defiend in the Traffic Count Programme: this site ID refers to "Count Site" number within the AWM Traffic Count Site ID in the traffic Count Site table.
>
> Road ID Number: is defined by AWM Road ID as defined in the traffic counting programme road list.
>
> Distance: Distance is given by the Counting Programme locations and should remain unchanged unless the counter needs to be shifted some distance from the defined location of the Count Programme, e.g greater than 200m or has been shifted past a known intersection/reference point.

> Where the location of the Count site needs to be moved, the new Location is to be recorded in the RSU setup.

With a new Site ID being created in the Count programme. The new Count Site ID will then need to be created in the AWM "Traffic Count Site table" along with new location, descrption and count group.

Do not Duplicate Count Site ID in AWM or use the same Count Site ID where the exisitng count site has been moved as described above.

The underscore character "_" separating the above fields is required. The Site ID, Road ID and Chainage fields must be preceeding zerofilled if less than six digits (e.g. 003834).

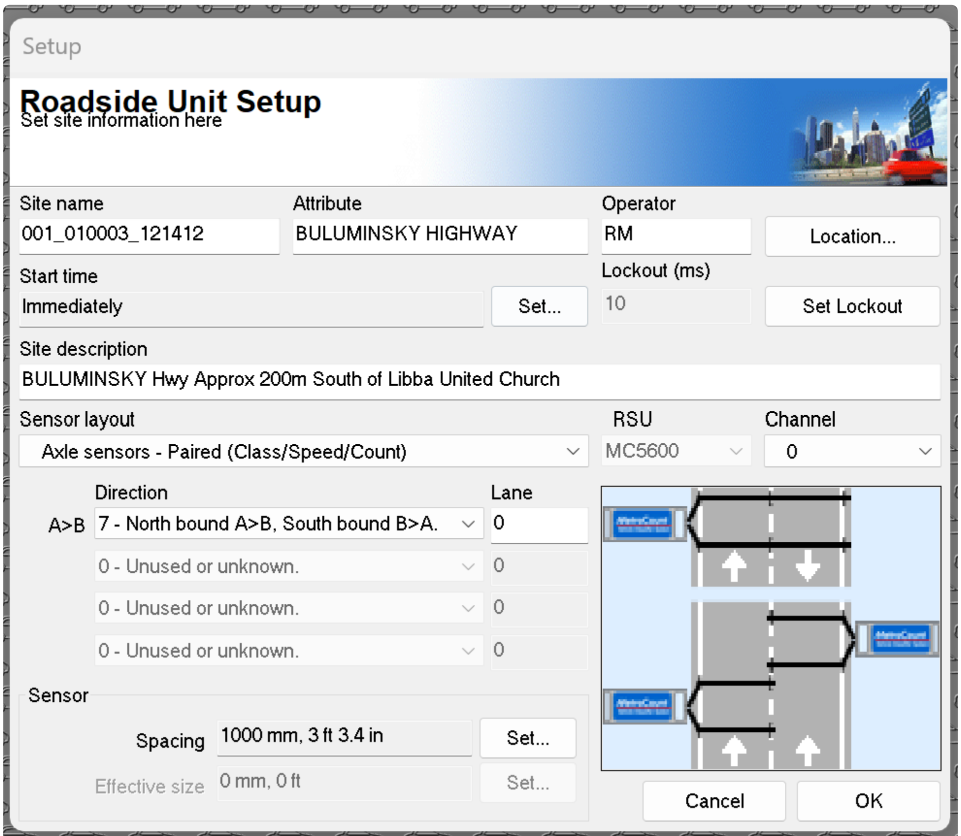
In the following example:

001 is the Trtaffic Count Site ID,

010003 is the AWM Road ID Number, and

121412 is the Chainage location reference as defined by the Count Programme

001_010003_121412



MetroCount 5600 roadside unit setup screen showing full site identification convention in a single carriageway with two lanes bi-directional

Image from AWM Maps showing Traffic Site Location - As described in RSU setup

> At sites with multiple lanes (refer to section "Lane" below), setup ALL MetroCount Roadside Units (RSU) with the same site ID but with a unique lane number for each unit. Refer to MetroCount RSU Help Files and setup instrucitons.

Entering Site Details into the MetroCount counter

The following are recommendations to use to enter Site Details to setup a vehicle counter for MetroCount 5600 (or 5900) setup.

Site name - As specified by AMB

Attribute - The ATTRIBUTE could/should be used to capture GPS coordinates or some other detail about the site. Inserting GPS coordinates is accessible via the LOCATION button. At a mininmum this shall contain the Road Name.

Direction A – Use options 7 (North is Primary) or 8 (East is Primary). The MTE software will always know the direction of survey – both Primary and Secondary. Leaving this blank can interfere with some reports and they may not process and you will need to modify this AFTER, which is time consuming.

Direction B – Leave this blank as options 7 and 8 in Direction A will be enough.

Lane – Unless you have more than one counter on the same road, you can leave this blank. If you had 2 counters and wanted the data to be combined, you would allocate lane numbers, combine the data sets and run a report. This is so you can differentiate the same Site name (as it should be) using different lane numbers.

Description – As above for Attribute, the description should be just that, a description of the site in its entirety. Typically, this will be the closest Village name or Junction Name. The Site Description allows for 200 characters. This can also be followed by the designated Speed Limit of that road in angled <> brackets. This way the speed will be picked up by MTE and assist in giving you speed related results such as 85%, max speed etc in future report.

Lock Out – It is recommend using 10ms for nearly all surveys with the exception of a bi-directional and very busy road. Usually inner-city traffic.

Sensor – Use Spacing 1000 mm, 3 feet 3.4 in.

Step 2: Traffic Data Collection

Manual Traffic Counts

A tally sheet with 12 (13 for Class 0 being Pedestrians) road user classes including pedestrians will be used for manual traffic counting. It is required that manual traffic counts are classified according to the vehicle type and time (hour). The updated Template of tally sheet form used for manual traffic-counting is given in DOW Traffic Count Tally Sheets.pdf .

This form shall be used by "Tally Clerks" to record the number of vehicles per hour. Upon completion of the counting period, the ticks can then be tallied and analysed back in the office. It is important that the comparison shall be made from the data collection from manual count and MetroCount where available for verification.

Manual traffic count is categorised by a visual assessment of the vehicle size and configuration of axles. The 13 road user classes of vehicle categories to be tallied during the course of the traffic data collection are tabulated below.

Class	Description
Class 0	Pedestrians - People walking along the road
Class 1	Motor cycle
Class 2	Cars, Station Wagons, Sedans
Class 3	Utilities, Pick Ups, Small PMVS (<15Persons)
Class 4	Buses (25Persons), Light Trucks (Rigid Body) 2axles
Class 5	Medium Trucks (Rigid Body) 3axles
Class 6	Heavy Trucks (Rigid Body) 4axles
Class 7	Articulated Light Trucks (3 Axles)
Class 8	Articulated & Semi Trailer Trucks (4 Axles)
Class 9	Articulated & Semi Trailer Trucks (5 Axles)
Class 10	Articulated & Semi Trailer Trucks (6 Axles)
Class 11	B double (8 axles AT)
Class 12	Double & Triple Road Train (2 trailers,11 axles, 3 trailers,16 axles)

Tally Counters

The quality of data collection depends on the tally clerks; hence recruitment of clerks should be done on site with a help of a councillor/village leader in order to engage candidates with Grade 10+ education as a minimum.

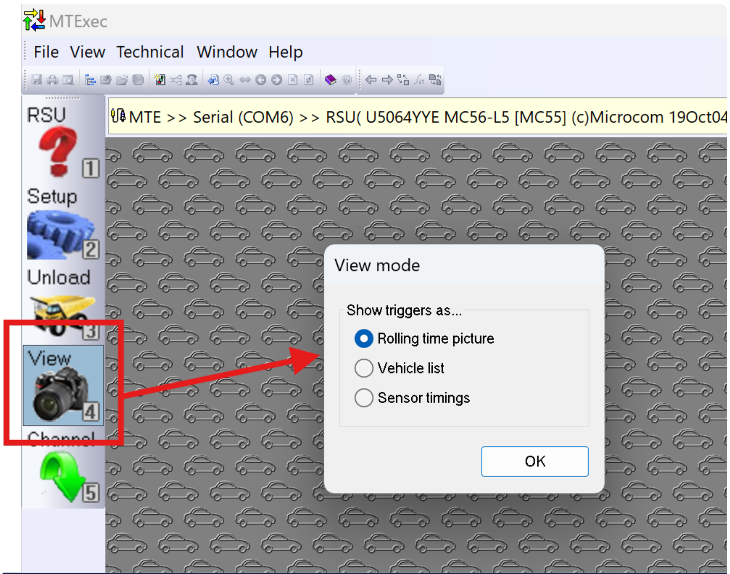
Before the actual counting of road users to take place, tally counters must be trained by a supervisor on how to interpret different classes of road users. After training them, 30- 40 minutes trial counting of vehicles (traffic survey) should be carried out by tally counters themselves under close supervision. The better the tally counters are trained; the most quality data will be collected.

MetroCount

The MetroCount RSU device shall be located as set out in theTraffic Count programme. These are made up of strategic locations to provide reliable information. The device shall be placed on the selected National Highways to obtain a full 7 day continuous count. At a minimum this requires the counter to be on site for a minimum of 8 days (possibly extra two days allowed for installation and decommission) simultaneously with manual counts where used, tally clerks keeping record of every vehicle that passes the site. This will provide comparison between 7 day count and tally clerks data and assist the averaging of confirmation of the ADT.

The AMB technical survey team shall train two provincial representatives from each of the 22 provincial works offices introducing the recording of traffic information by installing the device.

The traffic counting teams shall be set up to carry out the counting at the various locations throughout the National Road Network. In the course of the traffic data collection process, each count stations with its tally clerks and devices shall be monitored and supervised on a regualr basis (minimum of once every two days). Monitoirng will undertaken by trained technical staffs who have fair background knowledge on the traffic methods from the respective provincial offices to ensure efficient and accurate collection of data is being collected without any incidents that may result in data error. During the montoring the MetroCount RSU the montoring officer shall connect to the RSU and check the following parameters:



Connect to RSU Open View and check the following Triggers to ensureht RSU is collecting data

After a successfull 7 day count has been obtained, delegated survey coordinator from the Asset Management Branch - DoWH Headquarter collect in the data provinces from the RSU devices, collect tally sheets for data recording and processing into AWM system.

Traffic and Site Safety

Traffic safety during the traffic Data Collection is mandatory and is the responsibility of the AMB survey personal and delegated officers from each of the provincial works offices to ensure that appropriate safety measures are in place before a survey can be conducted to protect the observer at all times.

Whenever manual traffic surveys are in progress, appropriate signage should be in place for the safety of Traffic Counting Teams. The site should be inspected for safe use by supervisor who should also ensure that every tally counter wears a high visibility vests and no safety sign is removed from site until the survey is completed.

The count stations should be chosen carefully not only for collection of quality data, but also for full consideration to traffic safety. Both during installation and uninstallation of MetroCount device on a selected count station, utmost care should be taken into consideration. Supervising vehicle should be parked off the traveled way, wear reflective vests, and act in a manner that does not distract motorists or influence their driving behavior.

Traffic controllers and cones will be prepared to assist to make count sites as safe as practical during the installation and decommission of the site. Please refer to the diagram below, which is an extract from the DoW Safe Traffic Control at Roadworks Field Guide, and shows a typical setting out details of MetroCount device during installation and uninstallation.

Vandalism and interference with counting equipment is also a potential problem at the sites. Therefore, during the course of the survey, careful consideration is required in these circumstances. MetroCount devices and pneumatic tubes shall be monitored and looked after either by organised community security or if underatking a full manaul count by tally clerks concurrently till the end of the survey.

Typical example of setting out details of MetroCount device during installation and uninstallation

Typical example of setting out details of MetroCount device during installation and uninstallation. Note Dayglow vests, STOP/SLOW signs and road cones to help manage safety on site

Step 3: Download and Process Data from MetroCount Counter

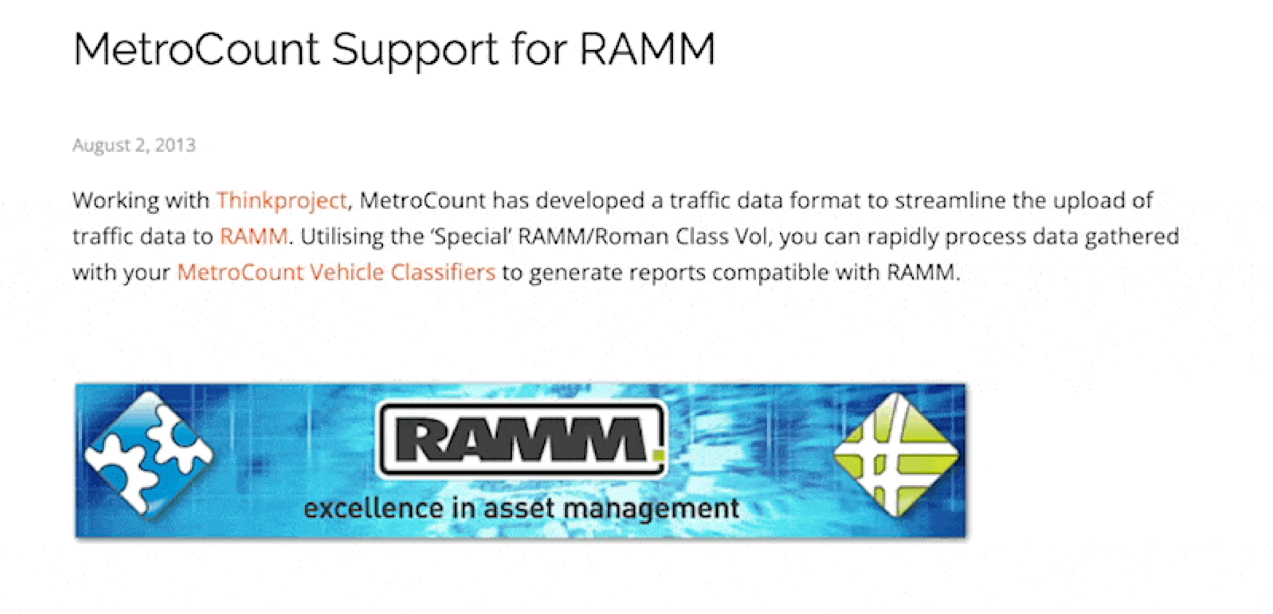
When the data collection period has ended and data has been collected from the field, it must be analysed and checked for accuracy. The thirteen classes tallies collected from the manual tally sheet shall be compiled and entered to its standard excel sheet. The number and nature of vehicles tallied (data) from the first day of the count to the last day of the count should be compared with the data from the MetroCount.

The comparisons of data from the two different survey methods are very important for the verification of the data. It is therefore, advisable that traffic data from MetroCount is cross checked by taking a manual count to enable easy checking and comparison for reliability and accuracy purposes.

Initially the information shall be managed and owned by the Department of Works Asset Management Branch and held within the RAMS database where it can then be disseminated to stakeholders via means of the current infrastructure managed by DoWH such as the website and intranet.

Required format for data supplied to PNG DoWH

All traffic count data to be collected by or supplied to PNG DoWH, must be generated using the MetroCount Traffic Executive software, and should be prepared following the instructions provided on the MetroCount Support for RAMM page.



MetroCount Support for RAMM

August 2, 2013

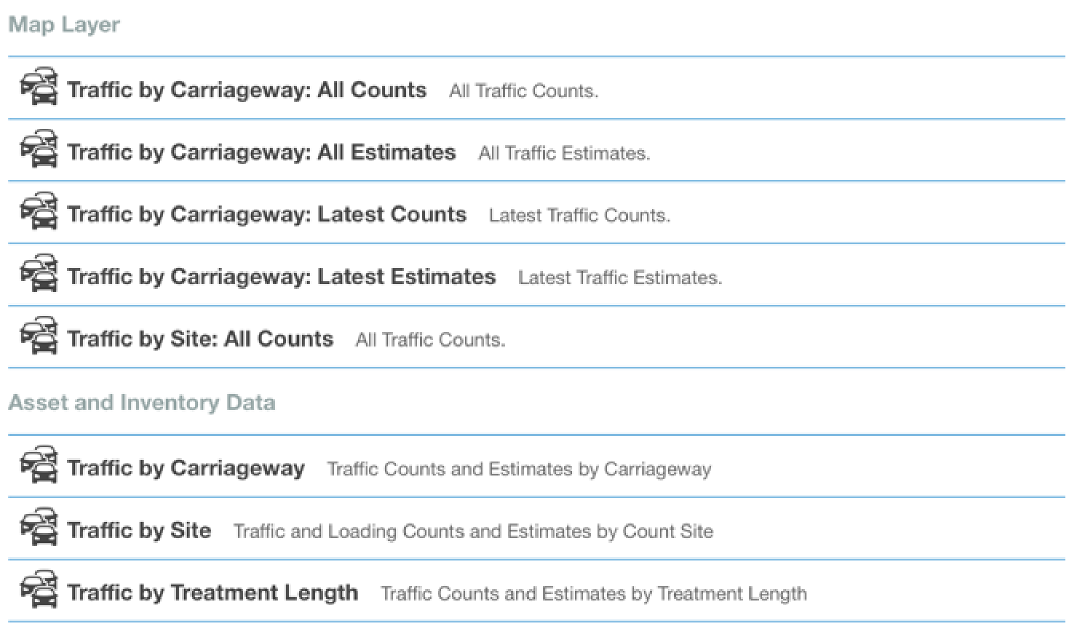
Working with Thinkproject, MetroCount has developed a traffic data format to streamline the upload of traffic data to RAMM. Utilising the 'Special' RAMM/Roman Class Vol, you can rapidly process data gathered with your MetroCount Vehicle Classifiers to generate reports compatible with RAMM.

Support information is provided on the MetroCount Support for RAMM page.

Importing Traffic Count Data into RAMM

Traffic count data is imported into RAMM using the MetroCount Import tool. This tool guides users through the process of importing traffic count data files exported from the MetroCount software.

Uploaded traffic count data can be viewed in RAMM by carriageway section, treatment length and count site.



RAMM Traffic data; map layers and tables available from the RAMM Menu

Quality Assurance

If the data collection is being undertaken by a contractor, they shall develop, implement, and manage a contract Quality Plan to ensure that the contract requirements are understood, risks identified, addressed and quality levels are achieved.

The contractor shall provide a draft quality plan within 10 days of the Award. DoWH shall review the draft plan within 5 days and the contractor will have 5 days to provide the final draft to DoWH. The quality management plan shall be reviewed annually by the fifth working day of November each year.

The traffic counting fieldwork is to be undertaken in accordance with this specification and latest best practice, and as per the equipment specifications and manufacturers operating manuals.

- The Contractor shall ensure that traffic counter operators and other survey/back up staff are fully trained in the use of equipment and safety procedures required under the Contractor's Health and Safety Plan.
- To ensure continuity and correctness of all counts and classifications, station set-ups shall be systematically checked as necessary.
- DoWH may undertake a data audit and compare the count data with previous records for the site. The Contractor shall be required to resolve and fix any data errors and anomalies at their cost.

As a minimum all counts must be checked for accuracy and completeness prior to loading into the RAMM database. The supplier must supply a quality check process through which each count must pass to be a successful count. As a minimum DoWH would expect that the following quality checks are completed:

- Must be a full 7 Day classified count.
- There is general balance on Directional split i.e. lane one / lane two is within +/- 5% of 100%.
- All report requirements identified in this specification are supplied in full with no missing data.
- Periodically a minimum of a 1 hour on site manual count is completed and compared to the same time period from the count data taken by the counting equipment. This manual check shall be completed on minimum of 10% (by number) of the counters used during the counting programme in any one counting period e.g. The Summer programme used 30 counters, manual verification counts required on 3 counters. This check is to be supplied with multi-media data appended to the relevant count record in RAMM.
- Visual surveys are to be carried out during daylight hours and are to be recorded as per manual tally

specification above. The date, start time and site number is to be recorded. For counts, the total vehicles for each lane will be recorded.

- Where there is a **difference with the data logger readings of greater than 5%** in any one lane for any class (for classification surveys) or any one lane (for counts) over the observed time period, the Contractor shall repeat the survey or continue (at continuous locations) with replacement equipment as appropriate.

If the data collection is being undertaken by a consultant, DoWH reserves the right for one AMB staff member to join the Consultant's on-site survey team(s) for quality review purposes. The Consultant is to allow for one (only) seating place in its primary survey vehicle to accommodate an AMB staff member and shall provide a minimum of five business days notice of any change of travel dates that have been previously agreed with DoWH (eg. through approval of the Consultant's Workplan). All direct costs (eg. travel airfares, accommodation, per diems etc) incurred by a DoWH staff member accompanying the Consultant's survey team are the responsibility of the client.

Stakeholders

Stakeholder	Role
DoWH AMB	The Asset Management Branch is responsible for this specification and utilising the data for the support of programme development and further analysis.
Provincial Works Manager (PWM)	The PWM is the most senior DoWH role based in each province and should be advised of any data collection to be done on national roads in their province.

Support

The following provides contacts for each of the main technical systems used by the DoWH AMB.

System		
ThinkProject Asset & Works Manager	The core system of the DoWH Road Management System	edmond.li@ghd.com
Mapillary	For uploading and accessing network video	remson.maea@pngroads.com
GoPro MAX	For the recording of network video	remson.maea@pngroads.com
TotalPave	For the recording of pavement (network) roughness	rexie.rei@pngroads.com
MetroCount	MetroCount counters and software for the recording of traffic counts	remson.maea@pngroads.com
KnowledgeOwl	Knowledgebase for the DoWH asset management and other related activities and requirements	elliot.mcbride@ghd.com

References and Additional Reading

Links to further support documents, manuals, publications and other content are included in the table below.

Reference Name / Description
MetroCount Support for RAMM
MetroCount Import tool

Reference Name / Description
MAX.amp Data Quality Management Plan (link TBC)
RIMS Guideline for Traffic Counting
RIMS Traffic Counting Guide Supplement
RAMM NZ Vehicle Classification Document

Exporting traffic data from MetroCount Traffic Executive v4

13/02/2025 4:30 pm +10

All information and screenshots in this article have been sourced and reproduced from the metrocount.com website.

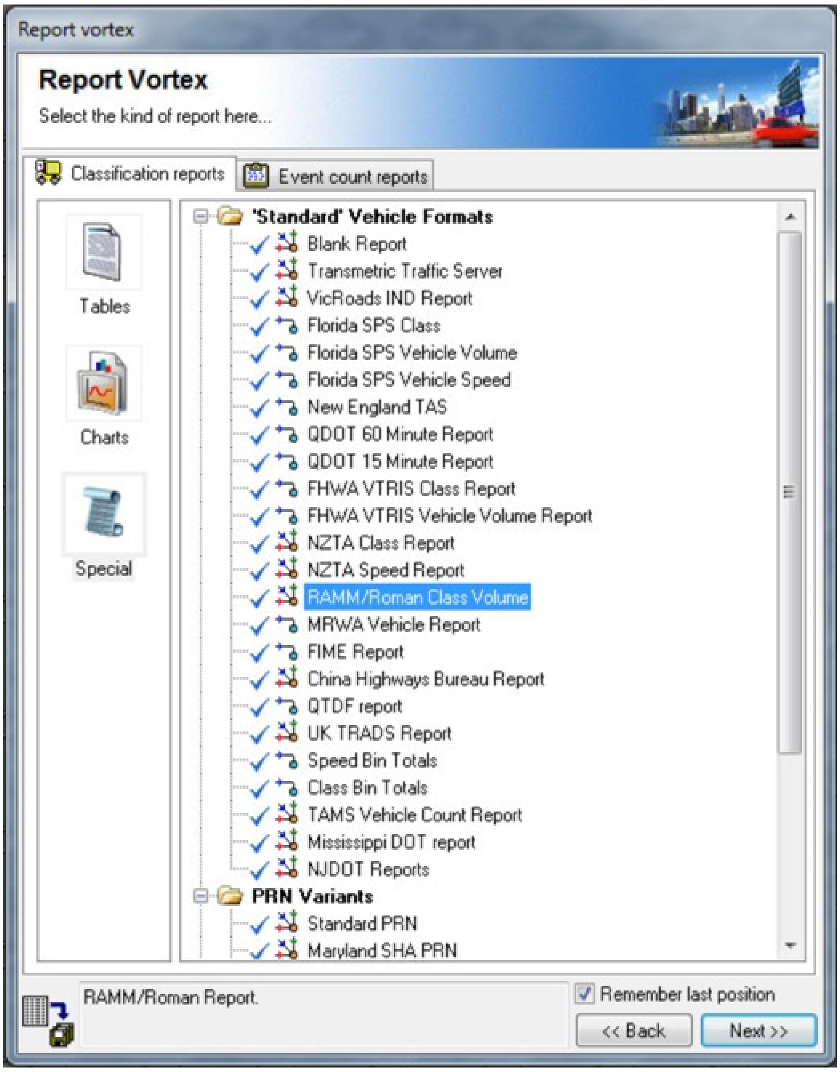
Please note the screenshots used in the article are generic only, and are not specific to the Papua New Guinea road network. The MetroCount documentation also states these instructions apply to V4.06 of the Traffic Executive software. Applicability of this article to later versions will need to be confirmed.

A RAMM-compliant data format is available for use in the MetroCount Traffic Executive application. Please follow the steps below when using the MetroCount Traffic Executive software to process and save traffic data for upload into RAMM.

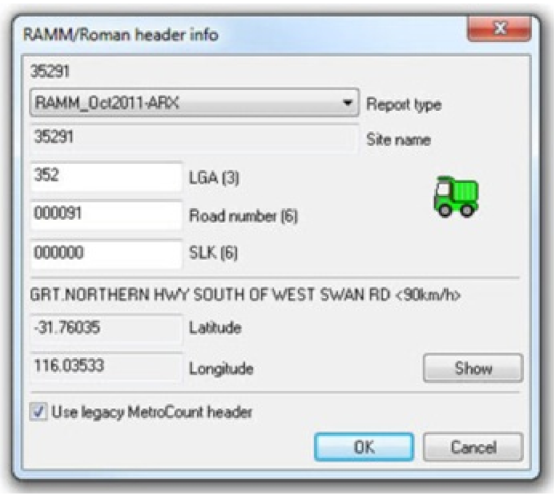
1. Select `New Report` and tag the relevant dataset.

2. In the Report Vortex screen, select the `Special` report type.

3. Select the `RAMM/Roman Class Volume` report.



4. A prompt will appear which requires the Report type of xxxx to be selected, and the relevant AWM site data to be entered. The MetroCount software requires the entered data to match the number of characters in the brackets next to each field. Therefore a preceding zero(s) may be necessary to meet this requirement e.g. the road number of 91 would be entered as 000091.



5. When the report has been generated, select File > Save Report as... to save the report. The file name must not change from the default file name the MetroCount software has generated.

6. The saved report file is now ready to be submitted to PNG DoWH for upload into RAMM.

> If you are using MetroCount Traffic Executive v3, please contact PNG DoWH as additional configuration files will be required for the Report Type.

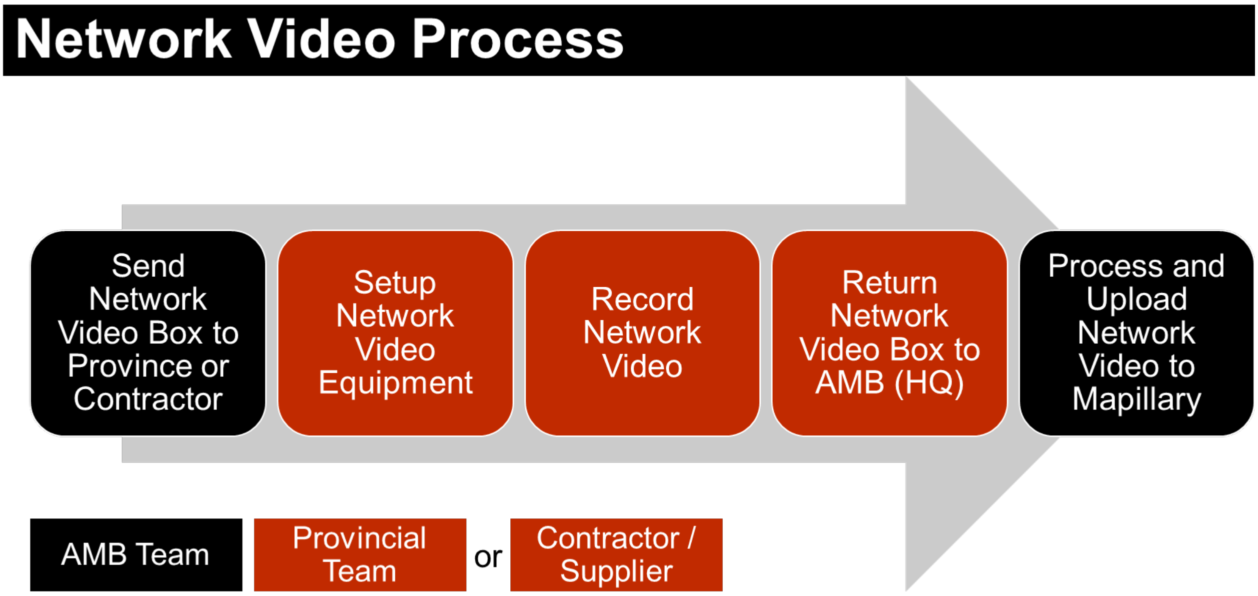
Adding Traffic Counts to RAMM

06/09/2023 12:13 pm +10

RAMM Notes and Assumptions	Indicative (draft) Data Dictionary	Other Supporting Links
RAMM has a MetroCount import tool. There are supporting configuration files available to help export data from the MetroCount application in a RAMM compatible format. The second link included on the right is a MetroCount support page discussing the process from a MetroCount perspective.	*(RAMM compatible import file to be generated from MetroCount software)*	Help page in RAMM with additional file downloads **MetroCount support page for RAMM** RAMM NZ Vehicle Classification Document RIMS Traffic Counting Guide Supplement

Network Video - Collection Process

14/08/2024 5:58 pm +10



Network Video - Vehicle Setup Instructions

13/02/2025 4:04 pm +10

Case Contents

1. GoPro Max
2. 2x batteries
3. GoPro dual charger
4. GoPro Remote (if not using phone)
5. SD cards (in case)
6. Selfie Stick
7. Lens caps
8. Suction mount
9. Turn key
10. GoPro case
11. Wet wipes
12. Phone holder (if using phone)
13. 4-port Belkin charger

14. Powerbank

15. Cleaning cloth

Vehicle Mount Setup

1. Attach the selfie stick to the tripod

Extent the selfie stick so it is 50-60cm in length.

Attach the bottom of the selfie stick to the central console of the tripod. Use the turning key to tighten.

Make sure the stick is tight and straight.

In some cases, you might also want to use the level mount but in the Department's testing it was established that connecting the stick directly to the tripod is more secure.

IMPORTANT! Tighten using the turn key to make sure connections are secure.

3. Connect the GoPro

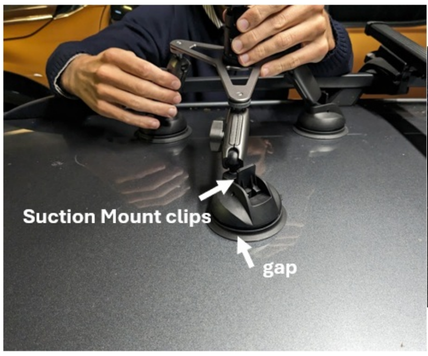
Fold out the connection points from the bottom of the GoPro.

Connect the GoPro to the selfie stick. Insert screw through the fold out connections and tighten.

Remove x2 lens caps and replace with the clear lens caps.

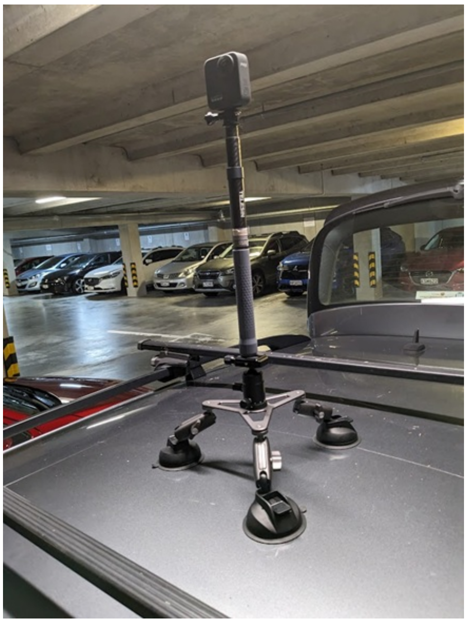
4. Attach tripod to car roof

- Place the tripod in position on top of the vehicle
- Use a wet wipe to clean the area of the vehicle that the suction mounts will be placed on and the suction cups (removing dust).
- Position the arms so that they are spread out evenly and the tripod is level.
- Use the lever to tighten the arms.
- Make sure the Suction Mount clips are raised.
- When in final position, press suction mounts down so there is no gap and then snap clips closed. Do this for each Mount.
- Finally, ensure mounts feel secured.



5. Adjust tripod on roof

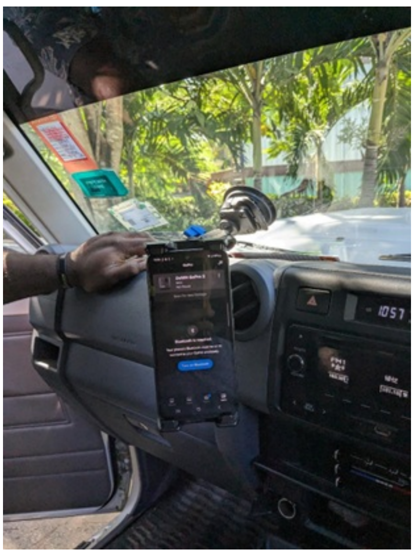
Adjust the angle of the stick to ensure the correct part of the road is being filmed. The screen should be facing the back of the car.



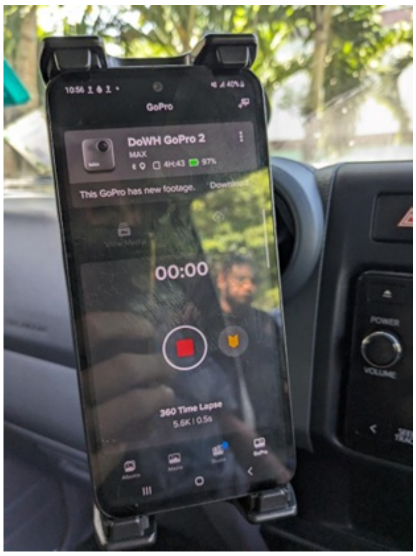
Use this lever on the level component to adjust angle.

Setting up the In Car Phone or Tablet Holder

Connect the three pieces of the phone holder together.



Use the suction cup to connect the holder to the inside of the windscreen. Make sure this is in a position that does not affect the drivers view.



Before pressing record make sure that the setting is on **360 Time Lapse with 0.5s interval**.

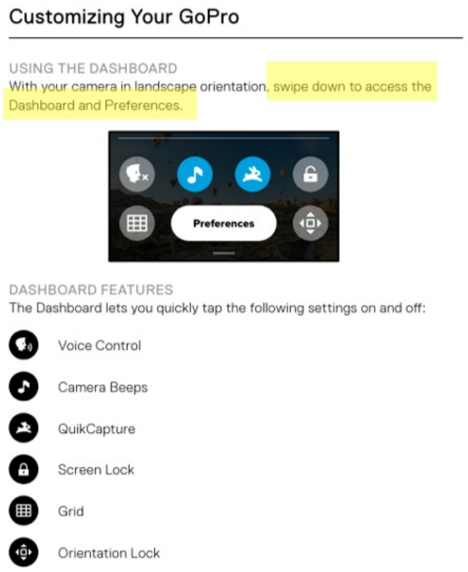
Network Video - GoPro MAX Recording Settings

11/08/2024 6:43 pm +10

GoPro MAX Settings for Recording

1. Check that GPS is on.

- Go to Preferences -> Regional -> GPS
- Make sure that the GPS icon is bright (not greyed out). To see this view, swipe down to open the dashboard page and then swipe down again to see the date/time and connections, including the GPS symbol.
-



Customizing Your GoPro

USING THE DASHBOARD

With your camera in landscape orientation, swipe down to access the Dashboard and Preferences.

DASHBOARD FEATURES

The Dashboard lets you quickly tap the following settings on and off:

- Voice Control
- Camera Beeps
- QuikCapture
- Screen Lock
- Grid
- Orientation Lock

Customizing Your GoPro

CONNECTION STATUS

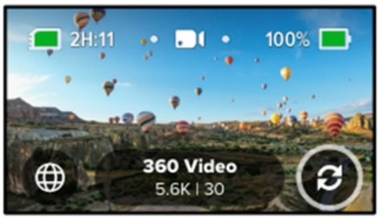
Check the top of the Dashboard to see your connection status.

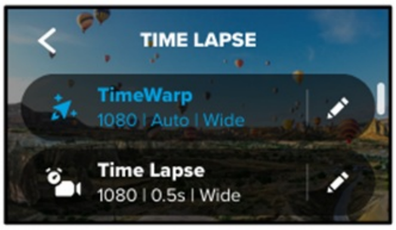
- GPS is on (white).
- GPS is off (gray).
- GPS is unavailable (gray).
- Camera is connected to the GoPro app (white).
- Camera is not paired to the GoPro app (gray).
- Camera is not connected to the GoPro app (gray).
- Auto Upload is on and ready (white).
- Auto Upload is off (gray).
- Auto Upload is on but not ready (gray).

2. Set to 360 Time Lapse and check settings

- Set the camera to '360' mode by tapping the icon on bottom left corner. This icon should appear.
- To select time lapse, press the mode button on side of camera until the clock icon and 360 Time Lapse appears.
- To edit Time Lapse settings, tap the middle bottom of the screen which will either say *360 Time Lapse* or *360 Timewarp*. Select *360 Time Lapse.*
- Then select the icon, scroll down to see the Interval option and select 0.5s

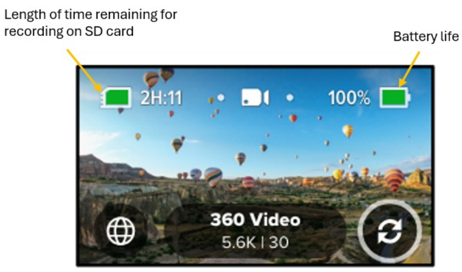
Before pressing record make sure that the setting is on **360 Time Lapse with 0.5s interval**.





3. Check battery and time available to record

- The time in top left of screen indicates how much time is available to record footage. For example, this camera has 2 hours and 11 minutes. You should make sure this is greater than the amount of time you expect to record for that day.
- The battery symbol in top right indicates how much battery is left (same as your phone!) Make sure you have the spare battery and ability to charge batteries if doing a lot of recording.



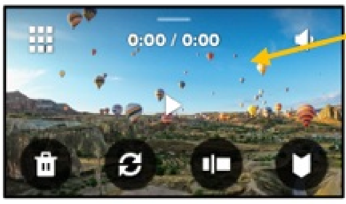
4. Test Recording

- Use the record button and film a short recording.
- Follow instructions below to check the recording has worked.
- Delete this test recording.

Playing Back Your Media

Swipe up to see the last video, photo, or time lapse you took. Swipe left and right to flip through the other files on your SD card.

Swipe up from bottom of screen to review footage.



The Media Gallery includes the following playback options:

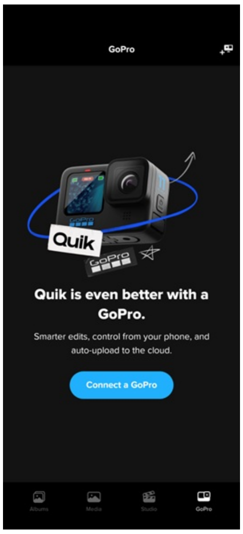
- Pause playback
- Resume playback
- See all of the media on your SD card
- Delete the file from your SD card
- Playback view
- Play back at slo-mo or normal speed
- Use a slider to scan through your videos or group of continuous photos
- Add/remove HiLight Tag

Network Video - Using the GoPro App or Remote for Recording

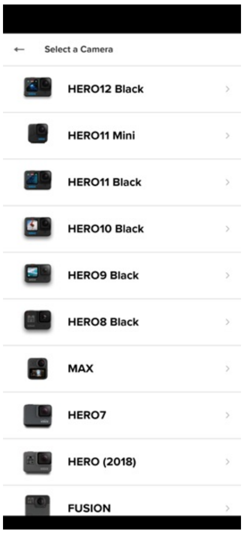
11/08/2024 6:44 pm +10

Using the GoPro Quik App

NOTE! It is recommended to use the phone app as it has better functionality than the Remote.

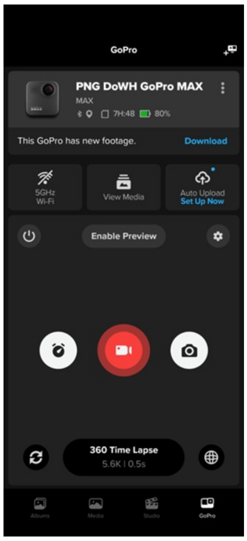


Download the GoPro Quik app. Open app and select the Connect a GoPro button.

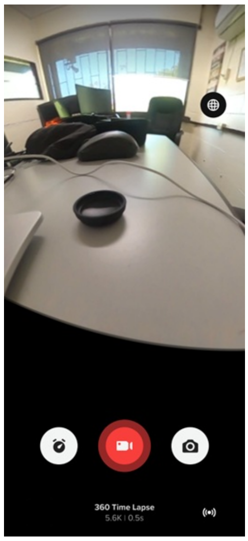


Select MAX

Follow these instructions to allow your GoPro to be connected. Keep the name given to the GoPro.



Once connected you should see this screen. You can operate settings from this screen and start/end recordings.



You can see the view from the GoPro by selecting the Enable Preview button. This requires the WiFi on your phone to be on. When you start recording you cannot see the preview.

IMPORTANT! Do not press record while in Preview mode because you cannot properly see the battery status (%) from this mode.

NOTE! When using preview, it uses the WiFi from the GoPro device, so it doesn't use your data.

Using the GoPro Remote

NOTE! You can either use the Remote of the phone app but you cannot connect both at once.

Pair the Remote

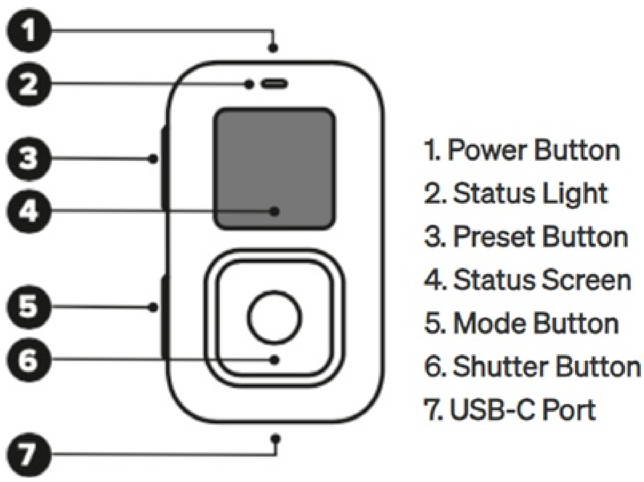
First time pairing to a camera

1. Power off The Remote.
2. On your camera, complete these steps to power on the camera.
3. Tap Preferences -> Connections -> Connect Device -> Remote
4. Power on The Remote.
5. Pair New will appear on The Remote's screen. Press the [Shutter Button] to start pairing.
6. The camera will indicate successful pairing, followed by an indication on The Remote.
7. When successfully paired, The Remote LCD displays the camera settings.

Next time you turn on the remote it will automatically attempt to connect to the GoPro.

Using the Remote

For taking network video, you should only need to use the remote to start/stop recording using the Shutter Button and to check battery life and memory on SD Card.



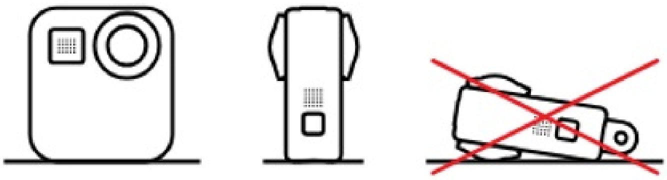
Network Video - GoPro Max Basics

13/02/2025 4:07 pm +10

General maintenance

Here are some more tips to get the best performance from your camera:

- Always use the black lens cap to protect the lenses when you're not using your camera. The lenses are exposed to capture spherical content and are unprotected. Scratches to the lenses are not covered under the warranty.
- Use the clear Protective Lenses if you want added lens protection when you're using your camera. NOTICE: The clear lenses may affect image quality under certain conditions.
- To protect the lenses from damage, do not rest your camera on its front or back side. Be sure the lenses are not resting against any surface.



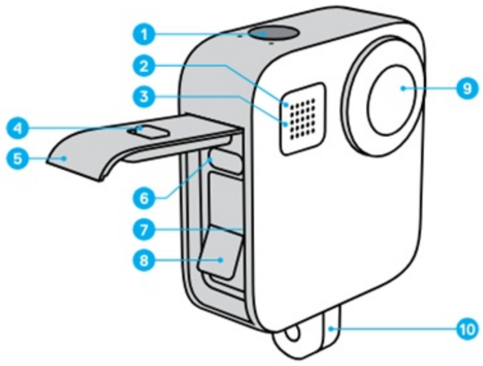
- To clean the lenses, wipe them with a soft, lint-free cloth. If debris gets stuck between the lens and the trim ring, flush it out with water or air. Do not insert foreign objects around the lenses.
- Your camera is waterproof to 16ft (5m)-no housing needed. Be sure the door is closed before using the camera around water, dirt, or sand.
- Before closing the door, be sure the seal is free of debris. Use a cloth to clean the seal if needed.
- Before opening the doors, be sure that your camera is clean and dry. Rinse your camera with fresh water and dry it with a cloth if needed.
- If sand or debris hardens around the doors, soak your camera in warm tap water for 15 minutes and then rinse thoroughly to remove the debris. Make sure your camera is dry before opening the doors.
- For best audio performance, shake your camera or blow on the mics to remove water and debris from the microphone holes. Do not use compressed air to blow into the mic holes. This could damage the internal waterproof membranes.
- After every use in salt water, rinse your camera with fresh water, and dry with a soft cloth.

WARNING: The dual lenses of MAX are unprotected and are susceptible to scratches, if not cared for properly. Always store MAX with the provided lens protection and avoid resting the lens on any surface. Scratches to the lens are not covered by the warranty.

GoPro MAX basics

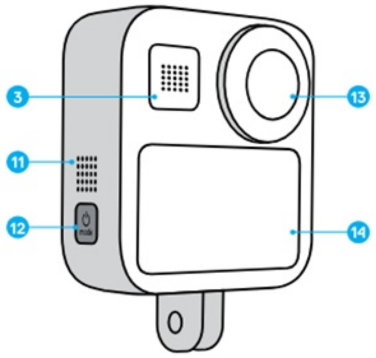
Link to GoPro MAX online manual

Meet MAX



1. Shutter Button
2. Status Light
3. Microphone
4. Door Lock
5. Door
6. USB-C Port
7. microSD™ Card Slot
8. Battery

Meet MAX



9. Camera Lens (Non-Screen Side)
10. Folding Fingers
11. Speaker
12. Mode Button
13. Camera Lens (Screen Side)
14. Touch Screen

USING THE TOUCH SCREEN

	Tap Selects an item and turns a setting on or off.
	Swipe Left or Right Switch between Video, Photo, and Time Lapse modes.
	Swipe Down From the Edge of the Screen Open the Dashboard when your camera is in a landscape orientation.
	Swipe Up From the Edge of the Screen See the last photo or video you captured and access the Media Gallery.
	Press and Hold the Capture Screen Turn on and adjust Exposure Control.

Getting to Know Your GoPro

CAPTURE SCREEN

This screen gives you access to your camera's capture settings.

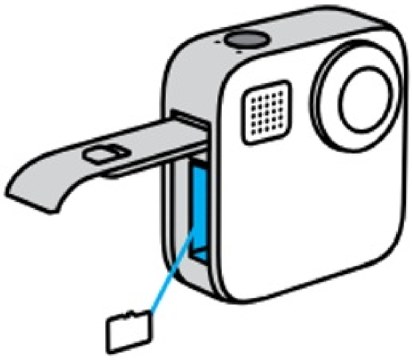
1. Current Mode (Video, Photo, or Time Lapse)
2. Recording Time/Photos Remaining
3. Digital Lens Shortcut
4. HERO/360 Mode Select
5. Battery Status
6. Horizon Lock Shortcut
7. Lens Switch
8. Capture Settings

Heads Up: The capture settings are not available when you rotate your GoPro to take portrait shots. Be sure to choose the settings you want before rotating your camera.

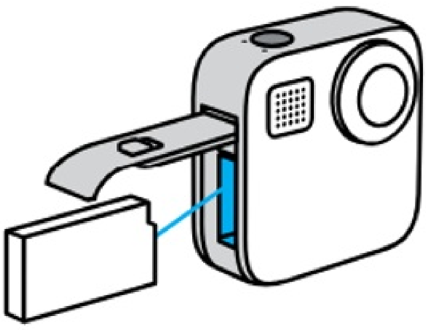
How to change the SD Card and Battery

Unlock the door, slide it down, and flip it open

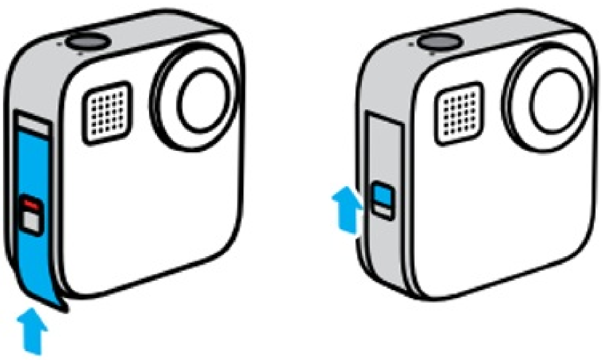
With your camera off, insert the SD card into the card slot with the label facing the battery compartment



You can eject the card by pressing it into the slot with your fingernail. Insert the battery.



Slide the door all the way up until there's no gap, and then lock it.



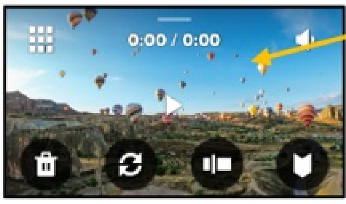
NOTICE: Push from the bottom to make sure that the door is closed correctly. Don't use the lock to slide the door closed.

Playing Back Your Media

Playing Back Your Media

Swipe up to see the last video, photo, or time lapse you took. Swipe left and right to flip through the other files on your SD card.

Swipe up from bottom of screen to review footage.



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Network Video - How to Record 360 Video Along Network

11/08/2024 6:48 pm +10

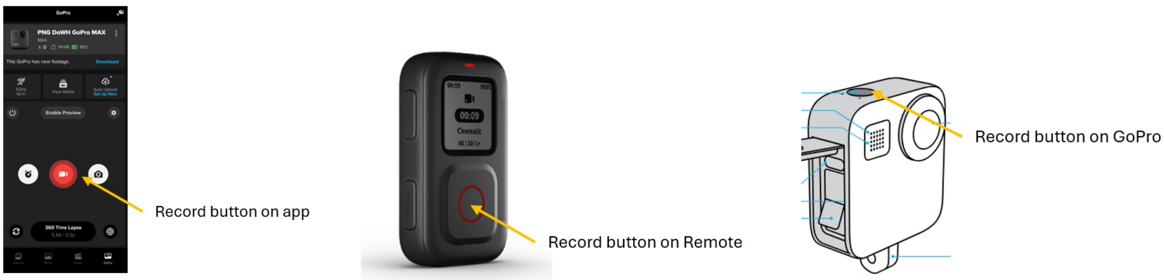
Recording Process

Map out your day of driving

- It is useful to have some target locations to stop and change batteries/SD Card, and to have a target destination for the end of your day (especially if you plan to stay overnight!)

Recording

- Press the record button on the remote or app to start recording before you start driving.



- When you stop, stop the recording.
- If you are stopping for a long time, turn off the GoPro to conserve battery.
- Before you start driving again, press record. Making sure there is no more than 5 to 10 metre gap between recordings.

Using the Log Form

- There is a Log Form provided in the tough-case. Every time you start/stop, use this to record the date & time and a location (if you have latitude/longitude locations this is the best way to record location).
- Also use the Log Form to record where there is a road that is supposed to be logged but is not accessible for any reason. Provide the reason why the road is not accessible.

Instructions for Driving

Speed Limit

- Should not exceed 70kmh.
- If you go faster than this speed the quality of the image will degrade and the gap between the images increases too much.

Charging batteries

- Using the 360 time lapse mode, a fully charged battery should last 2.5 hours.
- The other battery should be being charged using the power bank and dual charger while capturing footage. Alternatively, can charge using the cigarette lighter adapter.

Check battery and space on SD Card

- You can use the Remote and App to check the status of the battery and the space left on SD Card while you are recording.
- Make sure to proactively change battery/SD card as required. You don't want to drive for miles accidentally without recording!!

Recording two-lane and four-lane roads

- For two-lane roads (one lane for each direction) only take recording for one direction.
- For four-lane roads (two-lanes in each direction), take a recording for both directions.

Time of day

- Try to avoid taking footage early in the morning or late in the afternoon when the sun is low. Ideally, footage should be taken between 9am to 4pm.

End of the Day Tasks

Charge batteries

- Use the dual charger and Belkin four-port charger to charge the GoPro batteries and the powerbank (if necessary).

Secure gear

- Make sure the gear is in a secure place and padlocked.

Clean gear

- In some cases, the gear might get dirty so please clean as needed, so that footage is clear.

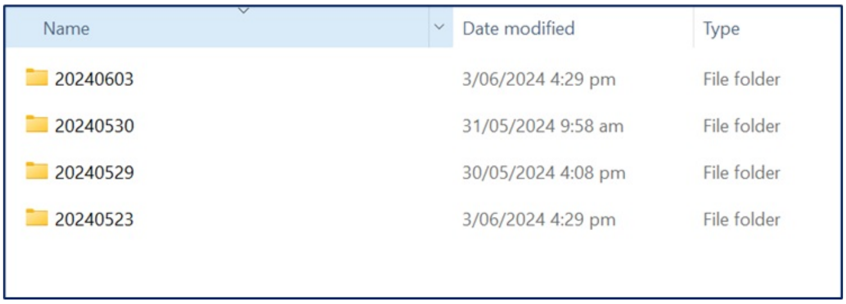
Communicate with POM team and office

- If you have any issues with the gear let the POM team know.
- If you are going out for multiple days/overnight you should check in with your local office to let them know your progress.

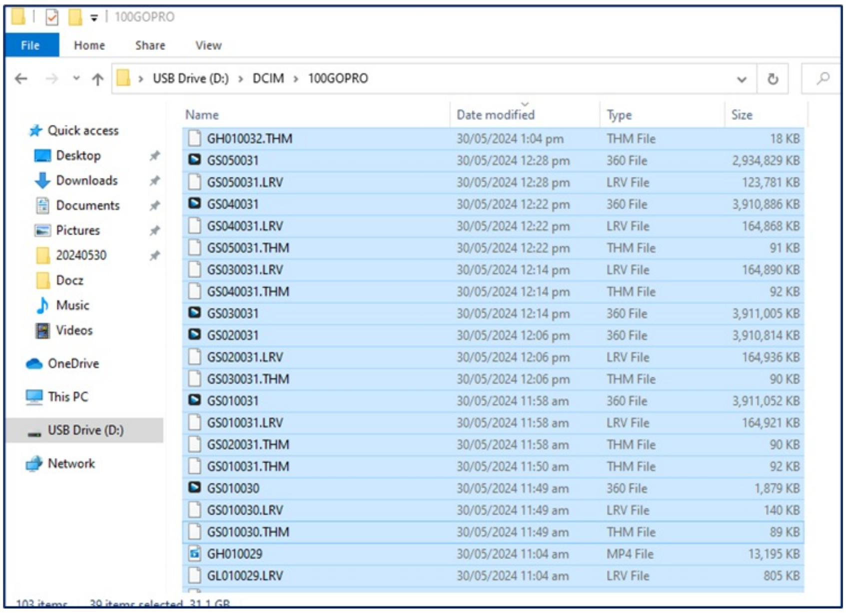
Network Video - How to Process and Upload Network Video to Mapillary

11/08/2024 6:49 pm +10

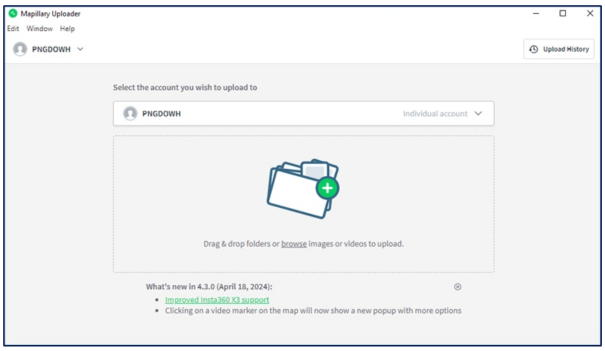
Create a folder for each date of data on the external hard drive.

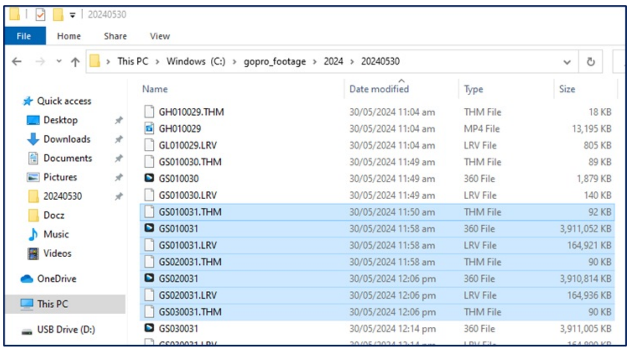


Use a USB SD Card holder or SD Card holder to access the files on the SD Card. Select the files for one date and copy and paste into the folder you created with the same date.



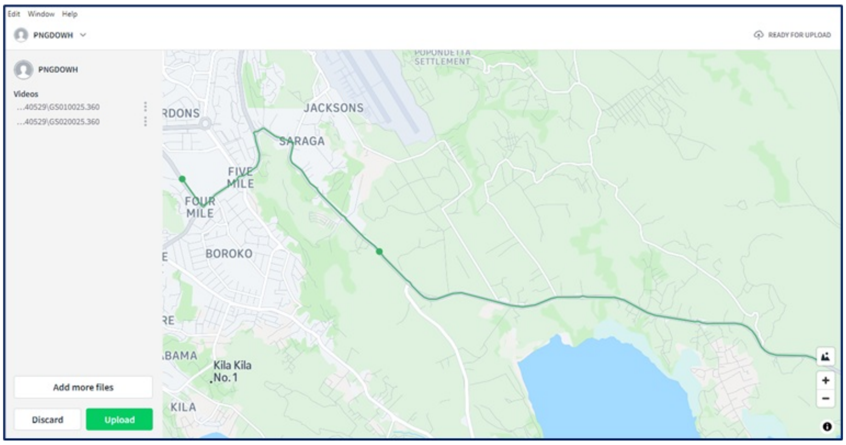
Open Mapillary. Select the files you want to upload either by dragging and dropping into Mapillary or using the *browse* function.





In Mapillary you will see the PREPARING FOR UPLOAD loading icon.

Once it is ready for upload you will see the GPS track on the map and the name of the video file on the left. If you are happy with the preview, press the *Upload* button.



Asset Handover Management

16/06/2025 12:55 pm +10

Introduction

Effective management of infrastructure assets is crucial for optimising outcomes and ensuring cost-effective operations over the asset's entire life. A critical part of this involves the **asset handover process**, which is the final task in managing construction projects or contracts. This process involves the transfer of assets and associated information from the party responsible for their creation, renewal, or validation (such as contractors, consultants or developers) to DoWH for ongoing management. Providing accurate and comprehensive information during handover is essential for a smooth transition and effective future asset management.

Purpose and Scope

The purpose of this article is to help to define the **asset data requirements and handover processes** for DoWH. It is recommended that, if it does not already exist, a formal Asset Handover Management Guideline document should be developed. This document can help to inform that document.

This article provides guidelines for parties involved in various asset activities to ensure consistent data standards and submission procedures are met.

This guidelines presented in this article applies to assets managed by DoWH and covers information requirements resulting from the following categories of asset activities:

- **New Capital Development**: Creation of new assets as part of DoWH capital works programmes.
- **Asset Renewals**: Work undertaken to restore an asset component (rehabilitation, refurbishment, and replacement).
- **Asset Disposal**: Decommissioning, deletion, or abandonment of assets.
- **New Land Development**: Vesting of new assets constructed as part of development or subdivision works.

Asset classes typically covered include, but are not limited to, those relevant to road networks and related infrastructure:

Assets currently in AWM:

- Network Change – Shortening or lengthening an existing route
- Structures (Bridges, Large Culverts)

To be Introduced in next phases:

- Pavements (Surface, Basecourse, Subbase)
- Structures general (Walls, Fences, Handrails)
- Drainage (Kerb & Channels, Pipes)
- Streetlighting
- Traffic Control (Signals, Roundabouts, Islands, Pedestrian Refuges)
- Paths
- Other special assets subject to vesting with DoWH.

Please note that this guide covers the asset data needs of DoWH only. Other entities may have their own requirements.

Principles of Asset Handover

Achieving a smooth and successful asset handover relies on adhering to key principles:

- **Clear Definition**: The approach to asset and operations transition at the end of a contract term should be clearly defined in the contract itself.
- **Consistency**: Implement a consistent and reliable procedure for every project handover. Organising the procedure in a checklist or systematic approach is recommended.
- **Early Planning**: Planning for asset handover should begin early in the project lifecycle, not just as an afterthought.
- **Effective Communication**: Maintain clear lines of communication with all involved parties throughout the project and handover phase. This would typically include the owner, designer and constructor.
- **Data Accuracy and Completeness**: Provide accurate and complete asset information to ensure the handover process goes smoothly and supports effective future management.
- **Whole-of-Life Value**: Contract management should ensure that handover criteria are met in a timely and robust manner to achieve value for money over the asset's whole life.

Asset Handover Process Overview

The asset handover process typically involves the steps specified below. More detailed information is provided in the last part of this article – *Detailed Asset Handover Process.*

1. **Project Management:** Early engagement with all stakeholders to understand what is being designed and built. Therefore, supply of data expectations can be set from the outset. As the project progresses and nears completion (e.g., practical completion), preparation for handover begins. This includes confirming testing and commissioning are complete, discussing and agreeing upon defect management procedures, and finalising compliance reporting.

2. **Data Preparation:** The party responsible for the work (contractor, consultant, developer) prepares the required asset information, including as-built plans, asset attribute data, and supporting documentation.

3. **Data Submission:** The prepared information is submitted to the DoWH Asset Management Branch.

    a. All required asset information (as-built plans, attribute data, documentation) should be submitted in digital format to minimise processing time and errors. This submission should be accompanied by certified softcopy (pdf) plans.

    b. The owner of the project is responsible for ensuring the required information is provided to DoWH.

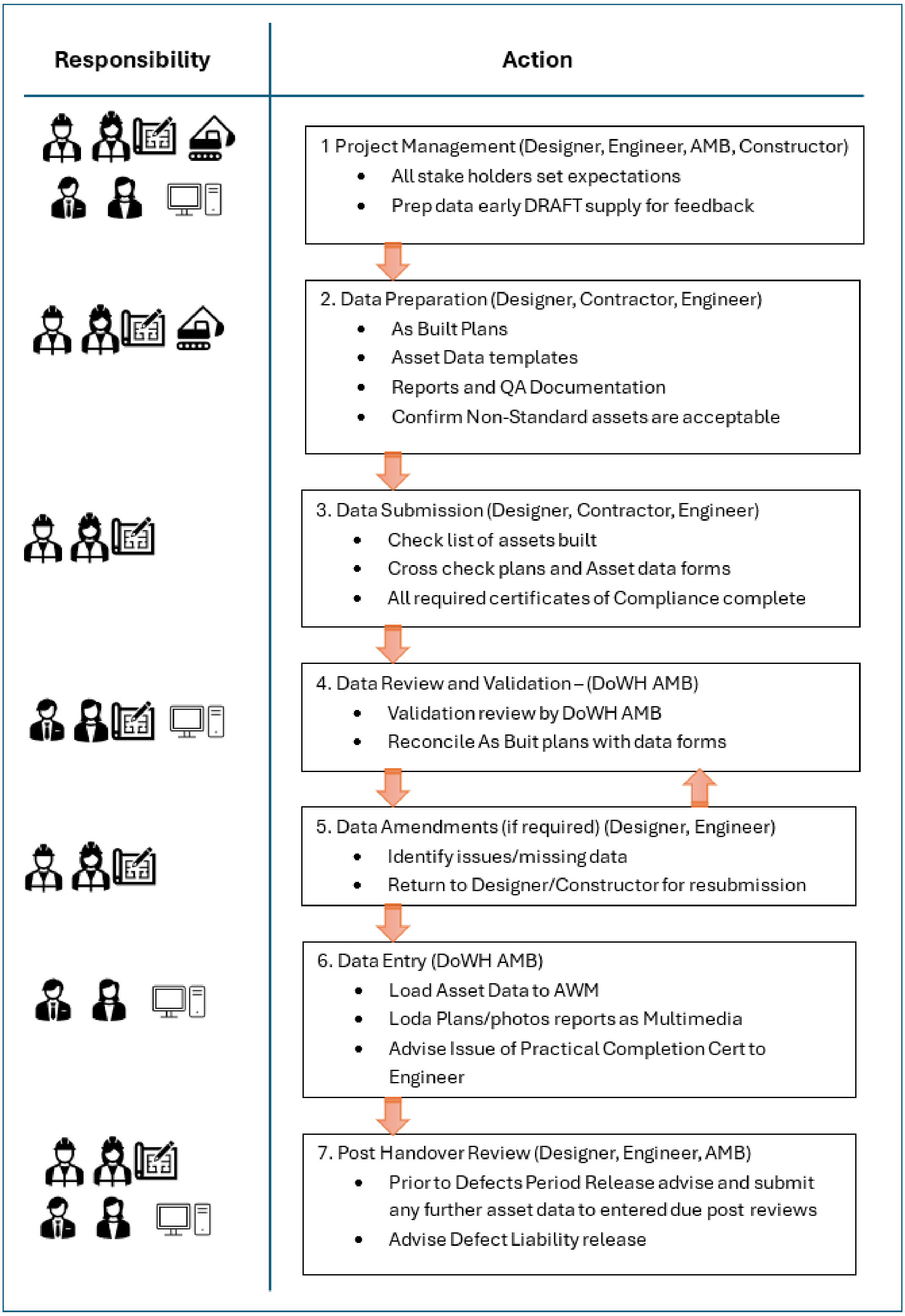
4. **Data Review and Validation:** The DoWH Asset Management Branch will review and validate the submitted information against the required standards and specifications. This includes checking for accuracy, completeness, and compliance with DoWH standards.

5. **Data Amendments (if required):** If the submitted information does not meet the required standards, it will be returned to the originator for correction and re-submission. Corrected information must clearly indicate it is an amendment.

6. **Data Entry:** Once the information is reviewed and accepted, the asset data is loaded into AWM, the DoWH road management system.

7. **Post Handover Review:** At the end of Defects Liability Period any new assets created, for example signs, guard rail as result of post safety reviews, will need to be captured and provided to DoWH Asset Management Branch (AMB).

Note: Projects are not considered complete until the required as-built plans, attribute data, and documentation have been **received, checked, and approved** by DoWH.



Required Information and Data Standards

A comprehensive set of information is required for asset handover to DoWH. A more detail This typically includes:

As-Built Plans (Drawings)

- **Format**: Must be provided in **digital format** (e.g., DWG, DXF) as well as a certified softcopy (pdf). This certified soft copy shall be red line mark up stamped electronically stamped with **AS BUILT. These documents can be stored in AWM with the relevant asset record.** This process is described in this article ___.
- Construction Drawings: If there are minimal changes between the design drawings and what was constructed, then the construction drawings can be modified, or marked up, to an as-built status and verified.
- **Content**: Include general information such as drawing title, project / subdivision description, plan number, contract number, scale, date, north sign, and the words "As-built Plan". A locality plan showing the work area relative to main roads, suburb, house numbers, or lot numbers is required.
- **Asset Details**: Plans must clearly show details of **all new assets** and how they link to existing assets. Any existing assets affected by the work, or those incorrectly recorded in existing systems, must be included and shown correctly. Assets abandoned or removed must also be shown. Affected private roads within a subdivision or development must be included.
- **Spatial Data**: Assets should be represented digitally as points, lines, polylines, or polygons, with each line or polygon representing an asset with a single set of attributes. Assets must be plotted with **spatial coordinates**. Recommended Best practice would require road centrelines with chainages/displacements at maximum 20m intervals are required and referenced for data sheets.
- **Dimensions and Levels**: Show primary dimensions and levels (e.g., pavement width, layer depth, drainage invert levels). Typical cross-sections may be required for specific asset types like pavements, bridges, footpaths, and traffic controls.
- **Layers**: Each asset class should ideally have its own layer in the digital drawing.
- **Certification**: Best Practice would recommend Softcopy (pdf) plans must include a signed certification statement by a Chartered Professional Engineer or Registered Surveyor. Engineer certification is required for various activities.

Asset Attribute Data

- **Submission**: Asset attribute data must be provided together with the as-built plans. It should be submitted using the **specified forms or data collection templates** relevant to the asset class and activity type. These are contained in [Knowledge Owl Reference]
- **Content**: Required data includes asset definition, asset attributes such as size (length, width, area), material, install date, activity type and clarity on is the asset new, modified, moved or removed. Mandatory data fields must be completed.
- **Look-ups/Pick-list Values**: Utilise the provided look-up tables (pick-lists) for attribute data fields. If an attribute is not in the pick-list values, the constructor/designer should contact the Asset Management Branch to either request a new asset attribute value or enter 'Other' and provide a full description. This is where the principle of the asset handover should be followed with early engagement to ensure all asset being constructed are acceptable and meet current standards.
- **Replacement Assets**: If an asset is replaced, two sets of information are needed: one to delete the old asset and one to create the new asset

Other Required Documentation and Data

Documentation: It is best practice to include the following documents where available:

- Operation and maintenance manuals or asset owner manuals for all assets.
- Warranties and guarantees provided by suppliers.
- Relevant certificates, such as Electrical Certificates of Compliance (for lighting) or Compliance Certificates/Safety Audit Reports (for bridges, structures).
- Rehabilitation design reports for road rehabilitation work.
- Project-specific documentation, not mentioned above and having an impact on the management of the asset over its life.

Spatial Location Information: This includes coordinates (X, Y, Z) for point assets and nodes, and details like road chainage (displacement) and offset from the road centreline. This information is crucial for locating assets within AWM.

Construction Plans: These may be required if the receiving authority does not already have them, primarily to clarify work shown on as-built plans.

Survey Office or Deposited Plans: Required when there are changes to property parcel boundaries, such as land acquisition for roads. Need to confirm what is this process for PNG.

Specific Project Data: Depending on the project type, this may include testing and commissioning data, defect management information, and compliance reporting or Maintenance Operating Procedures. Generally, for complex facility type assets e.g. mechanical and electrical plant.

Best Practices for a Smooth Handover

To facilitate a smooth and problem-free asset handover, consider the following best practices throughout the project lifecycle:

- **Plan Early**: Incorporate handover requirements into project planning from the outset. This would cover things such as non-standard assets not currently recognised within the asset database being built. Flow of information during the process.
- **Communicate**: Maintain clear and consistent communication with all stakeholders.
- **Document Management**: Implement a robust system for collecting, storing, and managing project documentation, including asset data and as-built information, as the work progresses.
- **Use Checklists**: Utilise project handover checklists to ensure all required steps are followed and information is collected systematically.
- **Thorough Inspections**: Conduct comprehensive final inspections, walk-throughs, and tests before handover.
- **Provide Instructions**: Furnish the receiving party (DoWH maintenance teams or asset managers) with clear instructions on operating and maintaining the new or renewed assets.
- **Stay Updated**: Ensure compliance with the latest DoWH standards, guidelines, and any relevant local codes or regulations throughout the project. Obtain the latest versions of required forms and specifications from DoWH.

By following the requirements and principles outlined in this guide, parties involved in asset activities can contribute to an efficient and effective handover process, supporting the long-term management of infrastructure assets by the Department of Works & Highways.

The purpose and importance of fulfilling these Information Requirements:

- They are essential for the ongoing efficient and cost-effective management of assets by the receiving entity.
- Accurate information enables robust planning and decision-making for future asset maintenance and operations.
- Providing accurate details helps ensure the handover process goes smoothly and drastically lowers the risk of handover and ongoing issues and disputes.
- It is necessary to ensure compliance with legal and contractual obligations.
- For roading assets, this information often forms the basis for inputs that drive the optimisation process in asset management systems and provides data for designers selecting treatments.

Once assets are successfully handed over and the information is integrated into the asset management system, this data becomes fundamental for ongoing asset management processes. This includes updating the inventory, assessing condition, predicting performance, selecting appropriate treatments, developing and reviewing forward works programmes, managing risks, and planning maintenance activities.

Detailed Asset Handover Process

Asset Handover involves several key steps, primarily detailed in this article. The overall process is designed to ensure that the receiving entity PNG DoWH obtains all necessary information about new or modified assets for effective long-term management.

Here are the steps involved in the Asset Handover process, drawing upon the sources:

Preparation and Planning

- The handover should be planned early in the project lifecycle, not treated as an afterthought.
- A consistent and reliable procedure should be used, often codified in a checklist or template.
- The approach to asset transition, including defining quality standards and handover requirements, should be clearly defined, ideally in the contract.
- Early consultation with the receiving entity's asset management team is recommended, especially for complex projects like public transport assets.
- The project owner; Developer, Contractor, Consultant, is responsible for providing the required information.

Information Gathering and Preparation

This is a critical phase requiring the collection and organisation of various types of asset information.

- **Asset Attribute Data:** Collect data defining the characteristics of the asset, such as asset type, description, size (length, width, area), material, install date, and the activity type (new, renewal, etc.).
- For roading assets, this data is typically recorded on standardised Road Asset Data Templates, obtained from the receiving entity. Using specified pick-lists helps ensure data consistency.
- Attribute data is required for new, renewed (if substantial replacement), validated, and disposed assets. For disposal, information like asset ID, date of disposal, and reason is needed.
- **As-Built Plans and Drawings:** Prepare plans documenting the final constructed state of the assets. These must show all new assets and any existing assets that were changed, removed, or needed correction in the database.
- Include spatial information such as Northing/Easting coordinates (EPSG: 28355) , road chainage/displacement, and offset distances. For linear assets, polylines are used, and for polygon assets, polygons are used.
- Show typical cross sections for assets like pavements, bridges, footpaths, and walls, and longitudinal sections for carriageways.
- Separate plans might be needed for different asset classes if a single drawing would cause conflict or confusion.
- As-built plans must be certified by a Chartered Professional Engineer or Registered Surveyor.

  - **Supporting Documentation:** Gather all necessary certificates (occupancy, inspection, compliance, electrical), builder and manufacturer warranties, permits, the construction contract, final drawings, operation and maintenance manuals, asset owner manuals, and supplier documentation (like guarantees).
    - Survey Office or Deposited Plans are required when property boundaries are changed, such as for land acquisition.
    - Testing and commissioning data and defect management information are also important to prepare.
    - Compliance reports should be included.

Information Submission

- All asset information (attribute data, as-built plans, and required documentation) is typically required in digital format (e.g., DWG, DXF, MS Excel, PDF). A certified hardcopy of the as-built plan(s) is also needed.

- Submissions are usually made to the project manager or a specific team (e.g., Asset Quality Assurance Team, Asset Acceptance Team).

Review and Validation

- The receiving entity's relevant teams (e.g., Development Engineer, Project Engineer, Contract Engineer, QA Team, GIS Team, Asset Management Team) review the submitted information for accuracy, completeness, and compliance with standards.
- This review process takes time (e.g., typically 10 working days is set for review and response on submitted data). Setting a time on data review and validation response is crucial in ensuring the focus and resupply of data remains at the forefront of the process.
- A joint site inspection involving Project Engineer, QA Team, and Maintenance teams may be organised as part of the review and handover process.

Correction and Resubmission

- If errors or deficiencies are detected during the review, the information (as-built plans, attribute data, documentation) is returned to the originator (Contractor, Consultant, Developer) for correction and resubmission.
- Resubmissions must clearly indicate that they are amended versions.

Formal Acceptance and System Update

- Once the submitted information meets the required standards and is satisfactory to the receiving entity, it is formally accepted.
- The accepted asset data is then loaded into the asset management databases.

Certification of Practical Completion and Defect Period Responsibilities

Post-Handover Activities

- Any defects or safety issues identified during the handover process and inspections are addressed and completed.
- Updated asset information is provided to the maintenance teams who will then plan and organise future maintenance activities for the newly accepted assets.
- For clients/owners, instructions on how to operate and maintain the property/assets may be provided.

Programme Development for Road Asset Renewals and Replacements

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This article focuses on Programme Development for Road Asset Renewals and Replacements, including commentary on the AWM System, required inputs, data quality impacts, the process, and a data flow diagram.

Systems Use in Programme Development (Renewals & Replacements)

Programme development is a fundamental aspect of road asset management, focusing on identifying *what* work is needed, *where*, *when*, and *why*, to ensure the road network meets defined levels of service in a cost-effective manner. For renewals and replacements, this process is heavily reliant on robust data and analytical tools, with systems like the Asset and Work Manager (AWM), incorporating the former RAMM database capabilities, serving as the central repository for the data required to support programme development providing key decision support evidence.

Renewals and Replacement Programme Development - AWM System

The AWM system, building on the foundation of systems like RAMM, is designed to store, manage, and provide access to vast amounts of asset data. This data is the cornerstone of effective programme development for renewals and replacements.

- **Data Repository:** AWM acts as the principal repository for inventory and condition information for most roading networks. This includes details about assets like pavements, bridges, culverts, drainage structures, and others. Information stored includes asset type, location, size, material, installation/construction date, and historical maintenance activities. For renewals and replacements, having accurate records of when assets were constructed or last renewed is vital for estimating remaining life. As-built data, submitted after construction or significant renewal works, is fed back into the AWM inventory to keep it current.
- **Condition and Performance Tracking:** AWM stores current and historical data on asset condition and performance, such as roughness, rutting, cracking, and deflection for pavements, or specific condition ratings for bridges and drainage. This data is essential for identifying assets that are deteriorating and approaching the end of their useful life or falling below acceptable levels of service. For renewals, condition data directly informs deterioration models and highlights the *need* for intervention.
- **Integration with Decision Support Tools:** While AWM itself is primarily a database and information system, it provides the essential input data for dedicated decision support systems and tools used in programme development. Tools like the Treatment Selection Algorithm (TSA) or more advanced pavement deterioration modelling software such as dTIMS use AWM data to:
    - Predict future asset condition based on deterioration models.
    - Identify when assets are predicted to fail or fall below target levels of service.
    - Recommend appropriate treatments (including renewals and replacements) based on condition, traffic, and established criteria.
    - Optimise treatment timings and selection to achieve desired outcomes (levels of service) at the lowest whole-of-life cost, considering various factors like agency costs and user costs.
- **Supporting Financial Forecasting:** The treatment recommendations and timing outputs from decision support tools, based on AWM data, translate physical needs into financial requirements for maintenance, renewal, and improvement programmes over the long term (typically 10 to 20 years or more). AWM data can also inform asset valuations, which are useful for estimating long-term renewal needs, especially for asset

classes not covered by sophisticated modelling tools.

- **Output for Works Programmes:** The primary output of the asset management function, supported by AWM and associated tools, is the Forward Works Programme (FWP). This programme details specific maintenance and renewal treatments required for different sections of the network, including the reason for scheduling (e.g., cracking, skid resistance, structural capacity) and the expected design life. For renewals and replacements, this is where the planned projects are listed for implementation.
- **Monitoring and Review Inputs:** AWM stores data on implemented works. This historical data, along with subsequent condition/performance data collection, is crucial for monitoring the effectiveness of renewal and replacement treatments and validating deterioration models, feeding back into the continuous improvement cycle of asset management.

In essence, AWM is the foundational database that enables the analytical processes necessary to develop robust, evidence-based programmes for road asset renewals and replacements, moving from simply tracking assets to proactively managing their lifecycle.

Developing Renewals and Replacement Programmes

Effective programme development relies on a variety of data inputs. These can broadly be categorised based on their necessity for a functional process. Following sets out the required inputs grouped by the Essential data to Mature fully evolved data set to support programme and development in full.

Required Inputs (Essential for basic programme development):

- **Asset Inventory Data:** Knowing *what* assets you have and *where* they are is the absolute minimum requirement. This includes fundamental details like asset type, location (e.g., road name and chainage/displacement), material, and key dimensions (length, area, diameter). This data is stored and managed in AWM.
- **Basic Condition Data:** Having some form of condition assessment, even if it's basic visual ratings or simple metrics like the presence of potholes or severe cracking, is necessary to identify assets needing intervention. For renewals and replacements, this indicates current deterioration. Frequency of collection is important to establish trends in condition.
- **Basic Network Segmentation (Treatment Lengths):** This is the segmenting of the network into homogenous performing sections. A basic approach would use the current top surface data as starting point to break the network into manageable sections.
- **Traffic Data:** Understanding the traffic volume, particularly heavy vehicles, is crucial because traffic loading is a primary driver of pavement deterioration and influences the required structural capacity for renewals. Basic AADT and heavy vehicle percentage are key.
- **Defined Levels of Service (LoS):** Clear statements of expected asset performance and service quality are necessary to determine the *target* for maintenance and renewal activities and identify when an asset is failing to meet expectations.
- **Cost Data:** Knowing the unit costs for different maintenance and renewal treatments is required to estimate programme budgets and evaluate treatment options.
- **Simple Treatment Selection Model:** Simple treatment selection model can be developed and used where the input data is of basic nature and only require the defined inputs as noted above and defined the triggers limits i.e. Defined Level of Service. These sorts of models can be developed in spreadsheets.

Mature State (Continual Improvement State)

To enable significantly enhance programme development accuracy, optimisation, and strategic value the following is required. This is the continual improvement state.

- **Enhance Asset Inventory:** This is an improvement state which would require detailed asset data accurate build dates, last replaced, e.g. detailed pavement data would hold such things as subgrade strength, pavement layer depths, pavement design strength, surfacing history. This enhanced knowledge of the asset make and history coupled with the following information provides a comprehensive understanding of past and current state. Allowing a future state to be determined from sophisticated performance models.
- **Detailed Condition Performance Data:** More detailed quantitative measures provide a more precise understanding of asset condition and performance. Examples of these measures include:
    - International Roughness Index (IRI)
    - Rut depth
    - Pavement deflection
    - Surface/pavement cracking data
    - Skid resistance
    - Texture.

This enables more sophisticated deterioration modelling and refined treatment selection. This data is typical collected through advanced survey equipment such as high speed multi laser collection systems which profile the road surface. Or Falling Weight Deflectometre (FWD) enabling the inference of pavement strength.

- **Network Segmentation (Treatment Lengths):** This is the segmenting of the network into homogenous performing sections. As opposed to basic segmentation this would be a more comprehensive sectioning of the network based on the detailed condition data. Providing a more accurate segmentation set allowing programme analysis to more accurate and quantifiable.
- **Condition Trends:** This requires the collection of condition data over time to establish a condition trend. This is the corner stone of a mature programme development process. This allows future state assessment to use past condition and trends to more accurately predict future performance based on the current performance models used today.
- **Comprehensive Traffic Data:** More detailed data, such as equivalent standard axles (ESA) calculations or seasonal variations, improves the accuracy of pavement loading estimates and deterioration predictions.
- **Historical Maintenance and Renewal Data:** Records of past works provide insights into asset performance trends, effectiveness of previous treatments, and calibration data for deterioration models. This is recorded in AWM.
- **Risk Assessment Data:** Information on identified risks (e.g., related to safety, network accessibility, environmental impact) associated with asset deterioration or failure allows for risk-based prioritisation of renewal projects.
- **Economic Data (User Costs/Benefits):** Data on vehicle operating costs, travel time, and accident costs enables formal economic evaluations (LCC, NPV, BCR, CBA) to demonstrate the value for money of renewal investments and optimise programs from a broader societal perspective.
- **Environmental Data:** Detailed data on subgrade conditions (e.g., CBR), drainage effectiveness, and climatic factors (e.g., moisture, temperature, frost) are critical inputs for pavement design, deterioration modelling, and selecting appropriate renewal treatments.
- **Advanced Treatment Selection Model:** Where the data and approach are in a mature state the need for a more advanced treatment selection to analyse and use all the available data becomes more relevant. These models are specifically designed software. Providing more complex analysis approaches and outcomes, for Example dTIMS or HDM4. These analysis software packages will tend to have the capability to undertake scenario testing, treatment optimisation amongst other modelling capabilities.
- **Continual Improvement:** This is a core part of the Mature programme development state. Continual data/systems and process improvement review ensures that opportunities for improvement and enhanced accuracy are not missed. These sorts of reviews should consider all aspects of the process such as advancement in technologies and approaches.

Examples of Excellent data versus Poor Data Quality

The quality of the data held in AWM directly impacts the reliability and effectiveness of programme development.

- **Excellent Data Quality Scenario:**
    - **Situation:** A high-traffic urban arterial road network segment with continuous, reliable traffic counting (including classification for heavy vehicles), recent high-speed data surveys capturing detailed roughness, rutting, texture, and skid resistance data, annual visual condition surveys, and accurate as-built records in AWM.
    - **Impact on Programme Development:** This allows for the use of sophisticated pavement deterioration models (e.g., dTIMS) that can accurately predict future condition based on traffic loading and observed performance trends. Treatment selection tools can precisely identify the optimal timing and type of renewal or rehabilitation (e.g., thin asphalt overlay, structural overlay) to maximise asset life and minimise lifecycle costs. Economic evaluations (LCC, NPV, BCR) are robust and clearly demonstrate the value for money of proposed interventions. The Forward Works Programme for this section is highly reliable, allowing for accurate efficient long-term financial planning and resource allocation.
- **Poor Data Quality Scenario:**
    - **Situation:** A low-volume rural unsealed road network segment with limited, infrequent traffic counts (possibly just ADT estimates), condition assessed only through irregular visual inspections, and incomplete historical maintenance records in AWM. The inventory data might be incomplete or inaccurate regarding material types or construction dates.
    - **Impact on Programme Development:** Deterioration models are less reliable or may not be applicable, making it difficult to predict when assets will require renewal (e.g., regravelling or resheeting). Programme development might rely heavily on expert judgement, simplified triggers (e.g., fixed regravelling cycles or response to public complaints), or reactive maintenance. Economic evaluations are based on broad assumptions, reducing confidence in the results. Forecasting long-term financial needs is less precise, potentially leading to budget shortfalls or overspending. For unsealed roads specifically, frameworks less reliant on condition data, using material properties and historical records, become more relevant in such scenarios.

The Programme Development Process

Developing programmes for renewals and replacements within the asset management framework, utilising systems like AWM, follows a systematic process. This process is iterative and cyclical, feeding into the overall asset management cycle.

1. **Define Strategic Context and Objectives:** Review and align with higher-level plans such as the Long Term Plan (LTP), Regional Land Transport Plan (RLTP), and Government Policy Statement (GPS). Establish strategic objectives and define desired outcomes for the transport network.

2. **Define/Review Levels of Service (LoS):** Clearly articulate the desired Customer and Technical Levels of Service that the assets are intended to provide. Ensure these are understood and agreed upon by stakeholders. These LoS provide the performance targets for the network.

3. **Collect and Manage Data:** Continuously collect, validate, and update asset data in AWM, including inventory, condition, performance, traffic, maintenance history, and cost information. Ensure data accuracy and consistency.

4. **Analyse Needs and Performance Gaps:** Analyse the current and predicted future performance of assets against the defined Levels of Service. Utilise AWM data and potentially integrated tools to perform gap analysis.

5. **Predict Future Performance and Deterioration:** Apply deterioration models (simple or sophisticated depending on data availability and asset type) to forecast asset condition over the planning horizon (e.g., 10-20 years).

6. **Identify and Evaluate Treatment Options:** Identify a range of potential treatment options (including maintenance, renewal, rehabilitation, or replacement) that could address the identified needs and restore/maintain LoS. Evaluate these options based on their effectiveness, impact on future condition, costs (agency and user), risks, and fit with strategic objectives.

7. **Optimise Programme:** Use decision support tools and/or engineering judgement to select the optimal set of treatments, considering resource constraints (budgets), risk appetite, and desired LoS. This involves trade-off analysis between cost, risk, and service levels.

8. **Develop the Forward Works Programme (FWP):** Compile the selected treatments, specifying location, type of work, timing, objectives, and estimated cost for the planning period. Renewals and replacements are key components of this programme.

9. **Prioritise and Finalise Programme:** Further refine and prioritise the programme within expected funding constraints. This results in the proposed programme for budgeting and approval.

10. **Seek Approval:** Submit the proposed programme as part of the AMP and LTP process for formal adoption by the governing body.

11. **Implementation:** Extract the Current Work Programme from the FWP and undertake the construction/delivery of the planned renewal and replacement projects.

12. **Monitor, Audit, and Review:** Monitor the progress and outcomes of implemented works. Audit the implementation process. Review the effectiveness of the overall programme development process and the accuracy of predictions. Feed lessons learned and updated data back into step 3 and step 1 for continuous improvement.

Life Cycle Context and Process flow Diagram

Below is a representation of a typical infrastructure life cycle management process and its relationship to asset data. Asset Data reside at the core of this process. Providing context of the importance of the asset data on programme development as it relates to an asset management system like AWM.

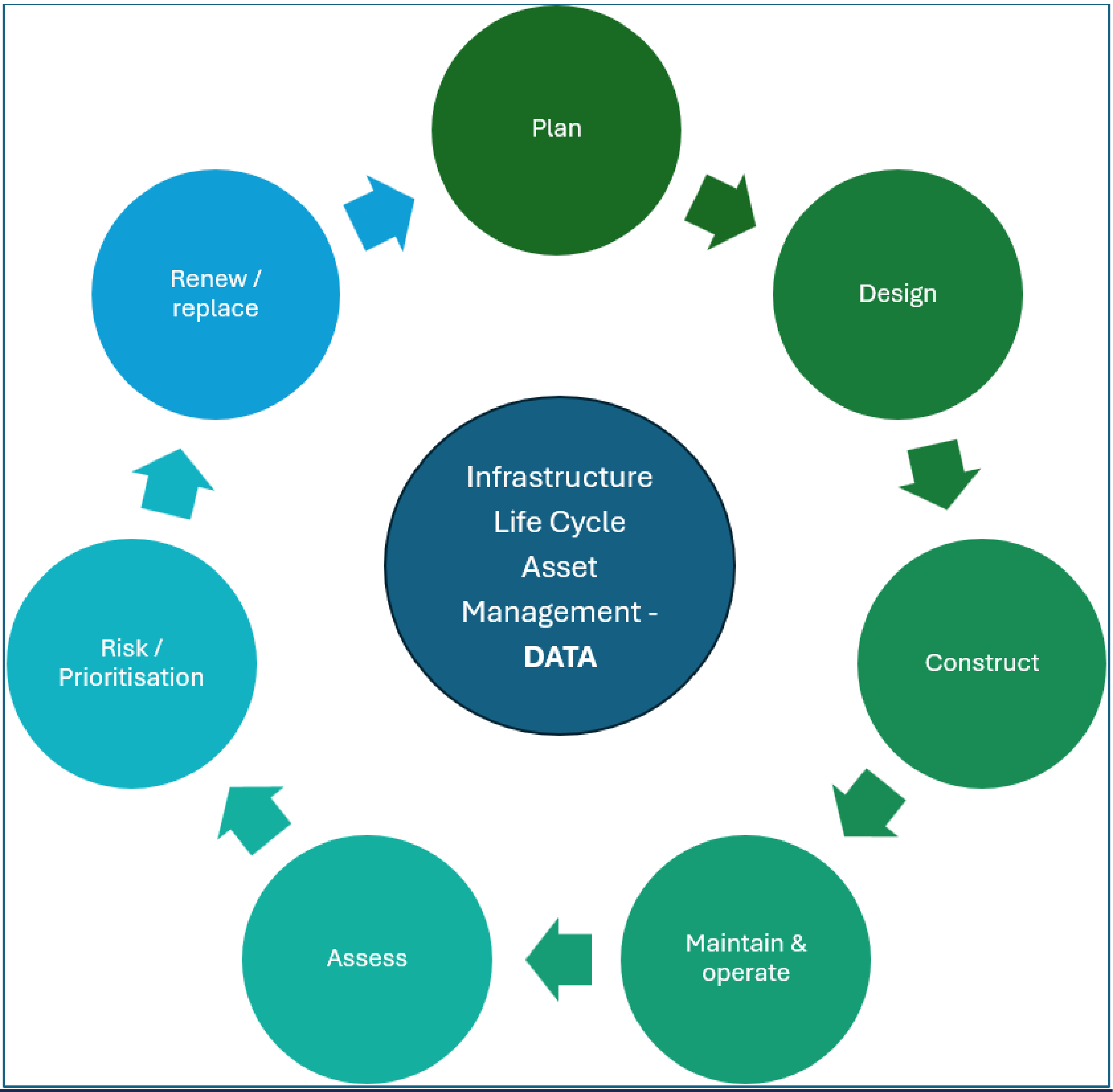

Figure 1: Typical Infrastructure Life Cycle Overview

Figure 2 illustrates a linear representation of the programme development. However, note that there is cyclic process within the linear process that show various inputs feed into other outputs and need to be reassessed. With AWM system being core aspect, which in turn supports analytical tools to generate needs and forecasts.

These outputs are then processed into the final works programmes, which are implemented, monitored, and reviewed, creating a continuous feedback loop that drives improvement in asset management practices and data quality over time.

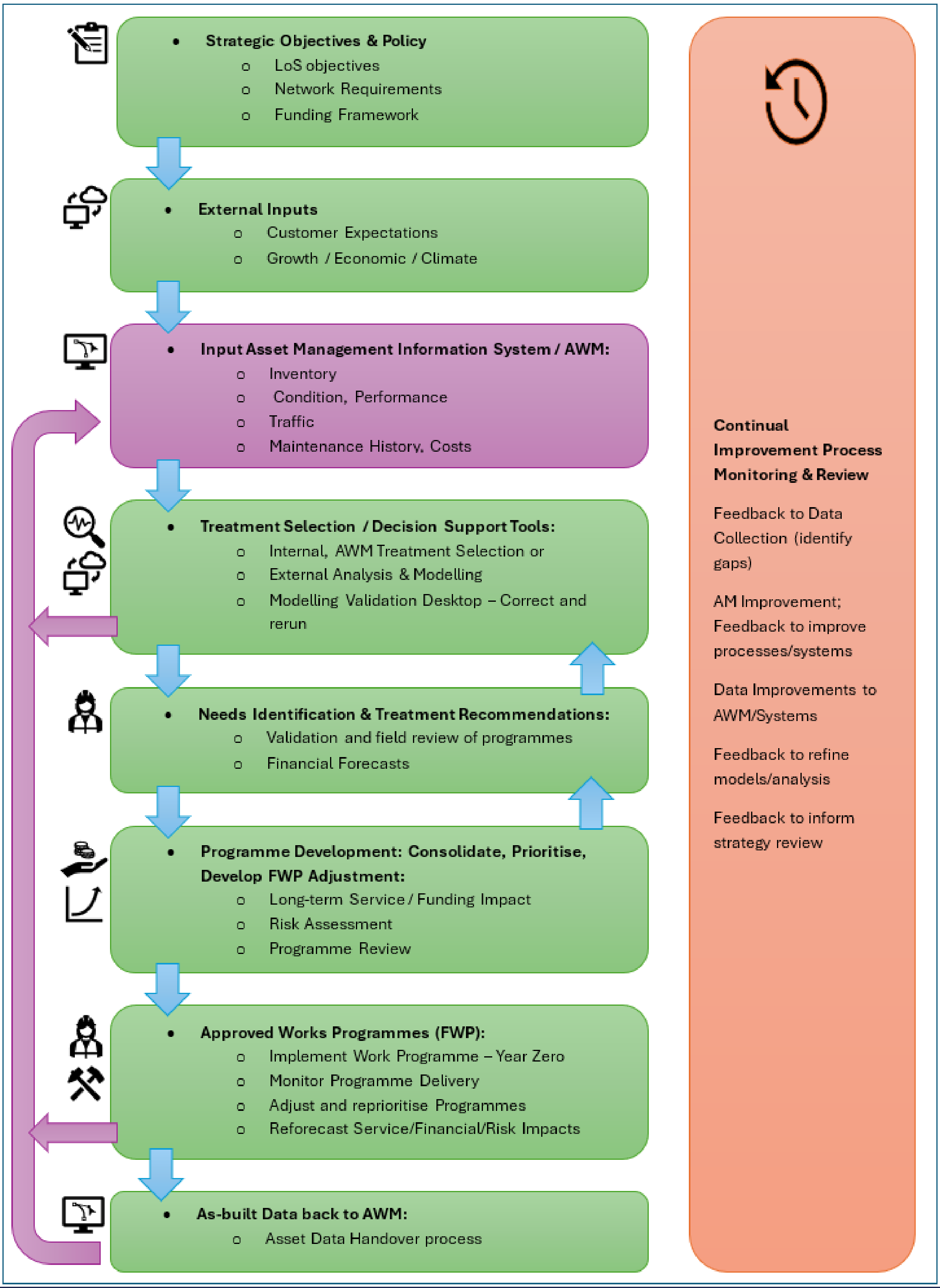

Figure 2: Programme Development Overview

Bridge Inspections - Collection Process

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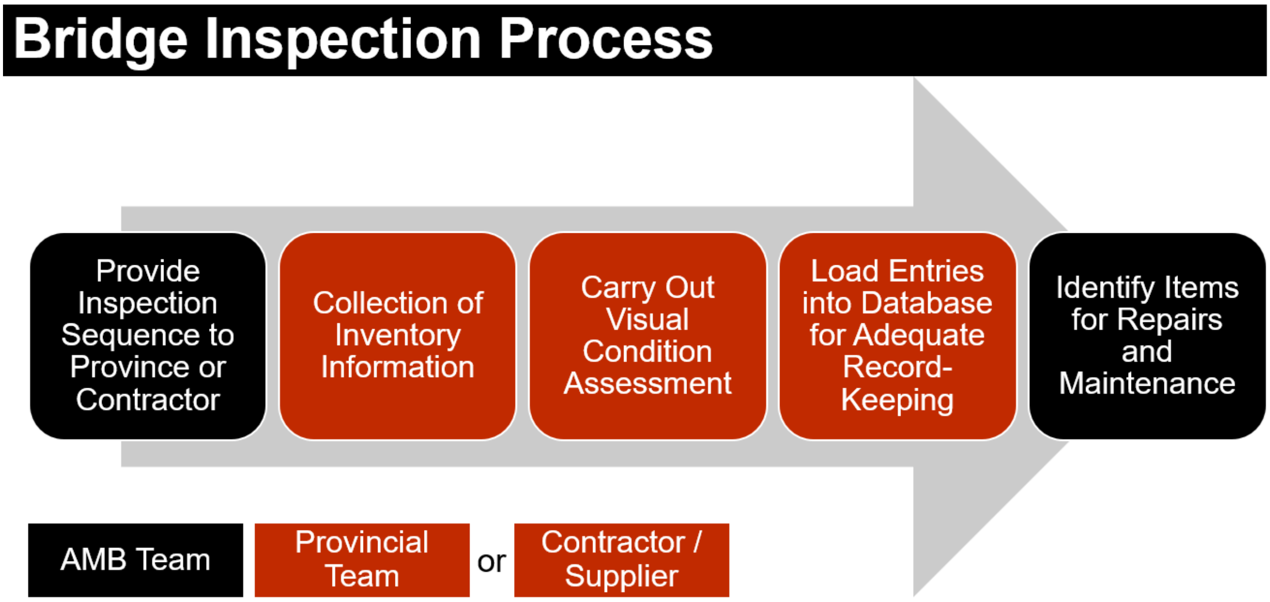

Bridge Inspections - Specification

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Article Purpose	To provide specification on a safe and standard method for collecting bridge condition data using Open Data Kit (ODK) data collection systems.
Intended Users	Anyone who is responsible for setting up or carrying out a bridge condition assessment whether it be provincial staff, AMB staff or contracted suppliers.
Last Reviewed	11th November 2024

Background

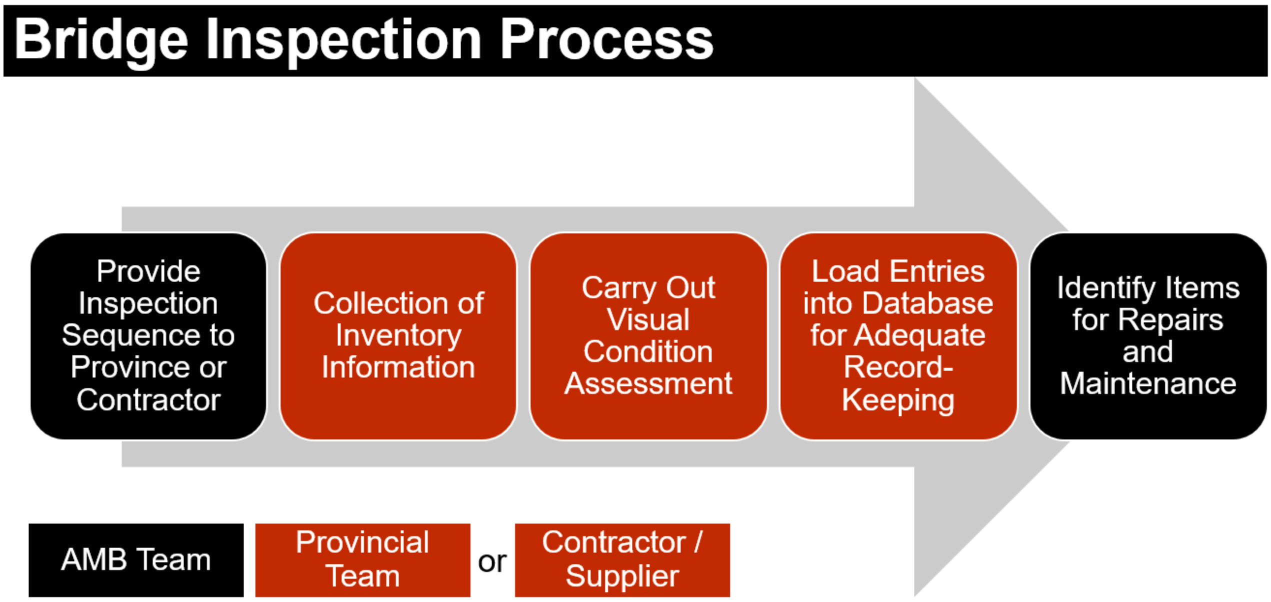
Bridges are primarily designed to carry traffic across obstacles. To fulfill this function, they must withstand various loads, including the weight of the structure, traffic, wind, scour, temperature changes, and other environmental factors. Since bridges need to be durable and some deterioration is inevitable, they must remain serviceable throughout their lifespan. This means that any deformation, cracking, or damage must stay within acceptable limits to make sure safety standards are maintained.

DoWH intends to maintain up to date data on the condition of their bridges which are to be uploaded to ThinkProject, Asset & Works Management "**AWM**" (formally known as "RAMM" Road Asset Maintenance and Management), which forms the core of the DoWH Road Management System. DoWH relies on the availability of inventory and condition data of every structure to provide reference data, to track the deterioration and to enable the overall management. Therefore, bridges need to be regularly inspected and assessed, to make sure appropriate maintenance is carried out.

Scope of Work

The purpose of the bridge inspection process is to collect required data for network level planning of the preservation and additionally assure the quality of data is sufficient.

The following high-level process provides broader context of the activities involved in the bridge inspection process.



Requirements & Methodology

Step 1: Planning the Inspection

To ensure an orderly, systematic, and efficient inspection, planning the inspection includes determining the sequence of the inspection according to type of inspection, selecting the inspection team, and determining the required activities. This includes:

- Establishing a time schedule for a day, week, or a month.
- Organise the field notes to be used and collating the survey forms required.
- Organise a safety boat when inspecting a river bridge.
- Any other measures to facilitate a thorough and complete inspection.

Step 2: Preparing for the Inspection

This includes organising the proper tools and equipment, reviewing the current Bridge Structure Files (if they exist), locating plans for the structure and preparing the inspection forms. Ideally the Bridge Inspection team should consist of the following personnel:

- Bridge inspector
- Project Engineer/Senior works supervisor
- Armed guard when inspecting crocodile infested rivers.
- Security personnel (where needed)

Suggested Equipment

Bridge inspections can be hazardous for both the inspection team and other road users as the vehicles and the inspectors must stop for the work while there is a lot of movement across the bridge. The inspectors must wear safety vests and vehicles must use special lights. Additionally, caution is necessary when moving under the bridge, on the slopes and in the water. For safety, the inspections must be carried out with at least two team members, both of whom should wear helmets when under the bridge and rubber boots when moving in the water. To keep inspections safe, efficient, and productive, the following equipment is suggested:

- Tripltek tablet
- 50m tape

- Ruler or 5m distance measure tape for taking small measurements and describing the size on photos.
- Binoculars
- Small hammer for delamination detection
- Crack gauge (simple card with different lines with thicknesses starting from 0.1 mm to 2 mm) for concrete damage inspection
- First Aid Kit
- Low rubber boots for moving in low flow rate water
- Brushes
- Bush knife
- Car charger or regular charger with inverter for Tripltek tablet
- Extra batteries for **ALL** equipment
- Ladder*
- Screwdriver for rust and timber testing*
- Hand torch or head light for darker places*
- Laser distance measurer to measure different parameters like length, width etc. Preferably with laser pointer display and for accurate measurement, it should have a tripod*

*Optional equipment

In addition to inspection equipment, a 4-wheel drive vehicle in good condition is required and overall safety equipment like safety vests, traffic cones, gumboots, protective glasses etc. need to be provided for the health and safety of the Bridge Inspectors.

Step 3: Collection of Inventory Information

Before carrying out the bridge condition assessment, it is important to have the correct bridge inventory information. This may have been collected during the inspections that are carried out after construction or reconstruction of a bridge, but if not, it can also be done in the office directly before condition assessment. The main idea of the collection of the inventory information is to prepare the background database for the maintenance and rehabilitation planning. The inventory information contains information on location, bridge geometry, general data, bridge elements, span information, and outer elements. **Without correct inventory information it is not possible to carry out the condition assessment (Step 4)**.

Additional information on the process for collecting bridge inventory information can be found here: Collection of Inventory Information - Work Instruction.

Step 4: Performing the Inspection

After obtaining the correct inventory information, the bridge condition inspection can take place.

The main purpose of these inspections can be summarised as:

- To assess the maintenance needs and strategy
- To assess the safety of users and to decide if a structural assessment is needed.
- To reduce the risk of unexpected failure
- To comply with regulations
- To assess the condition of a bridge element
- To decide if a more detailed inspection is needed

These visual condition assessments have a simple routine and will provide an initial indication of the condition of the structure to determine maintenance actions to be taken or if subsequent testing is required.

The assessment of a bridge condition involves inspecting every element unit of the bridge and evaluating each with a condition rating based on a scale of damage present and considering the necessary rehabilitation method. The overall condition is evaluated in 4 different categories shown below.

> It should be noted that the overall condition rating of the bridge (Bridge Condition Index or BCI), can have a misleading impact because different states of element deterioration can possess equal condition ratings overall. For this reason, additional smart flags and deterioration process assessment is necessary.

Condition State	Description	Possible Action
0 - Good	The element has no remarkable defects or wearing marks. The overall appearance is as good as new and only small damages can be seen such as bleaching.	Maintenance
1 - Fair	The element has minor superficial damages. Wearing and deterioration processes have occurred. The overall appearance is clean and small deviation of deterioration processes are allowed. Minor repair works are needed.	Small Repair
2 - Poor	The element has defects, like corrosion, but the severity of the damages do not affect functional requirements. The overall appearance gives a clear indication that deterioration processes are damaging the element. Repair is needed.	Repair
3 - Severe	The element has defects that could affect the overall or element performance.	Replacement

The overall rating is based on the American Association of State Highway and Transportation Officials (AASHTO) element level health index rating, where condition states are evaluated as a percentage of the overall amount.

> Condition assessment is the main information-collecting activity for maintenance planning of a structure and bridge network. Since the condition assessment is carried out visually, it means that it is highly based on the inspector's level of knowledge damages and deterioration processes. Therefore, it is recommended that staff rotation is avoided, and bridges should be inspected by the same people. Further explanation of deterioration processes is provided in Annex B.

Identification of Elements

Current bridge evaluation practice divides the bridge structure into constitutive components that can be commonly clustered into functional groups: **superstructure**, **substructure**, and **equipment** or can be used in establishing the structures orientation.

Primary Function

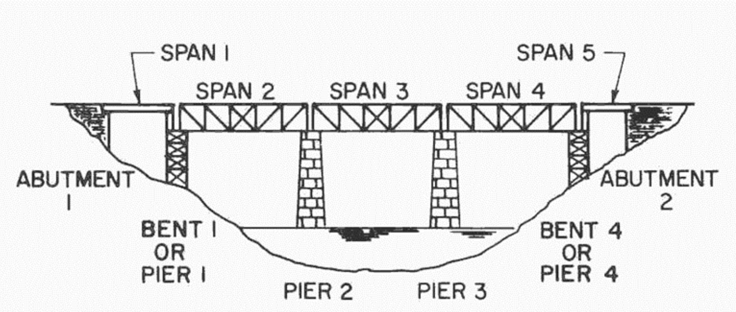
The elements that are subject to bending due to traffic load are in the '**superstructure' group**, while in the '**substructure' group** are elements mainly subjected to compression. The additional elements in the **'equipment' group** provide protection either to the structure or the users. Also, those elements may provide comfort to the users. The list of bridge elements mainly depends on the bridge structure type and should be defined in the bridge inventory list. The element groups can be seen below. If one needs further explanation, then Annex A provides terminology and explanation.

Group	Elements	Primary Function
Superstructure	Deck Slab	Load bearing
	Main girder	Load bearing
	Crossbeam/diaphragm	Load bearing
	Construction joints/Hinges	Load bearing
Substructure	Abutments incl. Wing Walls	Load bearing
	Piers	Load bearing
	Foundations	Load bearing
Equipment	Bearings	Articulation/Load bearing
	Expansion Joints	Articulation
	Drainage	Protection
	Run-on-slab	Comfort
	Waterproofing	Protection
	Pavement/Overlay	Protection and comfort
	Barrier and Windscreens	Protection and comfort
	Signs	Protection and comfort
	Installations	Comfort

This kind of segmentation is helpful when giving performance predictions for deteriorating bridge elements. This can be done after at least two inspection rounds using historical data, e.g., using the BCI. Given that the element is considered to fail when it reaches its worst condition or another performance goal, then the survival is defined as a condition where the performance goal is not violated.

Location Identification

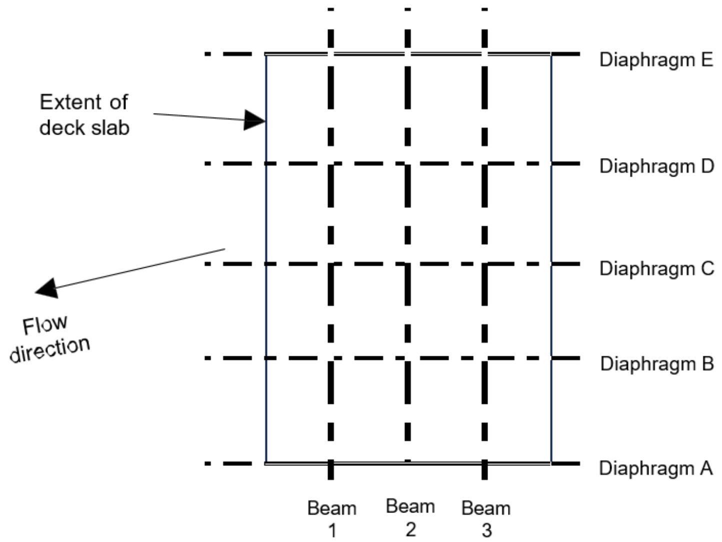
An important activity in establishing the structure's orientation, as well as a system for identifying the various components and elements of the bridge is the identification of the right elements. The identification system used during the inspection should be always the same. The bridge orientation must be determined based on the watercourse flow direction with the upstream aspect to the right of the bridge so that the watercourse flows right to left below the bridge.



Bridge element numbering sequence

The superstructure element numbering system should include the spans, the main beams, the secondary elements (diaphragms, transoms, etc) and, in the case of a truss, the panel points. The spans should be numbered consecutively, with Span 1 located at the beginning of the bridge. Multiple beams should be numbered consecutively from left to right facing in the route direction (refer Figure 2, page 9).

The crossbeams should be denoted consecutively from the beginning of the bridge with a letter, with the first crossbeam (the near abutment diaphragm) labelled as A, leading to the far abutment diaphragm.



Example of one span/3 beam bridge element numbering system

For trusses, the panel numbers should be numbered similarly to the beams, beginning with Panel Point 1. Label both the left and right trusses. Points in the same vertical line have the same number.

Open Data Kit (ODK) Data Collection System for Tripltek Tablet

The ODK data collection format has been set up for the logical process of inspecting the bridge approaches and deck; the superstructure; the substructure and finally the watercourse/features below the bridge. The set-up is as follows:

Page	Set-up
1-3	General data on bridge with salient features
4	Roadway approaching the bridge and deck surfacing elements
5	Span information* – Number of spans • Span 1: length of span, expansion joint data, abutment and wing walls data (2 for single span bridge), deck type and main member types. • Span 2 to (N-1): length of span, expansion joint data, pier data, deck type and main member types. • Span N: length of span, expansion joint data, abutment and wing walls data, deck type and main member types.
6	Roadway departing the bridge
7	Other pertinent details – waterway features, etc.

*All data input for Span 1 follows through to the last span so only those unique features (such as span length, pier height) need to be amended for each span.

Then starts the serious condition assessment with a loop feature for each category of functional group; as follows (note that the loop can continue until all serious defects on the individual elements (or groups, if common defects found)) have been identified and recorded:

- Bridge Element Condition Assessment > 1 (and 2) assesses the condition of the features on the approach, bridge deck and departing road sections.
- Waterway Condition Assessment > 1 (and 2 to N linked to Span Number) assess the condition of the waterway elements below the bridge.
- Superstructure Condition Assessment > 1 (to N with minimum for single condition reference per span).
- Substructure Condition Assessment > 1 (to N with minimum for single condition reference per span).

In order to avoid confusion as to whether an element or group feature has been inspected and found to be in good condition throughout, one Condition Assessment must be completed with 100 inserted into the '0(%) – as new' state **per span** if no defects are found.

For a particular span, a group of elements can be recorded and their condition state noted in a "group" Smart Flag when the condition state is found on all the elements; with any more serious condition state (defect) recorded in a separate Smart Flag for an individual element.

> For example, if all the steel deck beams in a span are in a similar state of defective corrosion this can be recorded in a Smart Flag with the comment "Refers to all beams – light corrosion of the steel beams" with a separate Smart Flag for the outer beam where a more serious corrosion state exists below a defective deck drain. A further Smart Flag needs to be raised for the deck drain repair.

Bridge Element Condition Assessment

To give full flexibility to the Inspector for the input of condition data the Condition Assessments have been set up in a "loop" so that as many Condition Assessments as required to fully describe the condition of the Elements and the defects found on them can be used.

Element	Span No.	Location	Unit	Length	Height	Condition State			
						0	1	2	3
Note 1	Note 2	Note 3				Note 4	Note 4	Note 4	Note 4

Note 1: All Elements described in tables in the Collection of Inventory Information - Work Instruction article.

Note 2: Each Span must be given a Condition Assessment with defects described separately. If there are no defects and the span is in good condition 100% must be inserted in Condition State 0.

Note 3: Location is given above (Bridge element numbering system). Sections of Main Beam can be given as 1A to 1B and likewise sections of secondary elements can be given as B2 to B3.

Note 4: Condition State MUST add up to 100%.

Particular Defect "Smart Flags" and Photographs:

How many Smart Flags	(insert number)	
Smart Flag #	Safety	Comment on Smart Flag
	Failure	

A "safety" Smart Flag **must** be used if, in the opinion of the Inspector, a defect impacts the integrity of the structure to such a degree that the safety of the public or structure are jeopardised.

Sequence of Condition Assessment

The sequence for a bridge of an average length and complexity is as follows:

1. Inspect roadway and deck elements
2. Inspect superstructure elements and bearings
3. Inspect substructure elements

4. Inspect riverbed and slopes

After or during the inspection, the **Bridge Inspector must take at least one photo of every element group.**

1. Roadway and Deck Elements

The inspector should check:

- The pavement for unevenness, settlement, or roughness (shown below).
- Shoulders, slopes, drainage, and the approach guardrail.
- The deck and sidewalks for various defects, noting the size, extent, severity, and location of each element. The location should be referenced using the span number or side.
- The expansion joints for sufficient clearance and for an adequate seal.
- The safety features, including barriers and handrails (shown below), signs and lighting are present and identify their condition.

Condition states of pavement			
Condition State 0	Roadway is smooth, no rutting and only small roughness.		
Condition State 1	Roadway has small, visible rutting, longitudinal unevenness that can be fixed with local repair.		
Condition State 2	Roadway has ruts, cracking and small holes. People need to pay attention when crossing, but no safety issues. Needs resurfacing.		
Condition State 3	Hollow ruts and holes. Safety of a road user is affected and whole pavement needs replacement.		

Condition states of barriers and handrails

Condition states of barriers and handrails			
Condition State 0	The elements have no remarkable defects or wearing marks. The overall appearance is as good as new.		
Condition State 1	The elements have minor superficial damages and deformations. Wearing and deterioration processes have occurred. The overall appearance is clean, but pitting corrosion can occur.		
Condition State 2	The elements have defects, like pitting corrosion, but the severity of the damages does not affect functional requirements.		
Condition State 3	The element has defects that affects the safety of users.		

2. Superstructure Elements

The superstructure must be inspected thoroughly since the failure of a main supporting member could result in the collapse of the bridge. The most common forms of main supporting members are:

- Girders
- Floor Beams and Stringers
- Slabs
- Trusses
- Eye bar Chains
- Arch Ribs
- Frames
- Bearings must be inspected thoroughly since they provide a critical link between superstructure and the substructure. For instance, one will need to record the difference between a rocker tilt and a fixed reference line, noting the direction of the tilt in the case of a rocker bearing. For an elastomeric bearing, for instance, any loss of section or major wear should be noted as a deterioration in condition.
- Utilities (pipes, ducts, etc.)
- Anchorages

Condition states of concrete superstructure elements			
Condition State 0	The concrete elements have no remarkable defects or wearing marks. The overall appearance is as good as new.		
Condition State 1	The elements have minor superficial damages, like honeycombing and hairline cracks. Wearing and deterioration processes have occurred.		
Condition State 2	The elements have defects, like corrosion, but the severity of the damages does not affect functional requirements.		
Condition State 3	The elements have severe defects, like peeling and heavy corrosion, the damages do affect functional requirements.		

Condition states of steel superstructure elements			
Condition State 0	The steel elements have no remarkable defects or wearing marks. The overall appearance is as good as new.		
Condition State 1	The elements have minor superficial damages, like deformation or painting defects. Wear has occurred.		

Condition states of steel superstructure elements			
Condition State 2	The elements have defects, like pitting corrosion, but the severity of the damages does not affect functional requirements.		
Condition State 3	The elements have severe pitting corrosion, that does affect functional requirements.		

3. Substructure Elements

The substructure supports the superstructure and is made up of abutments, piers and bents, footings, and piles. If the "as-built" plans are available, the field-measured dimensions of the substructure units should be compared to those presented on the plans. Since the primary method of bridge inspection is visual, all dirt, leaves, animal waste, and debris should be at least partially removed to allow close observation and evaluation. Substructure units should be checked for:

- Settlement by sighting along the superstructure and plumbing vertical faces.
- In conjunction with scouring inspection of the waterway, the substructure unit should be checked for undermining, noting both its extent and location.

Condition states of abutments			
Condition State 0	Elements have no remarkable defects, settlements or scouring. The overall appearance is as good as new.		
Condition State 1	Elements have small visible defects, settlements or scouring. The overall appearance is as good, but small repairs are needed.		
Condition State 2	Elements have remarkable defects, settlements or scouring. The overall appearance is satisfactory and elements function as intended, but repairs are needed.		

Condition states of abutments			
Condition State 3	Elements have critical defects, settlements or scouring. The elements may not function as intended and replacement is needed.		

4. Channel and Waterway Elements

Waterways are dynamic in nature, with their volume of flow and their path continually changing. Thus, the bridges passing over them must be inspected for the effects of these changes:

- Maintain a record of the channel flow profile and alignment, noting any meandering of the channel both upstream and downstream.
- Report any skew or improper location of the piers or abutments, that can be related to scour.

Smart Flags

The use of a "safety" Smart Flag **must** be used if, in the opinion of the Inspector, a defect impacts the integrity of the structure to such a degree that the safety of the public or structure are jeopardised. The addition of a smart flag and deterioration process assessment to the main damages of the bridge, is necessary to give in-depth view and evaluate bridge reliability and safety. Safety is defined as user safety, and the outcome (failure mode) is always an accident. The evaluation method of reliability is connected to failure modes in vulnerable zones of a structures and quantitative modelling of bridge damage processes.

By accurately identifying defects, potential failures can be predicted. As a Bridge Inspector, it is crucial to flag these defects with relevant comments, highlighting elements that require urgent attention or further structural assessment.

Observing a defect on a bridge often indicates active damage processes. Analyzing these processes and their relationship to the observed defects helps identify the root causes. Understanding damage processes is essential for predicting performance, planning preventive maintenance, and considering potential rehabilitation. Reliable information on these processes allows for optimised inspection and maintenance strategies, aligned with the exposure classes defined during the design phase.

Vulnerable Zones

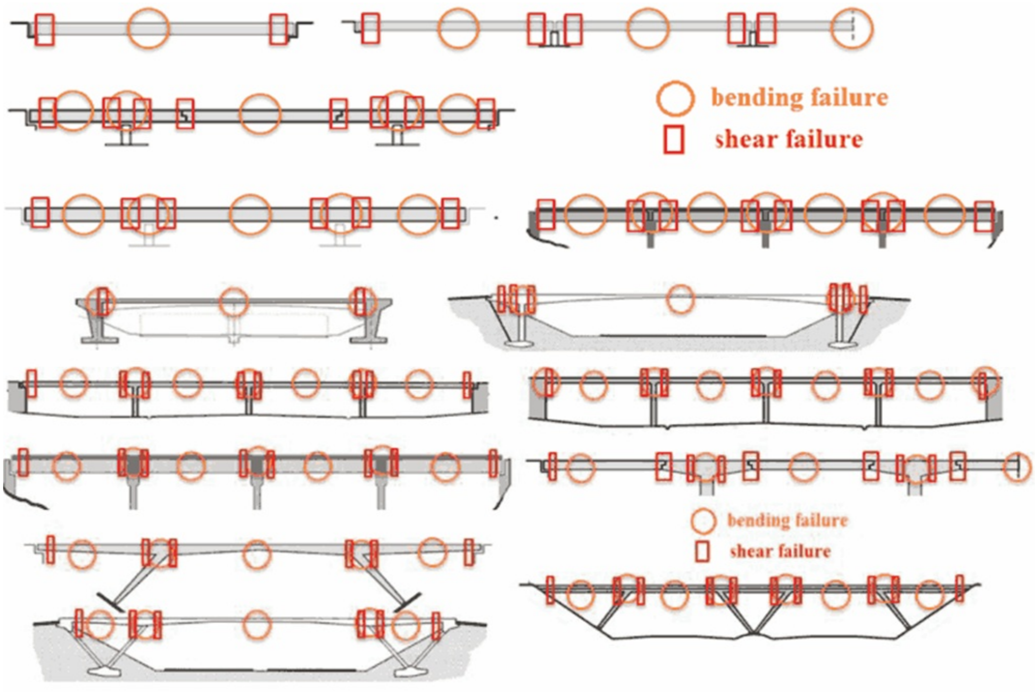
To assess deterioration processes, the evaluation should be tailored to the type of damage, its cause, and the material of the affected structural element. Most damages can be linked to specific defects or observations. However, some damages are merely symptoms and do not impact the structure's reliability.

Nearly all deterioration processes related to concrete structures can affect any part of a concrete bridge. However, it is important to note that not all parts of the bridge are equally critical in terms of consequences. For example, load-bearing elements have regions that are particularly vulnerable and require special attention, which will be discussed further.

The proposed segmentation of the superstructure in the longitudinal direction (partitioning of an element into regions with different vulnerability) is based on the Concrete Details Vulnerability Manual, and the Long-Term Bridge Performance Program Protocols, Version 1:

- High moment regions
- Sagging (label HMS region)
- Hogging (label HMH region)

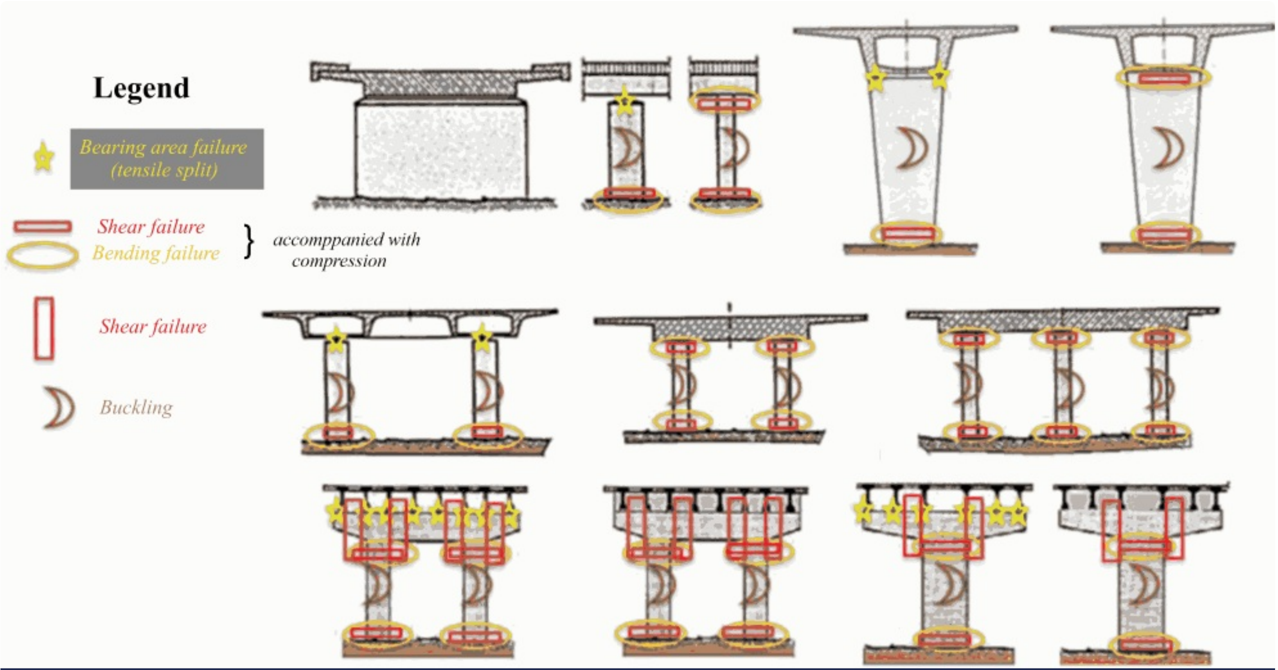
- High shear regions (label HS region)
- Construction joint (rigid type) (label CJ region)
- Shear key (label SK region)
- Hinges (label HG region)
- Anchorage zones (label AN region)



Vulnerable zones for different types of girder and frame bridges

Conceptual weaknesses may also be associated with some of the above-mentioned vulnerable zones. One such example is poor shear capacity in high shear regions in old concrete bridges. This conceptual weakness is due to limited understanding of the shear phenomena given in old design codes.

Furthermore, it should be noted that elements of substructure support the superstructure, implying that their failure might lead to a total collapse. In general, a substructure might fail in crushing or buckling failure mode. In addition, bearing areas are exposed to splitting forces. Pier caps (if they exist) are generally exposed to high shear stresses making them particularly vulnerable. Elements of substructures are mainly exposed to sudden events e.g., impact, scour and earthquake. Typical locations of vulnerable zones related to piers are presented below along with their relationship to an anticipated failure mode.



Vulnerable zones related to substructure

In addition to load beading function there is the elements that gives protection of comfort, these elements are related to nearly all bridge types. It should be noted that malfunction of these elements might jeopardize the load-bearing elements of the bridge (durability issues) and/or impose severe consequences themselves. The level of service generally depends on the adequate function of these elements (traffic safety issues). Below, vulnerable areas are listed as checklists that may be used during inspection.

- Bearings
  - Sufficient ability to allow movement, considering the temperature of the superstructure.
  - Correct position of the bearings themselves and parts of the bearing relative to each other.
  - Uncontrolled movement of the bearing, as predicted by Movement Indicator provided in slide-guide and Free Bearing (Pot & Spherical).
  - Fracture, cracks, and deformations of parts of the bearings.
  - Cracks in the bedding or in adjacent parts of sub- and superstructure.
  - The condition of the anchorage.
  - The condition of sliding or rolling surfaces.
  - The condition of the anticorrosive protection against dust, and of the sealings.
- Concrete hinges
  - Developed more than 100 years ago and if correctly executed they perform very well throughout the world. Concrete hinges are characterised by high load- carrying capacity and a moderate rotational capacity. Concrete cracking in the throat of the Freyssinet (un-reinforced) hinge and risk of impact shear loading in the Mesnager (reinforced) hinge are important considerations when assessing or predicting concrete hinge performance.
- Expansion Joints
  - Damage to the anticorrosive protection.
  - Cracks due to fatigue in steel members.
  - Damage to seals.
  - Workability of the linkage (proper function).
  - Obstruction or damage of the drainage system
- Drainage
  - as a sub-component of the equipment category, comprises of permanently installed drains and the associated piping systems. The inspection should verify proper deck slopes and proper functioning of kerb channels, drainage inlets, pipes and outlets, and possible drain holes for drainage of voids. Blockage

of drainage may create a serious traffic hazard as well as result in severe deterioration.

- Waterproofing is usually not visible, i.e., the condition has to be assessed from possible consequential damage on the neighbouring components such as:
    - Leaking decks/wet spots beneath superstructure
    - Finding of protective concrete wash out
    - Swelling of the pavement
    - Cracking of the pavement
- Pavement/Overlay
    - Cracks, unevenness, holes, and swelling
    - Rutting
    - Lack of friction
    - Joint failure
    - Improper drainage
- Barriers, windscreens, and signs
    - Damages from impact
    - The condition of the anticorrosive protection
    - Missing or loose bolts
    - The condition of the anchorage
    - The condition of the concrete
    - Visual appearance (readability, reflection, lighting etc.)
- Installations typically comprise of lighting (typically light poles), electro-mechanical dehumidification systems (primarily on signature bridges), Structural Health Monitoring Systems (primarily on signature bridges), hydraulic opening arrangement, and possible utility lines fixed/fastened on the bridge. Their vulnerability shall be evaluated case by case.

Hidden Defects

Sudden weight restrictions and emergency closures on roadway bridges are often because of hidden defects. These defects that are hidden from sight (inspection within touching distance) or are not obvious on the first observation/inspection. A guidance for detecting and managing hidden defects in bridges consists of a three-step procedure comprising of risk review, risk assessment, and risk management. As part of the risk review, two key questions must be asked during the review of existing information: **"What do the records say?"** and **"What is not recorded?"** Also, two questions must be asked on site during inspections: **"What can I see?"** and **"What can I not see?"**

The typical hidden defects for concrete girder and frame roadway bridges can be summarised as:

- Superstructure
    - Within the concrete body
    - Reinforcement
    - Prestressing wires/stands and anchorages
    - Voided and cellular structures
    - Half-joints
    - Obscure surfaces
    - Concrete hinges
    - Temporary works
- Bearings and expansion joints
    - Poor access
    - Inspection at the 'wrong time'
    - Un inspectable items
- Drainage
- Waterproofing

- Substructure

Road and Work Safety

The protection and safety of experts and environment are the essential on every work site and should be prioritized at all times during field operations.

Working on or near roads is extremely hazardous and the following rules must be observed by all personnel:

1. Before commencing inspection at the site ensure that all personnel are wearing high visibility vests, everyone knows the direction of traffic on all the lines, where to take refuge is a vehicle approaches and where are unprotected or unsafe areas.
2. During the inspection do not walk on or near the road without a reason and always walk towards oncoming vehicles.
3. Whenever crossing roads make sure all the lanes are clear before crossing.
4. When operating any machine or equipment, make sure you are aware of potential hazards (roads, power lines, other workers etc.), never step backwards without looking, and always look around you.

The best way of keeping work safety, is planning. The checklist of general safety requirements:

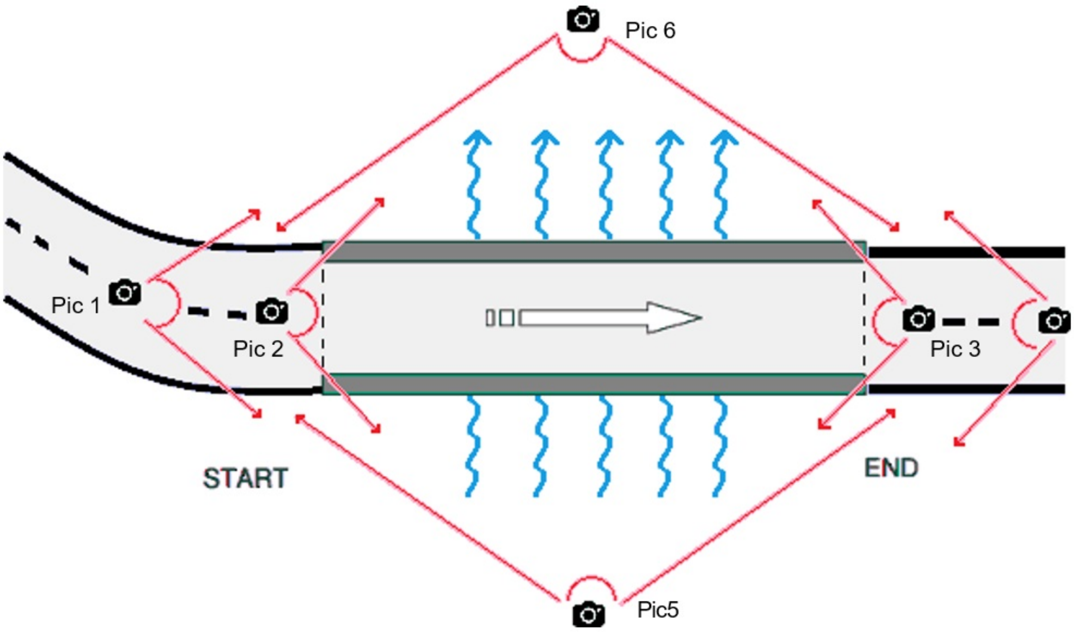
1. If bridge site is identified as having security problem, the inspection team should be escorted be the security personnel from the local police force. Necessary procedures should be in place to track the contact location of the team during survey period.
2. One should be familiar with the full requirements of the inspection work including personal clothing, footwear, gloves, helmets, overall falsework and access equipment.
3. The working order of all tools, machines and equipment should be ensured.
4. If needed, plan and arrange road closures and suitable traffic management procedures.
5. Ensure that a first aid kit is available.
6. Avoid involving persons who are not qualified for the tasks or operating particular equipment.
7. During the inspections, identify and locate all utilities existing at site (water, sewerage, electricity, signals, communications, gas etc.) If any utilities are affected take measures by informing the relevant authorities.
8. Personnel under the influence of alcohol or any medication which impairs alertness or causes drowsiness are not allowed to work on site or to operate any equipment.
9. Generally, all the work should be carried out as per industry standards or good practice.

Photographs for Bridge Inspections

In addition to data collection, inspections must include photographing the main elements and damages, starting with the most critical ones. It is recommended to take photographs in the same sequence as the condition inspections, beginning with general photos from above and then moving below the structures.

Use a tablet, mobile, or DSLR camera in landscape mode (horizontally) to capture the widest views possible. Only use portrait mode (vertically) when photographing tall subjects, such as a close-up of a pier. Regularly check that the lens is clean of dirt and grease, wiping it with wet and dry tissues as needed. Avoid taking photos against bright sunlight; if necessary, use your free hand to cast a shade over the lens.

For general photos, ensure to include at least six key areas, as follows:



Picture 1	Approach view of the bridge from the start (remember which end is the start, which the end)
Picture 2	Closer view of the bridge deck in one photo with the first expansion joint included. Also, other structures like barriers, parapets and trusses may ideally fit in the photo.
Picture 3	Similar approach view of the bridge from the other end.
Picture 4	Similar closer view of the bridge deck from that other end, including the last expansion joint and the other elements too.
Picture 5	Sideview of the whole bridge from upstream side. For taking the photo go as middle as you can, but if it isn't feasible, it can also be taken from the riverbank. Try to fit the abutments and closest banks too.
Picture 6	Similar sideview of the whole bridge from downstream side.

Additional general pictures of the whole bridge are optional, but may be useful.

For the element condition assessment photos, the sequence should be following, while filling the form or separately:

1. Take photos of roadway and deck surface elements
2. Take photos of superstructure elements and expansion joints
3. Take photos of substructure elements and bearings
4. Take photos of riverbed and slopes

Those photos are required always when there is something that is not 100% in the “as new” condition. If everything is perfect, no additional assessment photos are required, but can be added optionally.

Quality Assurance

If the data collection is being undertaken by a consultant, DoWH reserves the right for one AMB staff member to join the Consultant's on-site survey team(s) for quality review purposes. The Consultant is to allow for one (only) seating place in its primary survey vehicle to accommodate an AMB staff member and shall provide a minimum of five business days notice of any change of travel dates that have been previously agreed with DoWH (eg. through approval of the Consultant's Workplan). All direct costs (eg. travel airfares, accommodation, per diems etc) incurred by a DoWH staff member accompanying the Consultant's survey team are the responsibility of the client.

Stakeholders

Stakeholder	Role
DoWH AMB	The Asset Management Branch is responsible for this specification and utilising the data for the support of programme development and further analysis.
Provincial Works Manager (PWM)	The PWM is the most senior DoWH role based in each province and should be advised of any data collection to be done on national roads in their province.

Support

The following provides contacts for each of the main technical systems used by the DoWH AMB.

System		
ThinkProject Asset & Works Manager	The core system of the DoWH Road Management System	edmond.li@ghd.com
Mapillary	For uploading and accessing network video	remson.maea@pngroads.com
GoPro MAX	For the recording of network video	remson.maea@pngroads.com
TotalPave	For the recording of pavement (network) roughness	rexie.rei@pngroads.com
MetroCount	MetroCount counters and software for the recording of traffic counts	remson.maea@pngroads.com
KnowledgeOwl	Knowledgebase for the DoWH asset management and other related activities and requirements	elliot.mcbride@ghd.com

References and Additional Reading

Links to further support documents, manuals, publications and other content are included in the table below.

Reference Name / Description

Reference Name / Description

Element Condition State Tables

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1. Roadway and Deck Elements

The inspector should check:

- The pavement for unevenness, settlement, or roughness (shown below).
- Shoulders, slopes, drainage, and the approach guardrail.
- The deck and sidewalks for various defects, noting the size, extent, severity, and location of each element. The location should be referenced using the span number or side.
- The expansion joints for sufficient clearance and for an adequate seal.
- The safety features, including barriers and handrails (shown below), signs and lighting are present and identify their condition.

Condition states of pavement			
Condition State 0	Roadway is smooth, no rutting and only small roughness.		
Condition State 1	Roadway has small, visible rutting, longitudinal unevenness that can be fixed with local repair.		
Condition State 2	Roadway has ruts, cracking and small holes. People need to pay attention when crossing, but no safety issues. Needs resurfacing.		
Condition State 3	Hollow ruts and holes. Safety of a road user is affected and whole pavement needs replacement.		

Condition states of barriers and handrails			
Condition State 0	The elements have no remarkable defects or wearing marks. The overall appearance is as good as new.		

Condition states of barriers and handrails			
Condition State 1	The elements have minor superficial damages and deformations. Wearing and deterioration processes have occurred. The overall appearance is clean, but pitting corrosion can occur.		
Condition State 2	The elements have defects, like pitting corrosion, but the severity of the damages does not affect functional requirements.		
Condition State 3	The element has defects that affects the safety of users.		

2. Superstructure Elements

The superstructure must be inspected thoroughly since the failure of a main supporting member could result in the collapse of the bridge. The most common forms of main supporting members are:

- Girders
- Floor Beams and Stringers
- Slabs
- Trusses
- Eye bar Chains
- Arch Ribs
- Frames
- Bearings must be inspected thoroughly since they provide a critical link between superstructure and the substructure. For instance, one will need to record the difference between a rocker tilt and a fixed reference line, noting the direction of the tilt in the case of a rocker bearing. For an elastomeric bearing, for instance, any loss of section or major wear should be noted as a deterioration in condition.
- Utilities (pipes, ducts, etc.)
- Anchorages

Condition states of concrete superstructure elements			
Condition State 0	The concrete elements have no remarkable defects or wearing marks. The overall appearance is as good as new.		

Condition states of concrete superstructure elements			
Condition State 1	The elements have minor superficial damages, like honeycombing and hairline cracks. Wearing and deterioration processes have occurred.		
Condition State 2	The elements have defects, like corrosion, but the severity of the damages does not affect functional requirements.		
Condition State 3	The elements have severe defects, like peeling and heavy corrosion, the damages do affect functional requirements.		

Condition states of steel superstructure elements			
Condition State 0	The steel elements have no remarkable defects or wearing marks. The overall appearance is as good as new.		
Condition State 1	The elements have minor superficial damages, like deformation or painting defects. Wear has occurred.		
Condition State 2	The elements have defects, like pitting corrosion, but the severity of the damages does not affect functional requirements.		

Condition states of steel superstructure elements			
Condition State 3	The elements have severe pitting corrosion, that does affect functional requirements.		

3. Substructure Elements

The substructure supports the superstructure and is made up of abutments, piers and bents, footings, and piles. If the “as-built” plans are available, the field-measured dimensions of the substructure units should be compared to those presented on the plans. Since the primary method of bridge inspection is visual, all dirt, leaves, animal waste, and debris should be at least partially removed to allow close observation and evaluation. Substructure units should be checked for:

- Settlement by sighting along the superstructure and plumbing vertical faces.
- In conjunction with scouring inspection of the waterway, the substructure unit should be checked for undermining, noting both its extent and location.

Condition states of abutments			
Condition State 0	Elements have no remarkable defects, settlements or scouring. The overall appearance is as good as new.		
Condition State 1	Elements have small visible defects, settlements or scouring. The overall appearance is as good, but small repairs are needed.		
Condition State 2	Elements have remarkable defects, settlements or scouring. The overall appearance is satisfactory and elements function as intended, but repairs are needed.		

Condition states of abutments			
Condition State 3	Elements have critical defects, settlements or scouring. The elements may not function as intended and replacement is needed.		

4. Channel and Waterway Elements

Waterways are dynamic in nature, with their volume of flow and their path continually changing. Thus, the bridges passing over them must be inspected for the effects of these changes:

- Maintain a record of the channel flow profile and alignment, noting any meandering of the channel both upstream and downstream.
- Report any skew or improper location of the piers or abutments, that can be related to scour.

Smart Flags

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The use of a “safety” Smart Flag **must** be used if, in the opinion of the Inspector, a defect impacts the integrity of the structure to such a degree that the safety of the public or structure are jeopardised. The addition of a smart flag and deterioration process assessment to the main damages of the bridge, is necessary to give in-depth view and evaluate bridge reliability and safety. Safety is defined as user safety, and the outcome (failure mode) is always an accident. The evaluation method of reliability is connected to failure modes in vulnerable zones of a structures and quantitative modelling of bridge damage processes.

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Observing a defect on a bridge often indicates active damage processes. Analyzing these processes and their relationship to the observed defects helps identify the root causes. Understanding damage processes is essential for predicting performance, planning preventive maintenance, and considering potential rehabilitation. Reliable information on these processes allows for optimised inspection and maintenance strategies, aligned with the exposure classes defined during the design phase.

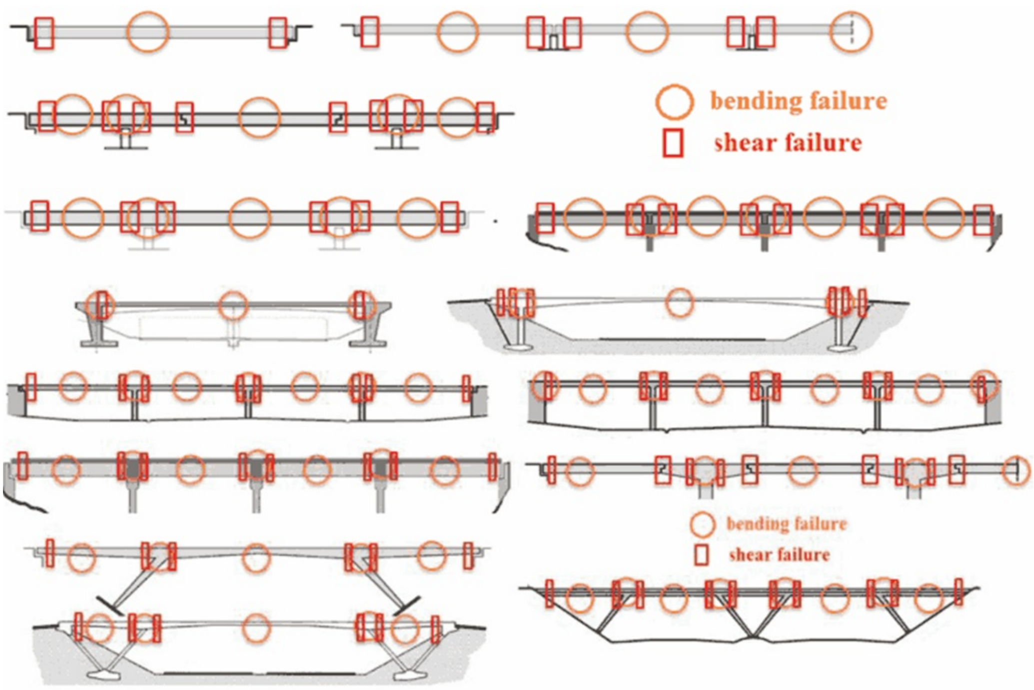
Vulnerable Zones

To assess deterioration processes, the evaluation should be tailored to the type of damage, its cause, and the material of the affected structural element. Most damages can be linked to specific defects or observations. However, some damages are merely symptoms and do not impact the structure’s reliability.

Nearly all deterioration processes related to concrete structures can affect any part of a concrete bridge. However, it is important to note that not all parts of the bridge are equally critical in terms of consequences. For example, load-bearing elements have regions that are particularly vulnerable and require special attention, which will be discussed further.

The proposed segmentation of the superstructure in the longitudinal direction (partitioning of an element into regions with different vulnerability) is based on the Concrete Details Vulnerability Manual, and the Long-Term Bridge Performance Program Protocols, Version 1:

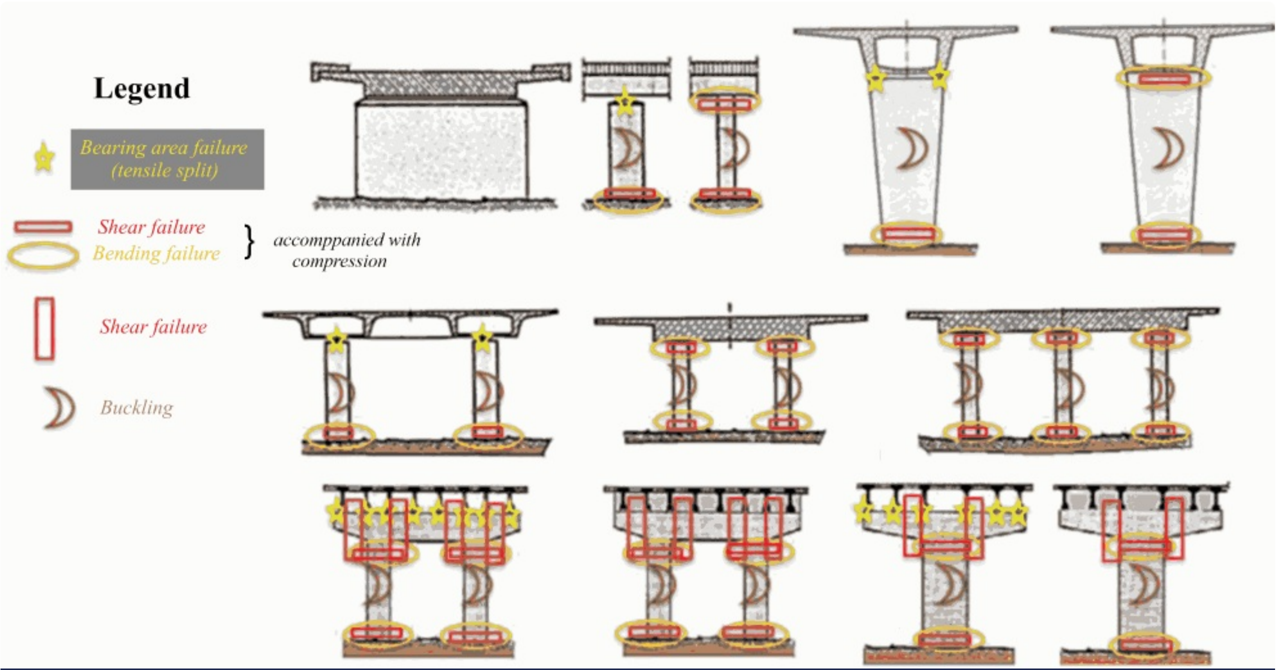
- High moment regions
- Sagging (label HMS region)
- Hogging (label HMH region)
- High shear regions (label HS region)
- Construction joint (rigid type) (label CJ region)
- Shear key (label SK region)
- Hinges (label HG region)
- Anchorage zones (label AN region)



Vulnerable zones for different types of girder and frame bridges

Conceptual weaknesses may also be associated with some of the above-mentioned vulnerable zones. One such example is poor shear capacity in high shear regions in old concrete bridges. This conceptual weakness is due to limited understanding of the shear phenomena given in old design codes.

Furthermore, it should be noted that elements of substructure support the superstructure, implying that their failure might lead to a total collapse. In general, a substructure might fail in crushing or buckling failure mode. In addition, bearing areas are exposed to splitting forces. Pier caps (if they exist) are generally exposed to high shear stresses making them particularly vulnerable. Elements of substructures are mainly exposed to sudden events e.g., impact, scour and earthquake. Typical locations of vulnerable zones related to piers are presented below along with their relationship to an anticipated failure mode.



Vulnerable zones related to substructure

In addition to load beading function there is the elements that gives protection of comfort, these elements are related to nearly all bridge types. It should be noted that malfunction of these elements might jeopardize the load-bearing elements of the bridge (durability issues) and/or impose severe consequences themselves. The level of service generally depends on the adequate function of these elements (traffic safety issues). Below, vulnerable areas are listed as checklists that may be used during inspection.

- Bearings
  - Sufficient ability to allow movement, considering the temperature of the superstructure.
  - Correct position of the bearings themselves and parts of the bearing relative to each other.
  - Uncontrolled movement of the bearing, as predicted by Movement Indicator provided in slide-guide and Free Bearing (Pot & Spherical).
  - Fracture, cracks, and deformations of parts of the bearings.
  - Cracks in the bedding or in adjacent parts of sub- and superstructure.
  - The condition of the anchorage.
  - The condition of sliding or rolling surfaces.
  - The condition of the anticorrosive protection against dust, and of the sealings.
- Concrete hinges
  - Developed more than 100 years ago and if correctly executed they perform very well throughout the world. Concrete hinges are characterised by high load- carrying capacity and a moderate rotational capacity. Concrete cracking in the throat of the Freyssinet (un-reinforced) hinge and risk of impact shear loading in the Mesnager (reinforced) hinge are important considerations when assessing or predicting concrete hinge performance.
- Expansion Joints
  - Damage to the anticorrosive protection.
  - Cracks due to fatigue in steel members.
  - Damage to seals.
  - Workability of the linkage (proper function).
  - Obstruction or damage of the drainage system
- Drainage
  - as a sub-component of the equipment category, comprises of permanently installed drains and the associated piping systems. The inspection should verify proper deck slopes and proper functioning of kerb channels, drainage inlets, pipes and outlets, and possible drain holes for drainage of voids. Blockage of drainage may create a serious traffic hazard as well as result in severe deterioration.
- Waterproofing is usually not visible, i.e., the condition has to be assessed from possible consequential damage on the neighbouring components such as:
  - Leaking decks/wet spots beneath superstructure
  - Finding of protective concrete wash out
  - Swelling of the pavement
  - Cracking of the pavement
- Pavement/Overlay
  - Cracks, unevenness, holes, and swelling
  - Rutting
  - Lack of friction
  - Joint failure
  - Improper drainage
- Barriers, windscreens, and signs
  - Damages from impact
  - The condition of the anticorrosive protection
  - Missing or loose bolts
  - The condition of the anchorage
  - The condition of the concrete

    - Visual appearance (readability, reflection, lighting etc.)
- Installations typically comprise of lighting (typically light poles), electro-mechanical dehumidification systems (primarily on signature bridges), Structural Health Monitoring Systems (primarily on signature bridges), hydraulic opening arrangement, and possible utility lines fixed/fastened on the bridge. Their vulnerability shall be evaluated case by case.

Hidden Defects

Sudden weight restrictions and emergency closures on roadway bridges are often because of hidden defects. These defects that are hidden from sight (inspection within touching distance) or are not obvious on the first observation/inspection. A guidance for detecting and managing hidden defects in bridges consists of a three-step procedure comprising of risk review, risk assessment, and risk management. As part of the risk review, two key questions must be asked during the review of existing information: **"What do the records say?"** and **"What is not recorded?"** Also, two questions must be asked on site during inspections: **"What can I see?"** and **"What can I not see?"**

The typical hidden defects for concrete girder and frame roadway bridges can be summarised as:
- Superstructure
    - Within the concrete body
    - Reinforcement
    - Prestressing wires/stands and anchorages
    - Voided and cellular structures
    - Half-joints
    - Obscure surfaces
    - Concrete hinges
    - Temporary works
- Bearings and expansion joints
    - Poor access
    - Inspection at the 'wrong time'
    - Un inspectable items
- Drainage
- Waterproofing
- Substructure

Road and Work Safety

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The protection and safety of experts and environment are the essential on every work site and should be prioritized at all times during field operations.

Working on or near roads is extremely hazardous and the following rules must be observed by all personnel:

1. Before commencing inspection at the site ensure that all personnel are wearing high visibility vests, everyone knows the direction of traffic on all the lines, where to take refuge is a vehicle approaches and where are unprotected or unsafe areas.

2. During the inspection do not walk on or near the road without a reason and always walk towards oncoming vehicles.

3. Whenever crossing roads make sure all the lanes are clear before crossing.

4. When operating any machine or equipment, make sure you are aware of potential hazards (roads, power lines, other workers etc.), never step backwards without looking, and always look around you.

The best way of keeping work safety, is planning. The checklist of general safety requirements:

1. If bridge site is identified as having security problem, the inspection team should be escorted be the security personnel from the local police force. Necessary procedures should be in place to track the contact location of the team during survey period.

2. One should be familiar with the full requirements of the inspection work including personal clothing, footwear, gloves, helmets, overall falsework and access equipment.

3. The working order of all tools, machines and equipment should be ensured.

4. If needed, plan and arrange road closures and suitable traffic management procedures.

5. Ensure that a first aid kit is available.

6. Avoid involving persons who are not qualified for the tasks or operating particular equipment.

7. During the inspections, identify and locate all utilities existing at site (water, sewerage, electricity, signals, communications, gas etc.) If any utilities are affected take measures by informing the relevant authorities.

8. Personnel under the influence of alcohol or any medication which impairs alertness or causes drowsiness are not allowed to work on site or to operate any equipment.

9. Generally, all the work should be carried out as per industry standards or good practice.

Photographs for Bridge Inspections

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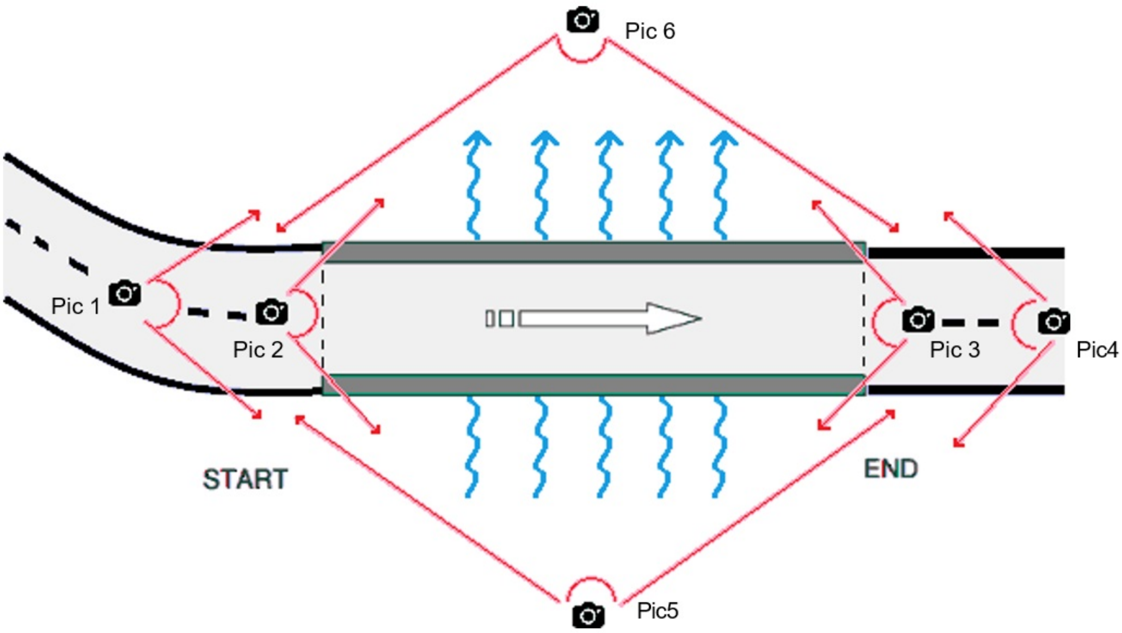
In addition to data collection, inspections must include photographing the main elements and damages, starting with the most critical ones. It is recommended to take photographs in the same sequence as the condition inspections, beginning with general photos from above and then moving below the structures.

Use a tablet, mobile, or DSLR camera in landscape mode (horizontally) to capture the widest views possible. Only use portrait mode (vertically) when photographing tall subjects, such as a close-up of a pier. Regularly check that the lens is clean of dirt and grease, wiping it with wet and dry tissues as needed. Avoid taking photos against bright sunlight; if necessary, use your free hand to cast a shade over the lens.

For general photos, ensure to include at least six key areas, as follows:



Picture 1	Approach view of the bridge from the start (remember which end is the start, which the end)
Picture 2	Closer view of the bridge deck in one photo with the first expansion joint included. Also, other structures like barriers, parapets and trusses may ideally fit in the photo.
Picture 3	Similar approach view of the bridge from the other end.
Picture 4	Similar closer view of the bridge deck from that other end, including the last expansion joint and the other elements too.
Picture 5	Sideview of the whole bridge from upstream side. For taking the photo go as middle as you can, but if it isn't feasible, it can also be taken from the riverbank. Try to fit the abutments and closest banks too.
Picture 6	Similar sideview of the whole bridge from downstream side.

Additional general pictures of the whole bridge are optional, but may be useful.

For the element condition assessment photos, the sequence should be following, while filling the form or separately:

1. Take photos of roadway and deck surface elements
2. Take photos of superstructure elements and expansion joints
3. Take photos of substructure elements and bearings
4. Take photos of riverbed and slopes

Those photos are required always when there is something that is not 100% in the “as new” condition. If everything is perfect, no additional assessment photos are required, but can be added optionally.

Bridge Terminology

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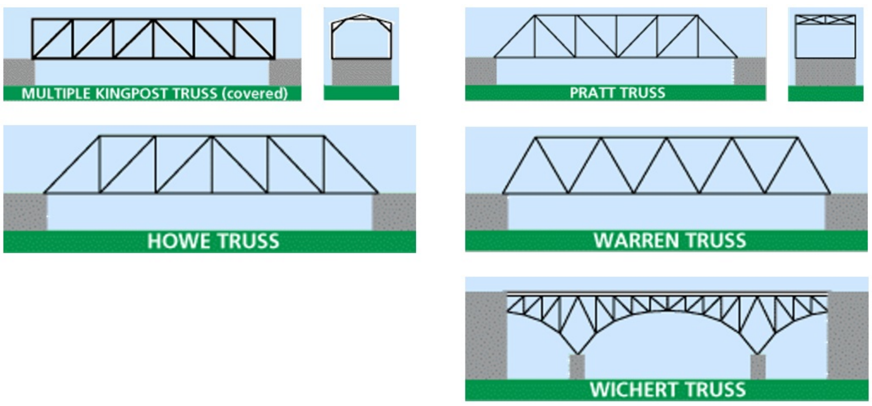
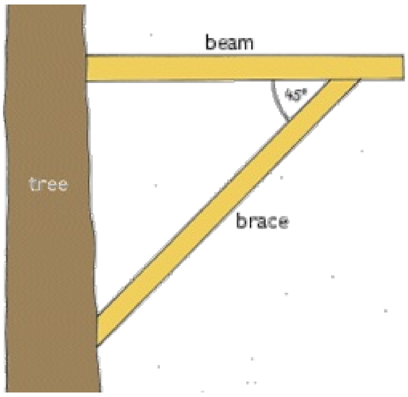
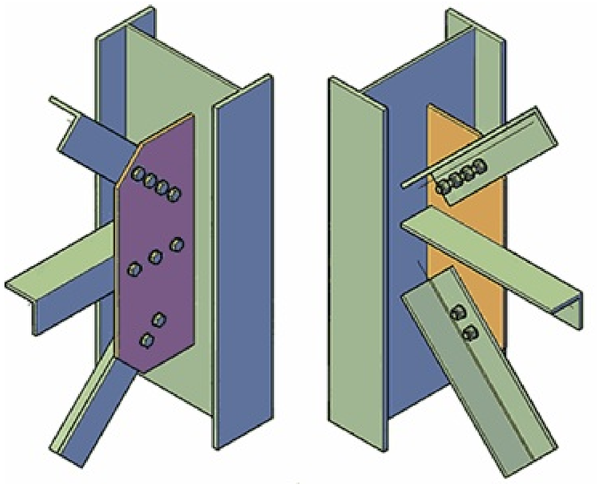
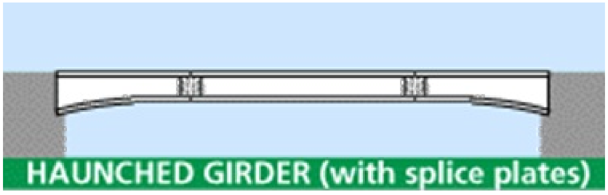
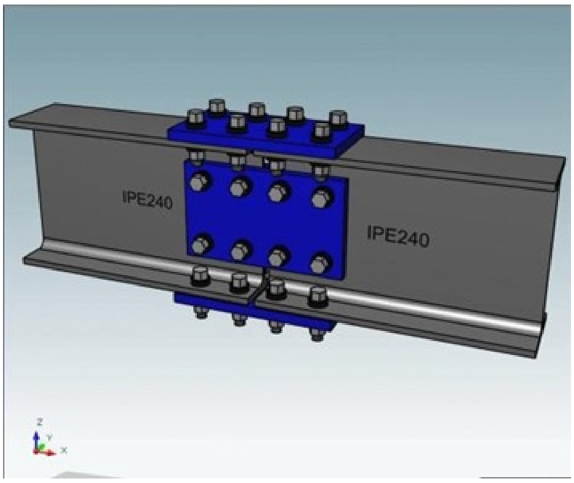
The intention of this Annex A is to introduce the taxonomy and terminology used in bridge management field.

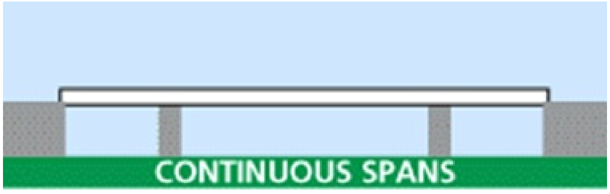
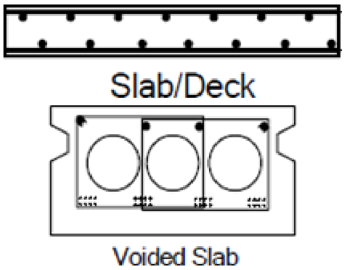
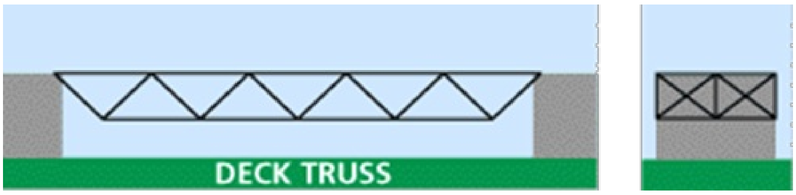
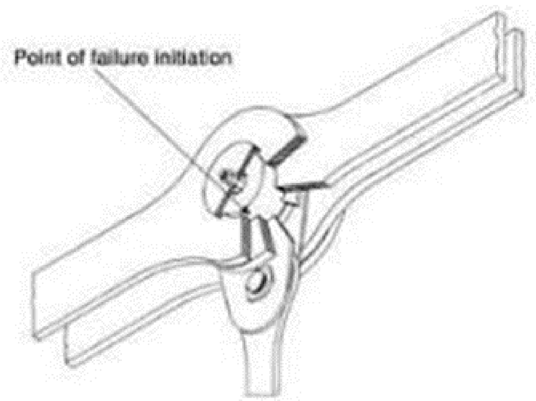
Force	External Influence on an object that tends to produce a change in its shape or cause movement.
Compression	Stress resulting from compressive forces that are characterized by pressing together.
Tension	Stress resulting from tensile forces that are characterized by pulling apart.
Dead Load	The weight of the structure itself, independent of traffic or the environment which must be supported by the structure.
Live Load	The dynamic or moving weight, such as the traffic carried by the structure.
Moment	The tendency of a force to cause a rotating motion on a member transverse to its longitudinal axis and vice versa.
Shear	Stress placed transversely or longitudinally on a member due to parallel forces moving in opposite directions.
Torsion	Tendency of a force to produce twisting or rotation of a member about its longitudinal axis. The resulting stresses from torsion are also shear stresses.
Deflection	The perpendicular distance a beam bends from straight due to load and span length.
Buckling	A longitudinal or transverse deformation or bending of members resulting from compressive forces.
Stress	The resistance of an object to an external force. Compressive stress develops as an object in compression resists being shortened. Tensile stress develops as an object in tension resists being elongated. Shear stress develops as an object subject to shearing forces resisting deformation.
Strain	The deformation of an object caused by a force acting upon it. Compressive strain is shortening of an object, tensile strain is the elongation of an object, while shear strain is a lateral deformation caused by a force which tends to move part of an object more than the other.
Thrust	A force caused by one part of a structure pushing outward against another. The thrust at the abutment of a segmental arch is also called a Drift.
Pre-stressing	Methods of increasing the load-bearing capacity of concrete by applying increased tension in the steel tendons or bars inside a beam, which get transferred to the concrete as compression. In pre-stressing members bowing action is possible due to faulty sequence of pre-stressing.
Post-Tension	The type of pre-stressing in which the tendons are loosely fed through tubes which are covered by concrete poured into the form. Once the concrete cures and the forms are removed, the tendon is clamped on one end and jacked tighter on the end until the required tension is achieved. It produces a camber in the member, which is able to withstand greater loads without deflection as compared to length-reinforced concrete beams.

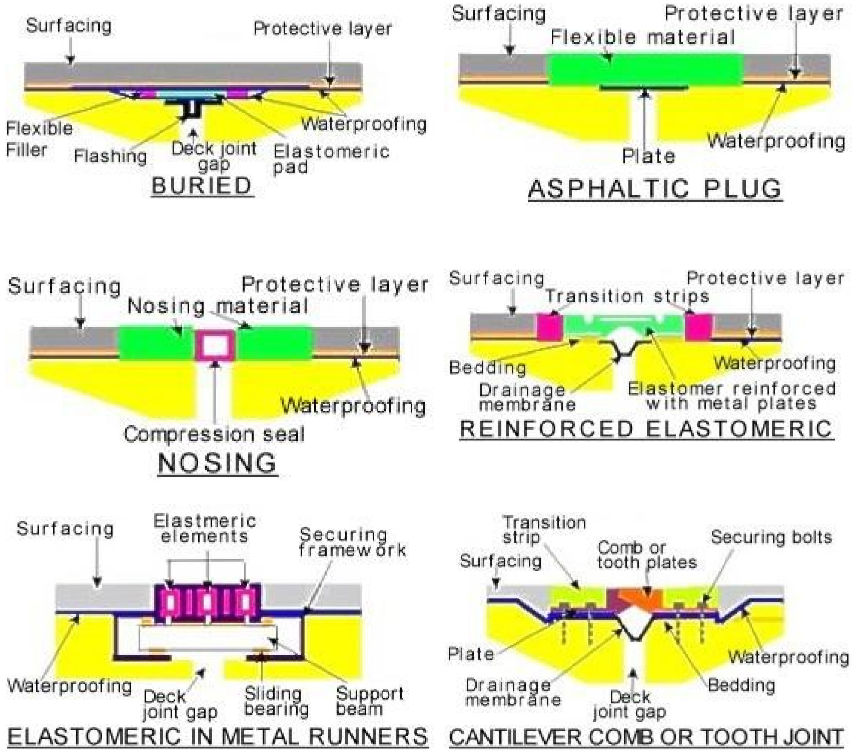
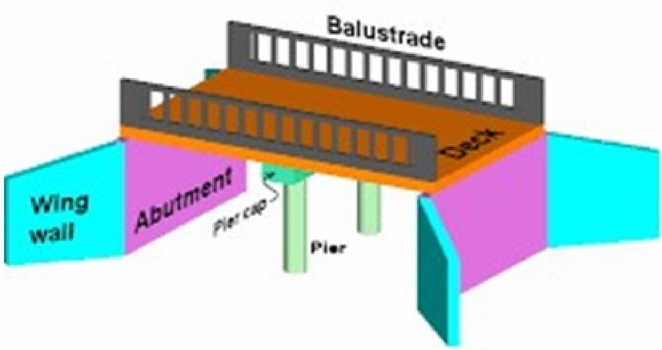
Pre-Tension	The reinforcing tendon is first stretched to the desired tension and then covered with concrete poured into the form. When concrete cures and the forms are removed, the jacked tendon is released. Thus, it transfers compressive forces to the concrete surrounding it, producing a positive camber.
Tendons	Steel strands or bars used for pre-tensioning or post-tensioning.
Camber	A positive, upward curve built into a beam which compensates for some of the vertical load and the anticipated deflection. Prevalent in pre-stressed beams.
Structure	A stable assembly of components that carries a load while resisting various applied stresses and transfers the load through the system foundation to the ground.
Superstructure	The portion of a bridge structure which carries the traffic load and passes it to the substructure.
Substructure	The portion of a bridge structure, including mainly the abutments and piers, which supports the superstructure.
Beam	A horizontal structural member supporting vertical loads by resisting bending and shear. A girder is a larger beam, especially when made of multiple plates. Deep longer members are created by using trusses. Beam bridges have span lengths up to 60m.
Floor Beam	Horizontal members which are placed transversely to the major beams, girders, or trusses; used to support the deck.
Girder	A horizontal structural member supporting vertical loads by resisting bending and shear. It is a larger beam often built-up of multiple metal plates, usually bolted, riveted, or welded together; precast or cast-situ, reinforced or pre-stressed concrete structure.
Tied Arch	An arch that has a tension member across its base which connects one end to the other end.
Vault	An enclosing structure formed by building a series of adjacent arches.
Extrados	The outer exposed curve of an arch; defines the lower arc of a Spandrel.
Truss	A type of structure made mainly of pin-connected members supporting vertical loads through axial tension and compression actions of its members. It is often made of a top and a bottom chord connected to slender web members placed in between them. 

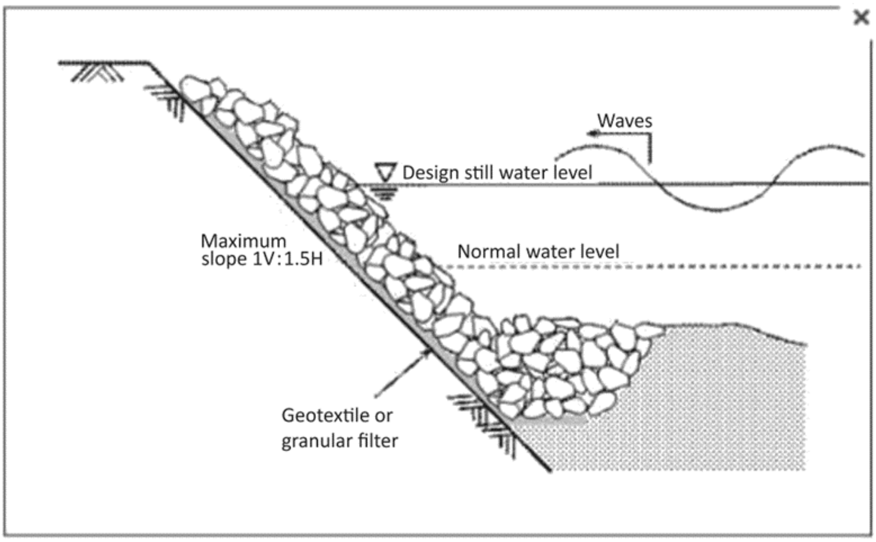
Bent	Part of a bridge substructure. A rigid frame commonly made of reinforced concrete or steel that supports a vertical load and is placed transverse to the length of the structure. They are used to support beams and girders. An end Bent is a supporting frame forming part of the Abutment. Vertical members of the Bent may also be called columns, piers or piles. It is the horizontal member on the top of the pier or a group of piers.
Bow String Truss	A truss having a curved top chord and a straight bottom chord meeting at each end.
End Post	The outward-most vertical or angled compression member of a truss.
Box Girder	A steel or concrete (precast or cast-in-situ) beam built-up from many shapes to form a hollow cross-section.
Buttress	A wall projecting perpendicular from another wall (in the front) which prevents its outward movement. It is usually wider at its base and tapers towards the top. While counterfort is opposite to buttress-wall projecting perpendicular from another wall (at the back).
Chord	Either of the two principal members (Top & Bottom) of a truss extending from end-to-end and connected to web members.
Crown	On-road surfaces where the centre is the highest point and the surface slopes downward in opposite directions, assisting in drainage, or a point at the top of an Arch.
Portal	The opening at the end of a through truss that forms the entrance.
False Work	A temporary structure used as a support during construction (scaffolding, formwork)
Fill	Earth, Stone, or other material used to raise the ground level, form an embankment or fill the inside of an abutment or a closed spandrel.
Embankment	Angled grading of the ground.
Wing Walls	Extensions of a retaining wall as part of an abutment; used to contain the fill of an approach embankment.
Cast-in-place	Concrete poured within formwork on site to create a structural element in its final position (usually for Bent, Abutment, Wing Wall, and in some cases, Deck Construction).
Culvert	A drain pipe or channel that allows water to pass under a road, railroad, or embankment.
Bedrock	A solid rock layer beneath sand and silt.
Skew	When the superstructure alignment is not perpendicular to the substructure alignment, a skew angle is created. An angle subtended between flow direction and normal to the traffic direction.
Revetment	A facing of Masonry or Stones to protect an embankment from erosion.
Tie	A tension member of a truss.

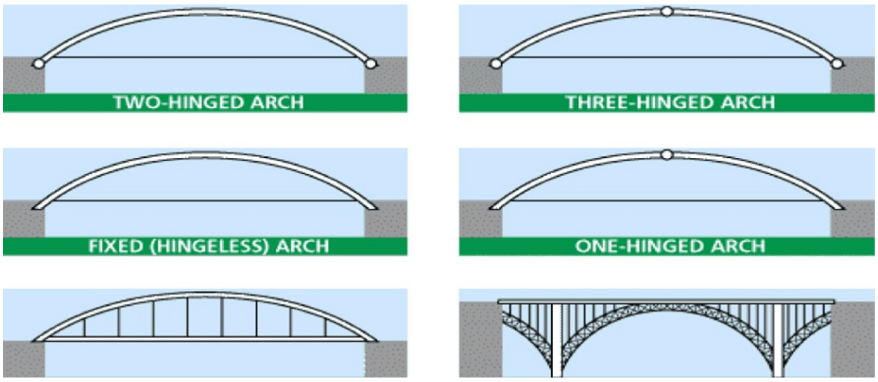
Scour	Removal of material from the stream bed or embankment as a result of the erosive action of the stream flow. 
Backwater	Increase in the upstream water elevation resulting from an obstruction to flow, such as a bridge and/or embankment placed in the floodplain.
Diversion Channel	A bypass created to divert flow around a structure so that construction can take place.
Flood Frequency	The concept of the probable frequency of a given flood. More precisely, it is the inverse of the probability that a flood will be exceeded at least once in a given year.
Freeboard	The clearance between the bottom of the superstructure and the design high-floodlevel.
Transverse	Positioning of a member so that it projects out from or crosses another, generally in horizontal or vertical position (e.g. cross bracings).
Lateral Bracing	Members used to stabilize a structure by introducing diagonal connections.
Web	The system of members connecting the top and bottom chords of a truss or the vertical portion of an I-beam or Girder connecting the top and bottom flanges.
Knee Brace	Additional support connecting the deck with the main beam which keeps the beam from buckling outward. Commonly made of plates and angles. 

Gusset Plate	A metal plate used to connect multiple structural members of a truss or beam connections. 
Haunch	The enlarged part of a beam near its supported ends which results in increased strength, while keeping increasing web depth in check. 
Splice Plate	A plate which joints two girders. 
Span	Horizontal space between supports of a structure. Clear Span is the distance of the inside surfaces while effective Span is the centre-to-centre distance.
Approach/run-on slab	Part of the bridge that carries traffic from the land to the main parts of the bridge.

Cantilever	A structural member that projects beyond a supporting column or wall and is counterbalanced or supported only at one end.
Continuous Span	A superstructure which extends as one piece over multiple supports. 
Deck	The top surface of a bridge which carries the traffic directly. 
Deck Truss	A truss which carries its deck on its top chord. 
Bearing	A device at the end of beams that is placed on top of a pier or abutment. The ends of the beam rest on bearings.
Pin	A cylindrical bar which is used to connect various members of a truss.
Eyebar	A structural member having a long body and an enlarged head at each end. Each head has a hole through which a pin is inserted to connect to the members. 

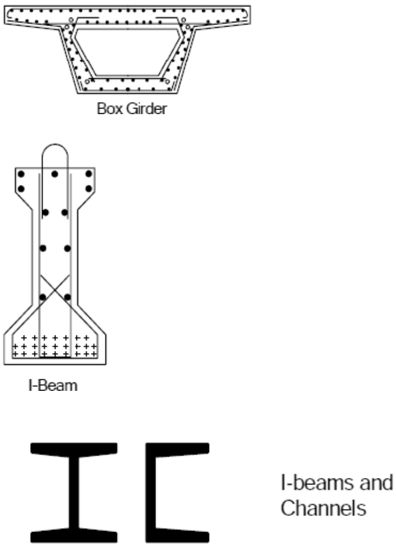
Expansion Joint	A meeting point between two parts of a structure, which is designed to allow movement of the parts due to thermal or moisture factors while protecting the parts from damage. Commonly visible on a bridge deck as a hinged or movable connection. 
Abutment	Supports the end of a span or accepts the thrust of an arch; often supports and retains the approach embankment. 
Foundation	The portion of a bridge structure that receives load from the substructure and transfers it to the ground or sub-strata.
Footing	The enlarged portion of the Foundation which rests directly on the soil, bedrock or piles, usually below grade and not visible.
Pier	A vertical structure which supports the ends of a multi-span superstructure at a location between the abutments.
Column	A vertical structural member that supports compressive loads mainly, and moments to some degree.

Pile	A long column driven deep into the ground to form part of a foundation. The pile can be driven (bearing and/or friction) piles, drilled piles or bored piles (Caissons). Driven piles are hammered directly into the ground. For drilled or bored piles, a hollow pipe is first driven into the ground and then concrete is poured afterwards, the pipe may be left in place or removed as the pouring of concrete proceeds.
Gabion	A galvanized wire box filled with stones used to form an abutment or for abutment protection. 
Riprap	Gabions, Stones, Blocks of Concrete or other Protective covering material of like-nature deposited upon river and stream beds and banks to prevent erosion and scouring by water flow. 

Parapet or Edge Beam	A low wall along the outside edge of a bridge deck used to protect vehicles and pedestrians. 
Anchor Span	Located at the outermost end, it counter-balances the arm of the span extending into the opposite direction from a major point of support. Often attached to an abutment.
Anchorage	Located at the outermost ends, the part of a suspension bridge to which the cables are attached. Similar in location to an abutment of a beam bridge.
Aqueduct	A pipe or channel, open or enclosed, which carries water. It may also be used as part of a canal to carry boats. Sometimes, it is also calledby a bridge.
Arch	A curved structure that supports a vertical load mainly by axial compression. 

Examples of main girders

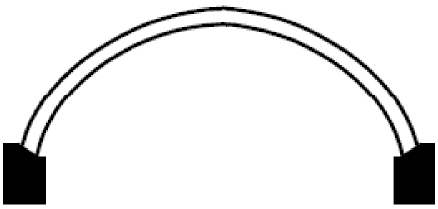
Bailey truss



Box girder and I-beams

Truss

Slab



Steel-soil bridge

Culvert

Frame

Crossbeams and diaphragms

Diaphragm

Crossbeam

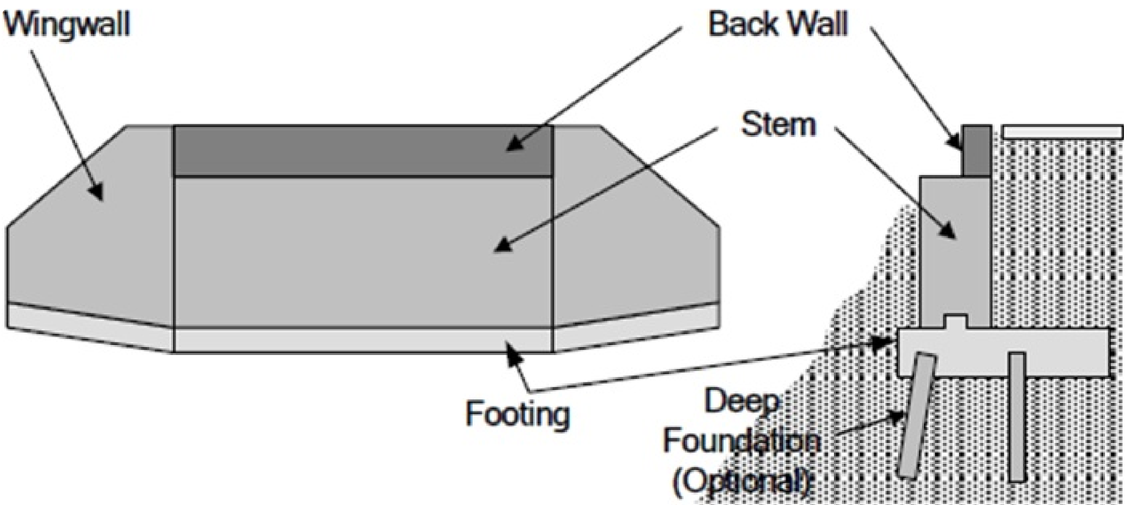
Construction joint

Sydney Harbour Bridge hinge

Wing walls

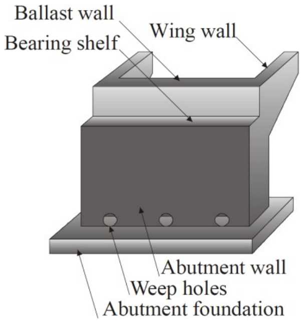
Freestanding and splayed wing wall

Foundation

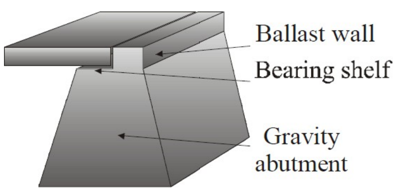


Spread footing and pile foundations

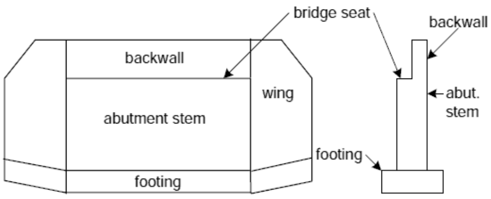
Examples of Abutments



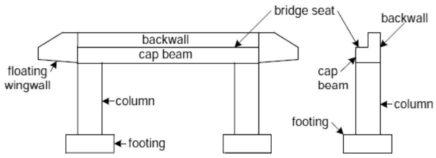
Cantilever abutment



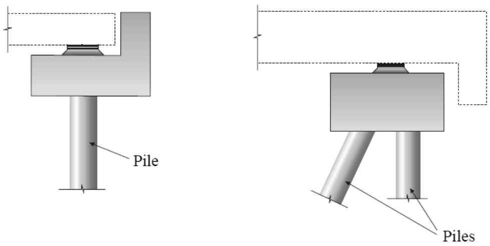
Gravity abutment



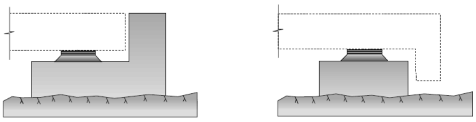
Full height abutment



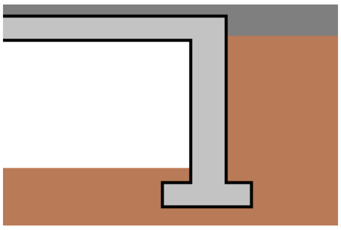
Open abutment



Pile (stub abutment)



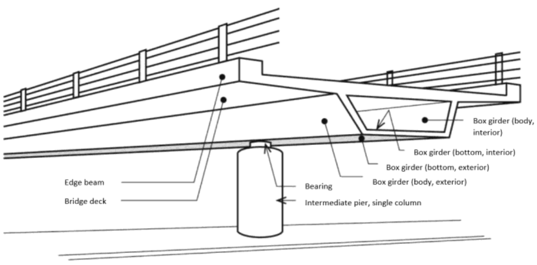
Bank-seated abutment



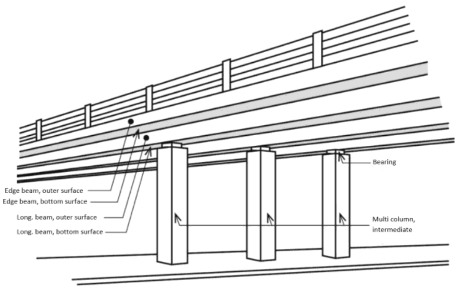
Integral abutment

Wall and counterfort

Examples of Piers



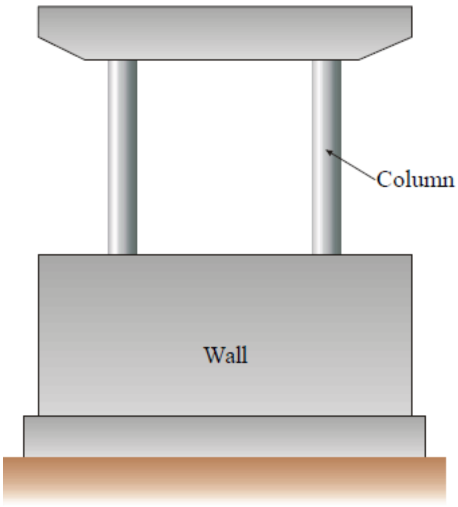
Single column pier



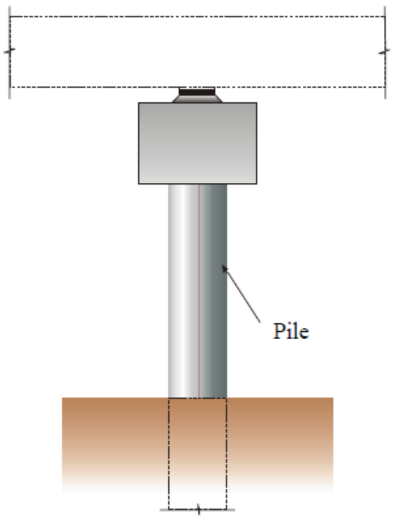
Multi-column pier

Solid wall

Gravity pier

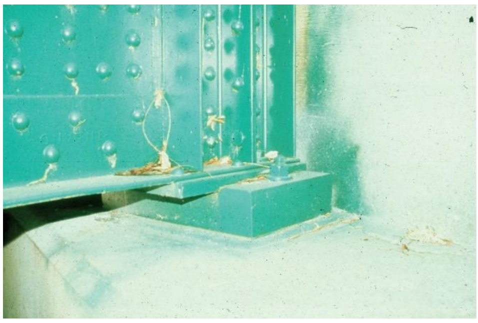


Wall and column pier



Pile pier

Examples of Bearings



Lubricated steel plate

Bronze bearing plate

Tar paper

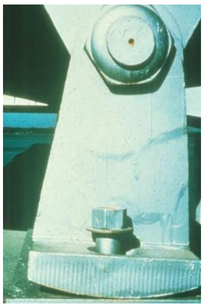
PTFE on stainless steel

Single roller

Rocker bearing

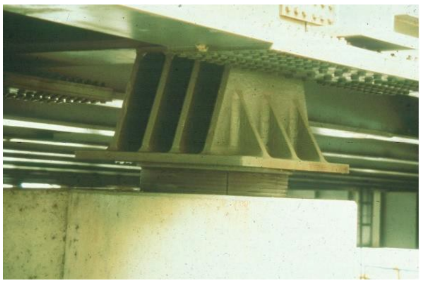
Segmental rocker bearing (out of position)

Segmental rocker nest bearing



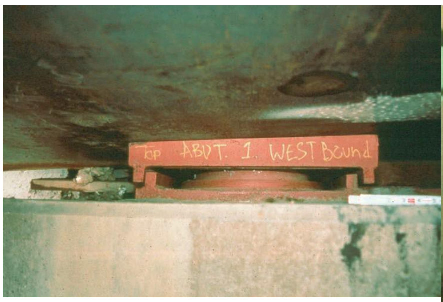
Pinned rocker

Plain neoprene pad

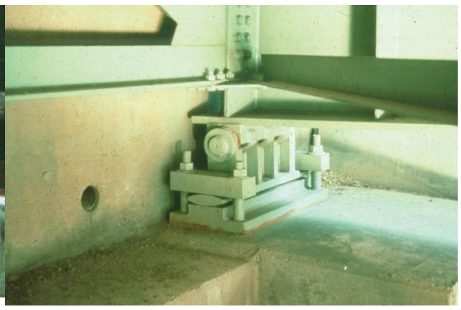


Laminated neoprene pad

Cylindricalbearing



POT Bearing



Restraining bearing

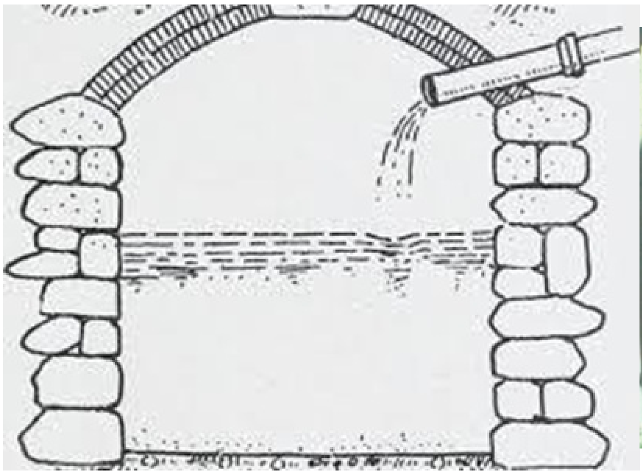
Pin and link bearing

Examples of barriers

Concrete and steel barriers

Steel handrail and concrete kerb

Drainage elements



Outlet pipe

Downspout

Deck drain

Bridge signs

Bridge Defects

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Concrete Defects

Concrete members can be used in three forms for bridge construction as stated below:

- Plain Concrete
- Reinforced Concrete (Cast in-situ and precast)
- Pre-Stressed Concrete (Post-Tensioned mainly)

Safety Concerns – The major concern to ensure the integrity of a concrete bridge component is mainly in the protection of its reinforcement or tendon from corrosion. An equally important but more minor concern is to ensure that the concrete segment of the component that usually acts to resist compressive forces is not undermined from carrying out its load-supporting function. Unattended corrosion of the reinforcing bars or post-tensioning tendons would imminently lead to a catastrophic failure.

Sources of Defects - in concrete, it can be as a result of the following:

- Lack of durability of the concrete, resulting from an improper composition of the concrete elements
- Poor placement practices
- Poor quality control
- Aggressive environmental factors

The most common concrete defects to watch out for are:

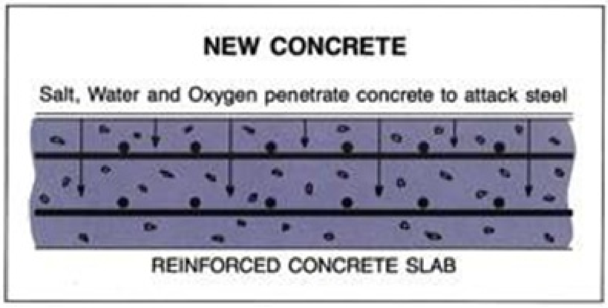
Corrosion of Reinforcement or Tendons

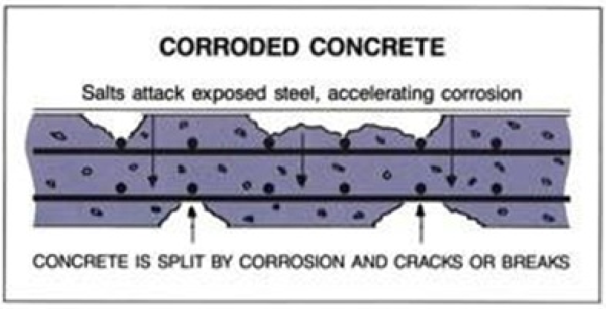
since concrete is poor in providing resistance to tension, most designs essentially ignore the contributions of concrete in the tension regions of the load-transfer mechanisms, making the reinforcement the critical member in these sections. Therefore, any significant loss of a section of the reinforcement or tendon due to corrosion would significantly reduce the load-carrying capacity of the member.

Concrete provides protection to the reinforcement or tendon and maintains a good alkaline environment of about pH 13, which leaves the reinforcement in a passive state. When this alkalinity is compromised and drops below pH 10 through exposure to salt, oxygen, moisture, air or other chemicals, the process of corrosion is triggered and can accelerate fast.

The bridge inspection exercise, therefore, should diligently seek for any exposed reinforcement or tendon or for defects that would expose them to environmental conditions and thus exacerbate corrosion.

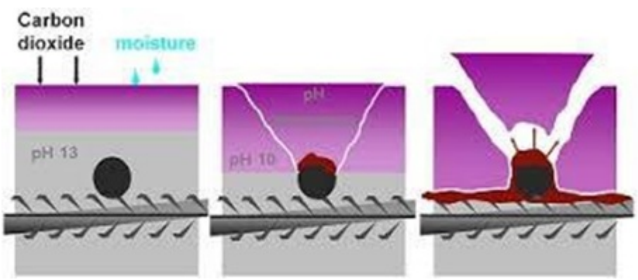
Measurement – condition assessment should include extensive sketches of defects, including some level of quantification (say length, area, percentages measures) and determination of the degree of reinforcement section loss when corrosion is already in progress.





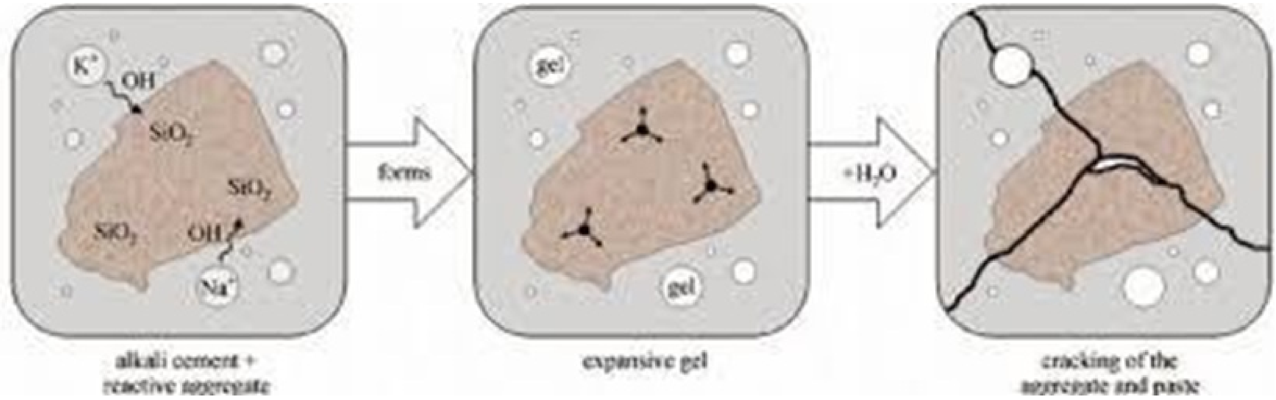
Carbonation of Concrete

This chemical condition affects the durability of concrete and lowers the alkalinity of the concrete cover to the reinforcement. The expansion of the carbonate gel that results from the chemical reaction may produce cracks in the concrete, thus opening a fault line for further progression of carbonation, and consequently causing the reinforcement to become prone to corrosion.Carbonation does not actually harm the concrete directly nor reduce its strength. However, poor, and porous concrete with high permeability, high water-to-cement ratio, low cement content, short curing period, or poor consolidation makes the concrete susceptible. Its resulting effects on the concrete allow corrosion of the reinforcing steel to thrive.



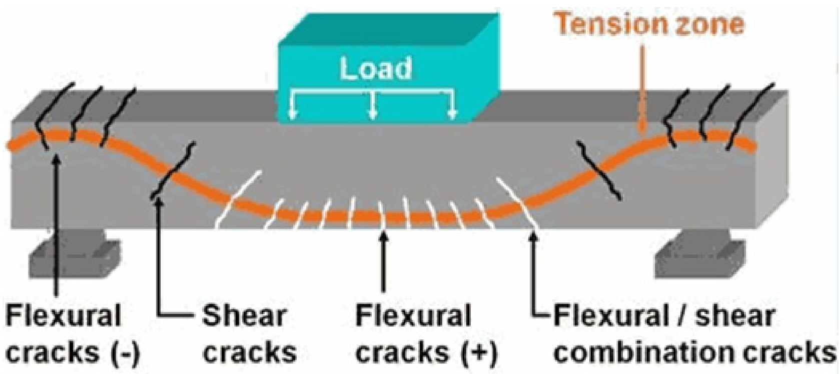
Alkali-Silica Reaction

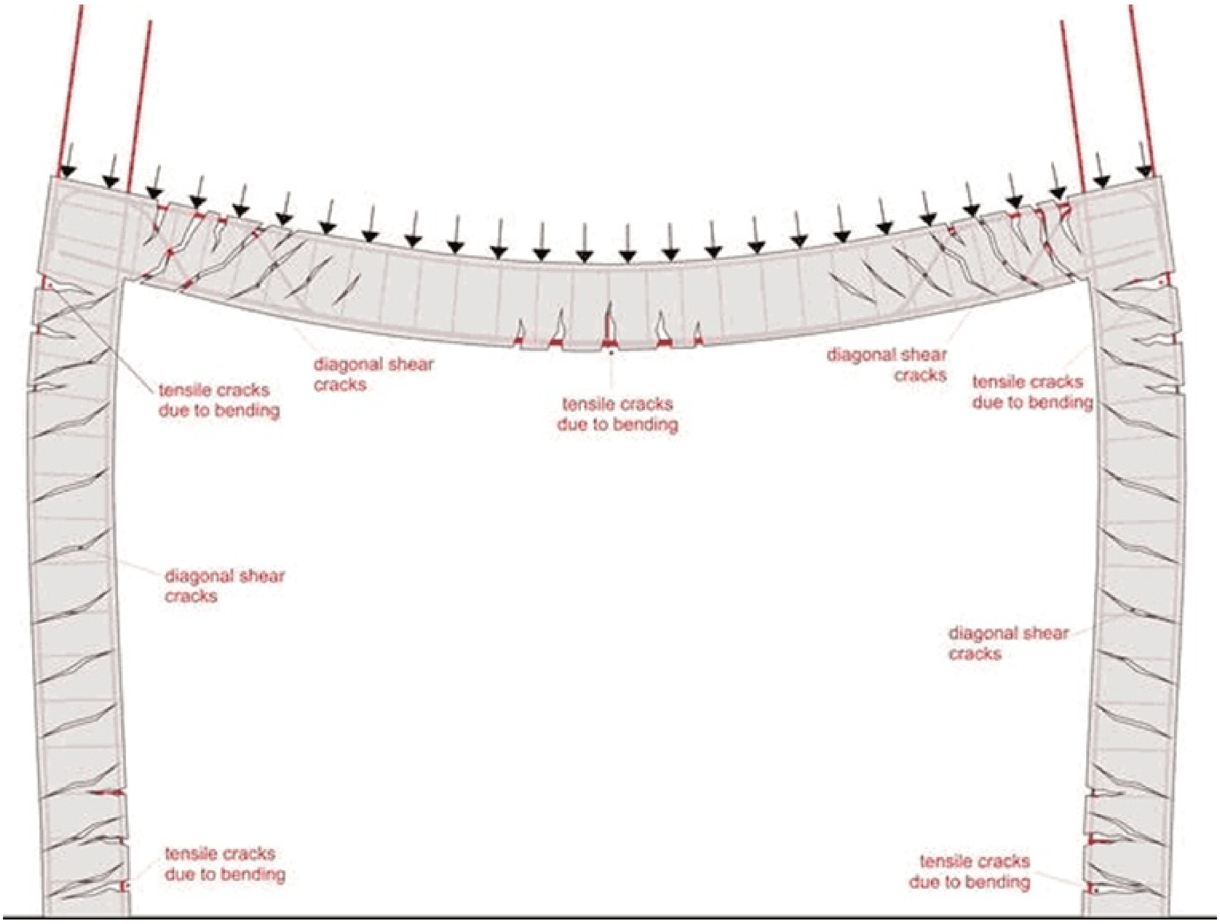
This chemical attack on concrete durability is as a result of the reaction of the silica in certain aggregate types with the alkaline in cement to produce Alkali-Silica Gel. The expansion of the gel when mixed with moisture leads to cracking and delamination of concrete. Its effect may take about 5 to 10 years to appear.



Cracks in concrete

So far, we have seen concrete cracks initiated by environmental conditions resulting in chemical reactions that lead to cracking of concrete. In addition to these, a concrete member can also crack due to overload situations while performing its structural functions. These cracks again expose the reinforcement to corrosion agents and should be eliminated.



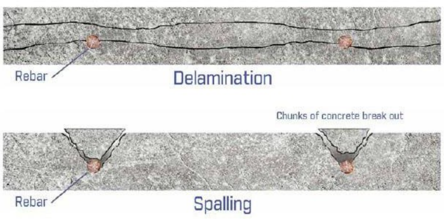


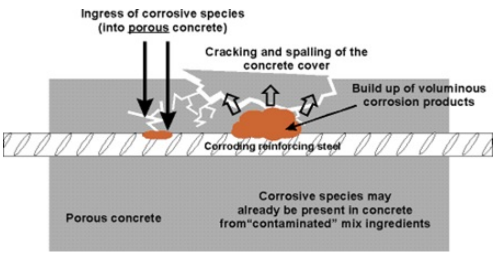
The extent of the crack width measurements can be assessed against a scale such as shown below:

Type of crack	Crack Opening or crack width
Hairline cracks	up to 0.1mm
Minor cracks	0.1 to 0.3mm
Moderate cracks	0.3 to 0.6mm
Severe cracks	> 0.6mm

Spalling of Concrete

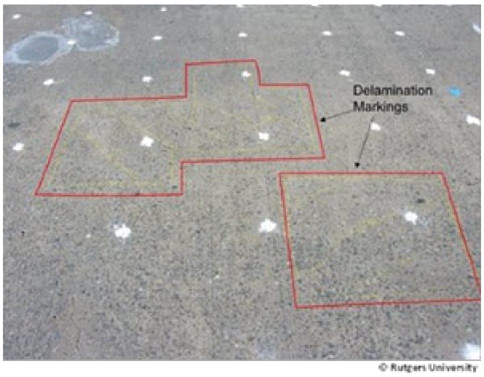
This can be as a result of the chemical attacks previously mentioned. It can also be due to the expansive action of corroded reinforcement exposed from flexural or shear cracks that develop on the member as a result of overload or due to damage by vehicular or vessel impact forces usually at the exposed corners or edges, deck joints or construction joints. In all cases, spalling is characterized by the actual removal or detachment of chunks of the concrete member. Therefore, there is an appreciable loss of concrete section that must be noted and recorded.





Delamination of concrete

This is a discontinuity in the surface concrete that is substantially separated but not completely detached from the concrete below or above it. It may appear as a solid surface but can be identified by a hollow sound that is produced by tapping the concrete with a hammer. Delamination defects may be hard to detect in the field and should be assessed very carefully.



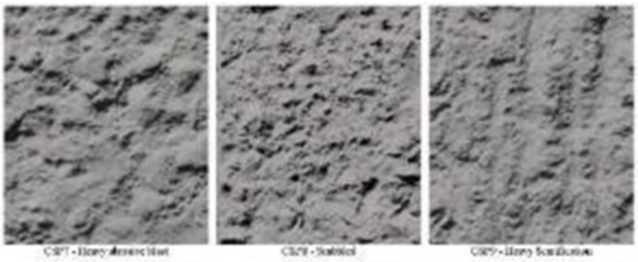
Surface defects in concrete

A surface defect is not necessarily serious in itself, but is indicative of a potential weakness in concrete and needs to be captured during the inspection. Such defects may very well have serious traffic or bridge safety consequences if not treated. There are a few concrete defects under this category and they include:

- Concrete Segregation – due to the differential concentration of the components of mixed concrete.
- Cold joints – produced when there is a delay in the placement of successive pours of concrete.
- Surface Deposits:
    - Efflorescence – deposit of salts, usually white and powdery, resulting from a mixture of salt and water that oozes out to the surface through pores or cracks in the concrete.

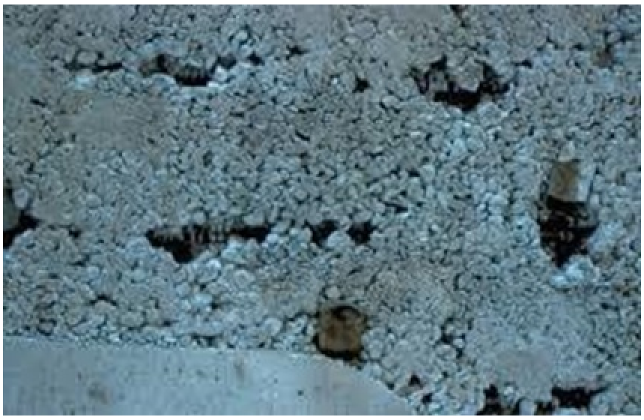
 

- Exudation – Liquid or gel-like discharge through pores and cracks in the surface.
- Encrustation – A hard crust or coating formed on the concrete surface.

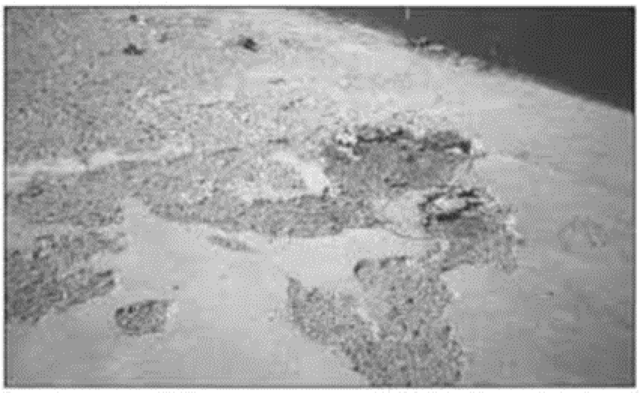
- Stalactite – A downward pointing formation hanging from the concrete surface, usually shaped like an icicle.


- Honey combing - Produced due to improper or incomplete vibration of the concrete, loss of moisture from formwork during concreting, which results in voids in the concrete. The existence of these voids constitutes a danger to the reinforcement embedded in the concrete member.




Abrasion

Deterioration of concrete brought about by vehicles scraping against the concrete surfaces, such as the deck, Kerbs, barrier walls, and Piers.




Slippery surface

Results from the polishing of the Conc. Deck surface by the action of repetitive vehicular traffic.

Steel Members

Similarly, to concrete, the main damage process of steel is corrosion, but also fatigue is an important issue.

1. **Corrosion** –. There are different types of corrosion:
    a. Environmental corrosion – affects metal in contact with soil or water and may be caused by the formation of a corrosion cell due to moisture content, oxygen content, de-icing salt concentrations, and accumulated foreign matter such as roadway debris and bird droppings.
    b. Bacteriological corrosion – caused by organisms found in swamps, bogs, heavy clay, stagnant water, and contaminated water.
    c. Stress corrosion – results from exposure of an increased portion of the metal at the grain boundaries due to the action of tensile forces.
    d. Fretting corrosion – appears on closely-fitted steel parts that are under vibration, and can be identified by pitting and a red deposit at the interface.
    e. Stray current corrosion – caused by cathodic protection systems for pipelines or foundation piles, DC industrial generators, DC welding equipment, central power stations, large substations, electric railways, and railway signal systems.

2. **Fatigue Cracking** – develops in steel member bridges due to repeated loadings. This type of cracking can lead to sudden and catastrophic failure. Out-of-plane distortion affecting member connections is a primary cause. Factors leading to the development of fatigue cracks include:
    a. The frequency of truck traffic (ADT)
    b. The age or load history of the bridge
    c. The magnitude of Stress range (variation in truck configuration & loading)

d. Type of detail of the member (connections most susceptible)

e. Quality of the fabricated detail (existence of stress concentration points to be avoided or minimized)

f. Material fracture toughness (base metal and weld metal)

g. Quality of Welds

3. **Overloads –** loads which exceed that for which the member or structure was designed could lead to crack initiation at the overstressed locations. An overload situation may
produce plastic deformation of the steel after exceeding its elastic limits and may progress to complete failure of the members in tension through elongation and "necking" --- a decrease in cross section --- and in compression members through buckling.

4. **Vehicular Damage** – This is damage caused by impact from a vehicle or vessel. Indications of vehicular damage include dislocated and distorted members.

Steel Defects

Corrosion

Corrosion is the deterioration of steel by chemical or electrochemical reaction resulting from exposure to air, moisture, industrial fumes and other chemicals. Corrosion will occur if the steel is not protected or if the protective coating wears or breaks off. It can result in the loss of section as it progresses and becomes flaky and delaminates, exposing pitted surfaces.

Permanent Deformation

It can take the form of i. Bending, ii. Buckling, iii. Twisting, iv. Elongation, v. combinations of these. It may be caused by overloading, vehicular collision, or inadequate or damaged intermediate lateral supports or bracing:

1. Bending Deformation – usually associated with the flexural members.

2. Buckling Deformation – usually associated with the compressive members, e.g. web, flanges of beams, plate girders, or box girders.

3. Twisting Deformation – rotation of the member about its longitudinal axis, and is usually as a result of eccentric transverse loads on the member.

4. Axial deformation – occur along the length of the member and is normally associated with internal tension forces.

Cracking

This is a linear fracture of the steel. It is mainly produced due to fatigue and can, under certain conditions, lead to brittle fracture.

1. Brittle Fracture – a crack completely through the component that usually occurs without prior warning or plastic deformation. Brittle fracture may result in fatigue-prone details after the initial fatigue cracking.

2. The primary factors leading to fatigue crack are – The number of applied stress cycles, which is a function of Average Daily Traffic(ADT), the magnitude of the stress range (i.e. live load range and fatigue strength of the

connection).

3. The locations susceptible to cracking in steel members are:
    a. Locations of Stress Concentration e.g. Weld/Joint members.
    b. Locations with Loss of Sections due to corrosion.
    c. Point of Stress Concentration due to poor quality of fabrication details
    d. Welded details are more prone to cracking than bolted and riveted details, but bolts and rivets can also crack. However, the cracking is unlikely to extend to the adjacent members and will just weaken the joint.

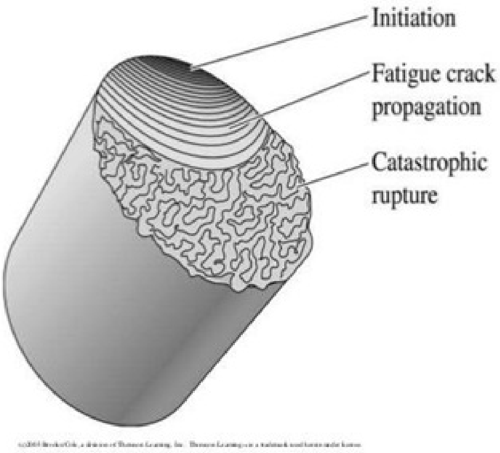


Figure : Schematic representation of a fatigue fracture surface in a steel shaft, showing the initiation region, the propagation of fatigue crack (with beam markings), and catastrophic rupture when the crack length exceeds a critical value at the applied stress

Note: Cracks perpendicular to the direction of stress are very serious, with those parallel being less so, but can still turn into perpendicular as they run unchecked.

Timber Members

1. **Wood Decay** – untreated wood or portion thereof is vulnerable to damage by living organisms and predators including:
    a. Fungi – plants that feed on the cell walls of a wood
    b. Parasites – these tunnel in and hollow out the insides of timber members for food and shelter (e.g. termites, carpenter ants, powder-post beetles, marine borers, and caddisflies).
2. **Chemical Attack** – chemicals do not cause structural degradation to wood, but animal waste can cause damage. Also, strong alkalis will destroy wood fairly rapidly.
3. **Checks** – partial-depth separation of fibres, of which crack or fissures do not extend through the piece from one face to face of the wood.
4. **Splits** – full-depth cracks extending from face-to-face of the wood.
5. **Knots** - A knot is a particular type of imperfection in a piece of wood; it affects the technical properties of the wood, usually reducing the local strength and increasing the tendency for splitting along the wood grain.
6. **Cracks** - cracks resulting from overstress.

7. **Damage from other Sources** – wood deterioration can also be caused by:'
    a. Fire
    b. Impact or collision
    c. Abrasion or mechanical wear
    d. Overstress (leading to cracks)
    e. Weathering or warping

Masonry Members

1. **Weathering –** occurs when a hard surface degenerates into small granules, giving stones a smooth, rounded look.
2. **Spalling –** occurs when small pieces of rock or bricks break out or chip away
3. **Splitting** – occurs when seams or cracks open up in rocks or bricks, eventually breaking them into smaller pieces.
4. **Bulging** – a change in shape or bending of the face of a masonry wall, usually due to the soil behind pushing part of the face outwards (can happen in abutments, retaining walls, or barrels of spandrel walls of masonry arch bridges. Vehicular impact can cause masonry parapets to bulge
5. **Poor Pointing** – refers to the mortar between the bricks or stones. The mortar can be worn away by the river or rainwater, running down the face of the masonry.
6. **Cracking** – can be caused by overloading, vibration or impact from traffic, by failure of the foundation, temperature changes, or by wetting and drying.
7. **Spandrel Wall Separation** – may occur in arched masonry bridges when lateral forces acting on the spandrel wall result in the spandrel slipping over the arch back. It is usually a sign that the bridge is overloaded or over-ballasted.
8. **Ring Separation** – may occur in arched masonry bridges as result of inter-ring stresses caused by either settlement or increased loading over time. Chemical action may cause the arch barrel to deteriorate, with individual rings contracting and separating from their adjacent and/or subsequent rings, leaving voids in the worst cases.
9. **Distortion –** occurs as result of the development of transverse cracks in masonry bridge members.

Some causes of the above forms of deterioration include:

a. **Presence of Chemicals** – gases and solids dissolved in water often attack rocks and the cementing compounds between the rocks.
b. **Volume Changes** – seasonal expansion and contraction can cause tiny seams to develop, weakening the rock.
c. **Frost and Freezing –** water freezing in the seams and pores of rocks can spall and split the rock.

d. **Abrasion** – mainly due to wind- and waterborne particles.

e. **Plant growth** – roots and stems growing in crevices or joints can exert a wedging force. Also, lichen and ivy can chemically attack stone surfaces.

f. **Marine borers** – rock-boring molluscs attack rocks by means of chemical secretions.

g. **Backfill saturation** – saturated backfill soil may lead to excessive pore pressures in the backfill soil, which can in turn lead to excess active pressure on the masonry walls and eventual failure of the walls.

Aluminum Members

1. **Fatigue cracking** – the combination of high stresses and vibration caused by wind produces fatigue.

2. **Pitting** – aluminium can pit slightly, but this condition rarely becomes serious.

General defects not related to bridge material

Scouring of Foundation

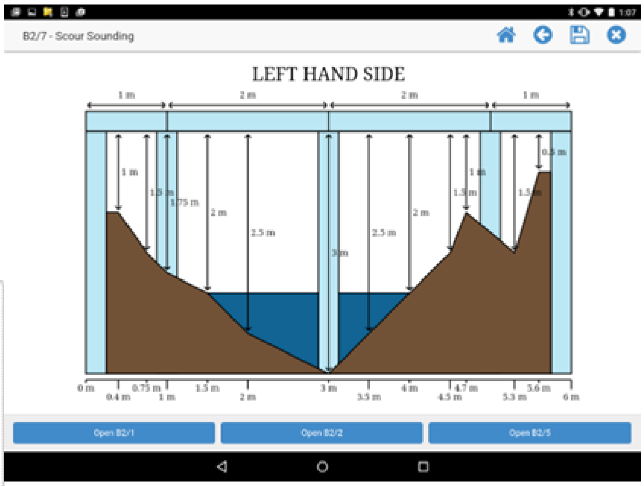
Scouring of foundation caused by excessive stream flows or changes in the alignment of the stream channel can result in the progressive settlement or movement of abutments and piers and consequently to total bridge collapse if unchecked. Scour is perhaps the biggest threat to the substructure and foundation components regardless of the material the structural component is made of. Exposure of the foundation components and erosion of the surrounding soil strata is a recipe for disaster and poses a serious safety hazard to the structural integrity of the bridge and must be avoided or corrected immediately.

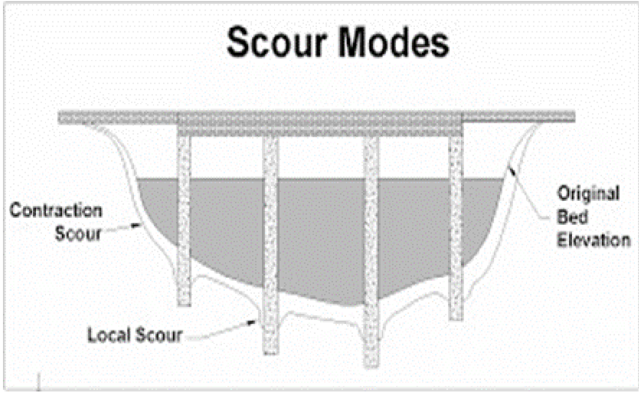
Scour Modes are in three main forms:

1. **General Scour** – occurs naturally in stream channels and includes the aggradation and degradation of the stream bed, which may occur as a result of changes in the hydraulic parameters governing the channel form such as changes in the flow rate or changes in the quantity of sediment in the river channel.

2. **Contraction Scour** – occurs as a result of the reduction in the channel's cross-sectional area that arises due to the construction of structures such as bridge piers and abutments. It manifests as an increase in flow velocity and the resulting bed shear stresses, thus causing scour.

3. **Local Scour** – occurs around individual bridge piers and abutments.





Movement Deflection

Usually, movements in bridges can be detected and should be recorded by observing total closures or excessive openings of deck expansion joints:

1. Bearing or jamming up between the end of the Superstructure and Abutment ballast wall, with the associated cracking and spalling of concrete that will occur.

2. Cracking or excessive settlement of the approach embankments or heaving at its toe.

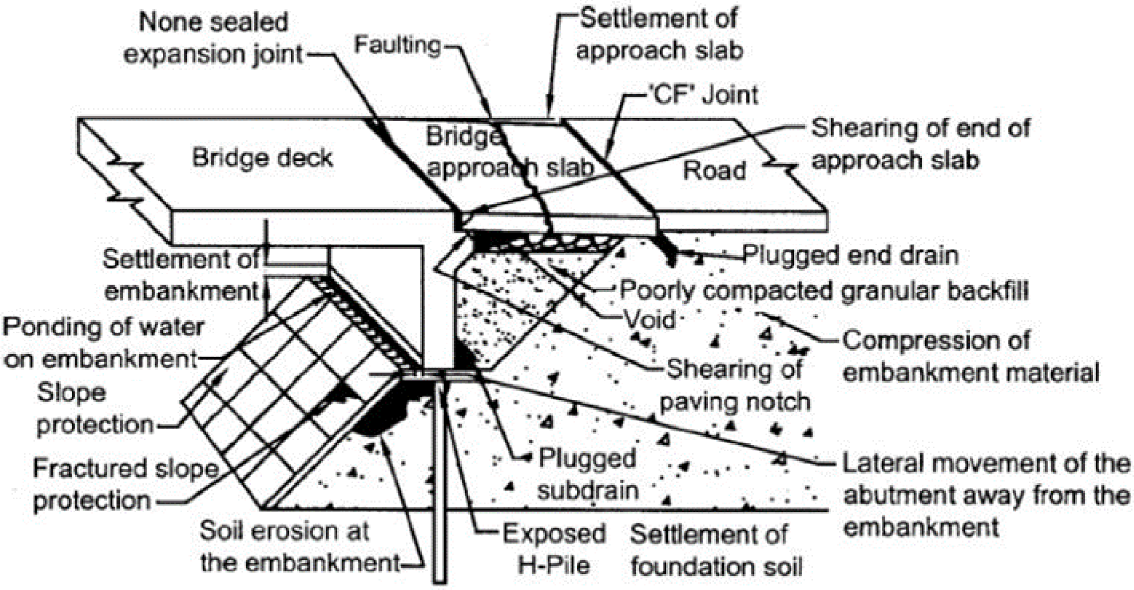
3. Scour causing undermining of the foundation components.

4. Out-of-verticality of columns, piers, abutments, and service or utility poles.

Conditions at the Approach

An Embankment is used to provide a stable road between the bridge and the surrounding ground. Often, it is also required for providing horizontal, and sometimes vertical support for the Abutment and foundation. The most common defect associated with the Approach is excessive settlement
adjacent to the bridge abutment, which causes unsatisfactory riding quality and possible damage to the deck and expansion joints. Excessive settlement at the bridge approach span interface with the main bridge structure resulting in a “bump” is a safety hazard for the vehicular traffic and its users. Possible reasons for this failure include:

- Poorly compacted embankment
- Continuing settlement of the underlying ground
- Erosion due to blockage or inadequate drainage



Embankment

Expansion Joints

They are installed to allow the horizontal movement of bridge components resulting from environmental forces and vehicular traffic loading. Furthermore, they are often designed to protect the bridge underneath from the ingress of water or salts and other corrosive chemicals through the bridge deck by the installation of rubber seals or its equivalent. Two of the main effects to check at the expansion joints during the inspection are the excessive opening of the joint resulting from the horizontal movement and for broken rubber seals.

Vegetation

Uncontrolled and excessive growth of vegetation under or adjacent to the bridge does not in itself cause damage to the bridge. It can, however, cause fire hazard, blockage to the waterway, and build- up of debris and moisture around abutments and bearings.

Debris

The build-up of debris on the upstream side of the bridge can cause the following adverse effects on the bridge:

1. Imposed loads on the bridge during flooding, which it was not designed for.
2. Cause blockage of the bridge waterway during flooding, which can exacerbate problems of scour, undermining of foundations, flooding, and in extreme cases, total blockage and diversion of the watercourse.
3. Build-up of debris below a bridge may become a fire hazard, increasing the risk of fire damage to pile and pier caps or bent.

Drainage

Ineffective bridge drainage may affect the bridge in several ways:

- Flooding of the bridge deck, which may create serious traffic hazard.
- Uncontrolled water ingress over concrete or steel surfaces or bearings below the deck level may result in corrosion or unsatisfactory performance of the bearings.
- The debris carried by drainage flows may build up in areas, retain moisture and promote corrosion.
- Uncontrolled discharge from the deck can cause erosion of Approaches and Batters, and possibly undermine

the foundation.
- Leakage of bridge decks through joints and cracks may cause unsightly staining of beams, piers, and abutments.
- Inadequate collection of drainage from the bridge approaches can also cause erosion, piping, and washout or scour of the Approach Embankment and Batter slopes.

Utility and Services

Utilities, including Lightings and Pipe lines, are often found on bridges and must be inspected for their functional integrity, especially with respect to the bridge structure.

Pipe lines

HOW TO - Add a Project Record into the System

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In this article, we will show you how to add a Project record into the AWM System.

Step-by-Step Guide Video

The video below provides a detailed walkthrough and the article includes a step-by-step guide.

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Setting Up for this Work

Materials used as inputs

In order to add a project and/or contract, you will need some reference documents that contain information about the project. This might include your most recent Monthly or Quarterly Project Report(s) or a spreadsheet file with a list of projects and associated information such as estimated cost, location, type of work etc.

Relevant Data Layers

To support this process, the user should add the following data layers to the system.

These layers are as follows:

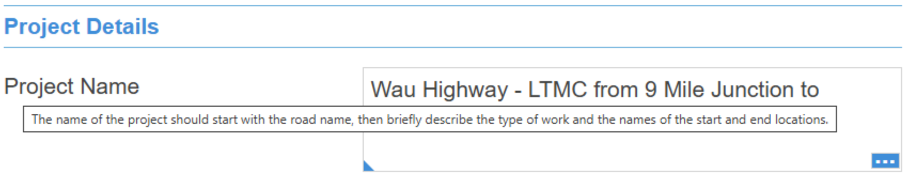
Data Layer	Description
DoWH Projects	Table of all Projects that have been added to the System. Contains information about project location, financials, status etc.

Data Layer	Description
DOWH Contracts	Table of all Contracts that have been added to the System. Containing information about contract financials, contractor details etc.
Carriageway Sections	Each road is split into one or more sections and in AWM these are called Carriageways. A carriageway holds information about the given segment of road, including ownership, dimension data, pavement type, hierarchy (road classification), network type and terrain.
Data Fix Request	Table for recording fixes that need to be made – for this exercise, this is likely to be missing roads or mistakes in the centrelines.

How to add a Project record

How do I know what information to enter?

Description of fields can be found in the Field Descriptions article. When using the table, you can also hover your mouse over the field to see a brief description of the field (see below example).



You should also pay attention to the type of data that can be entered as described in Field Description article (data entry column), for example – do not use commas (,) when entering the financial information.

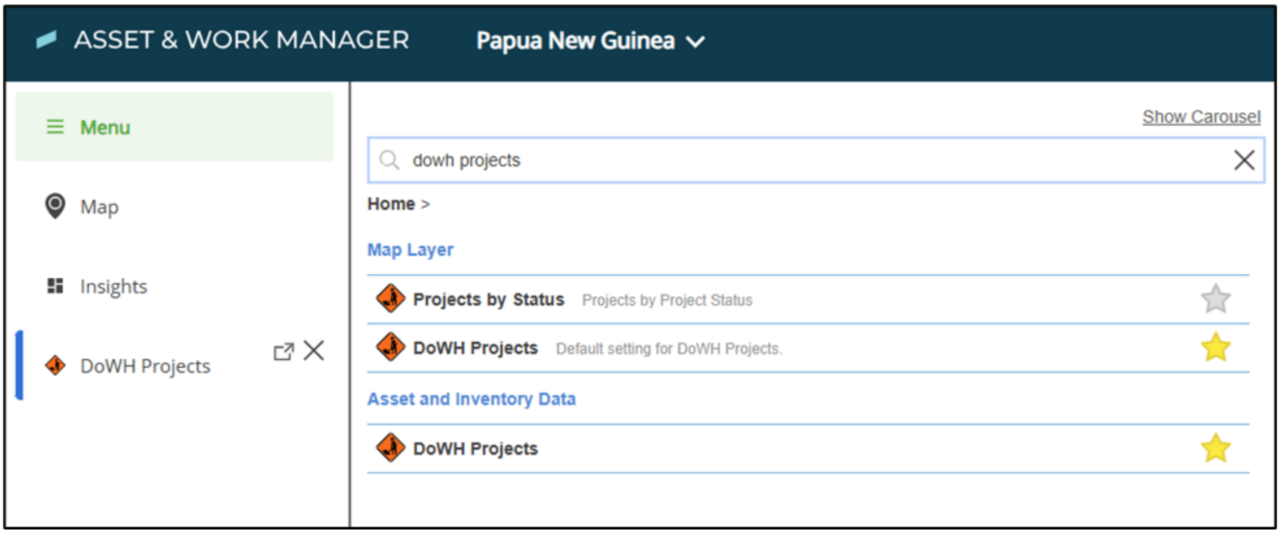
Step-by-step Guide for adding the Project

1. Firstly, you should identify a project that needs to be added to the System – a project should be added to the system when:

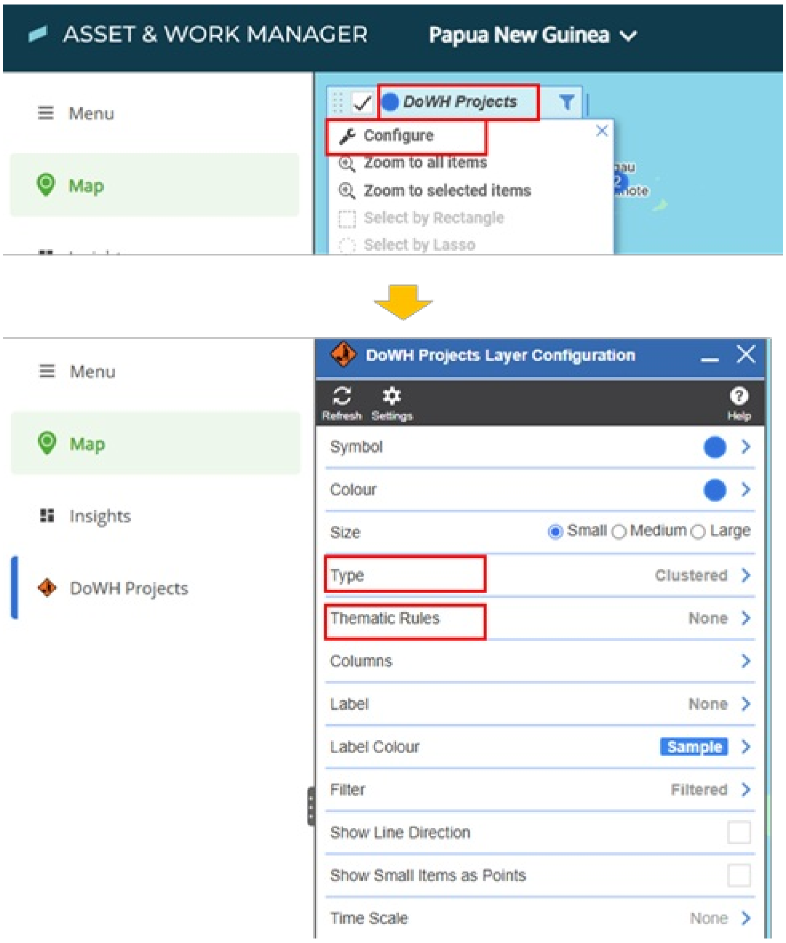
- It is not already in the System (see step 7 on how to check)
- It needs to be monitored and reported on an ongoing monthly basis or
- It is a proposed project that should be added for all stakeholders to be able to view.

NOTE: If you want to add the project but it is not on a road currently in the System, you can still add this project – following the instructions in this article.

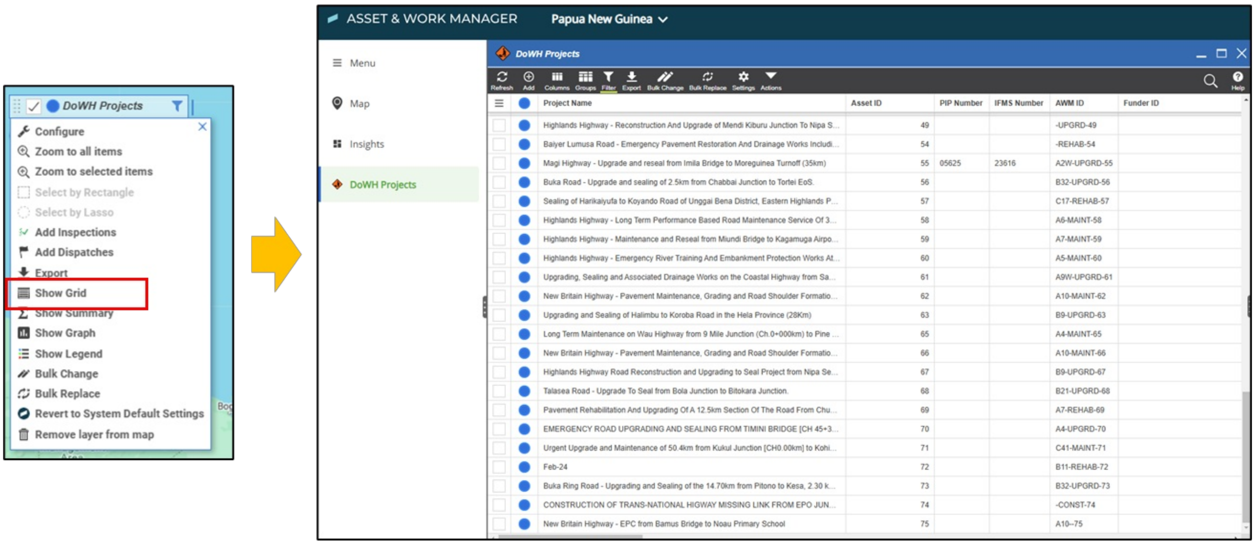
2. In the System, go to the Menu and search for 'DOWH Projects'



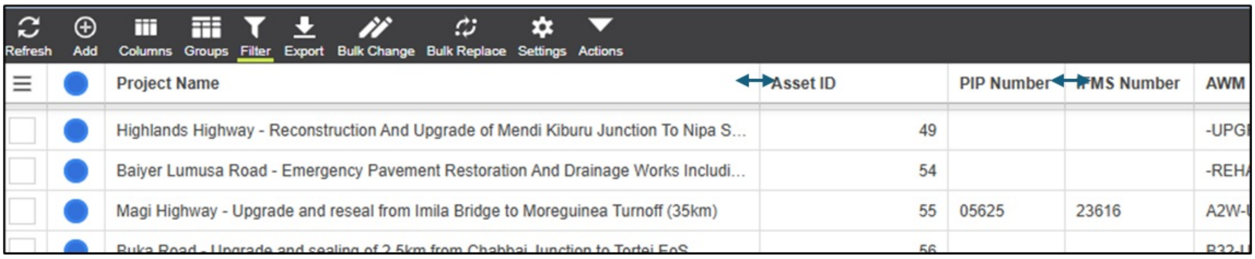
3. Click on the layer name and update configuration using 'Configure' to change how you view the project on the map. For example, you might want to change the 'Type' from *Clustered* to *Standard*, and potentially use Thematic Rules to view Projects by *Type of Work* or *Status* (see example below).



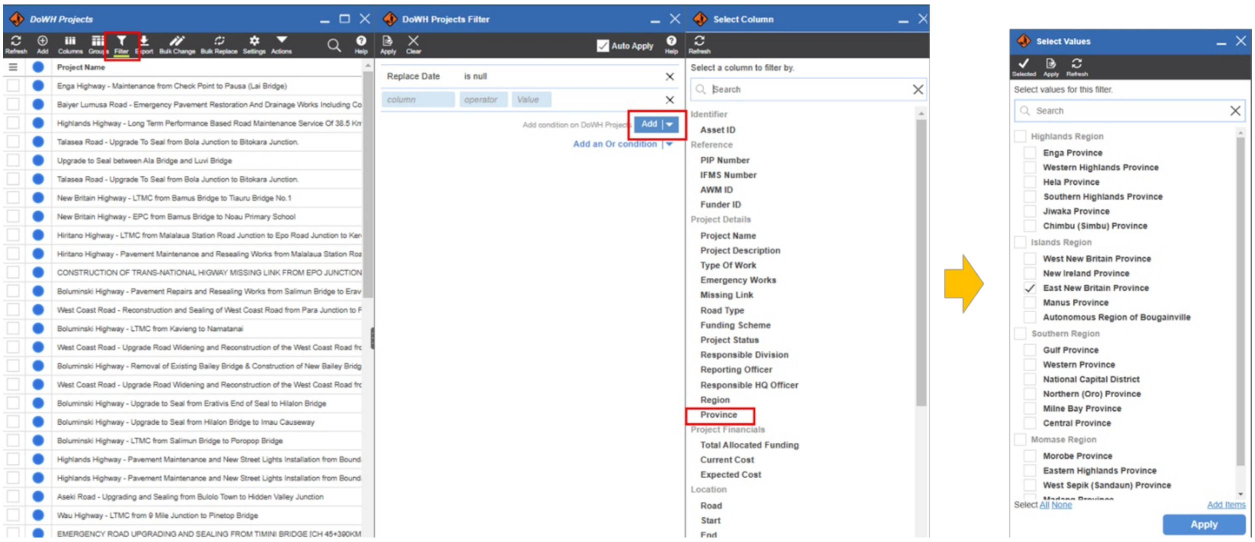
4. To see the list of projects as a data table, click on the layer and select 'Show Grid'.



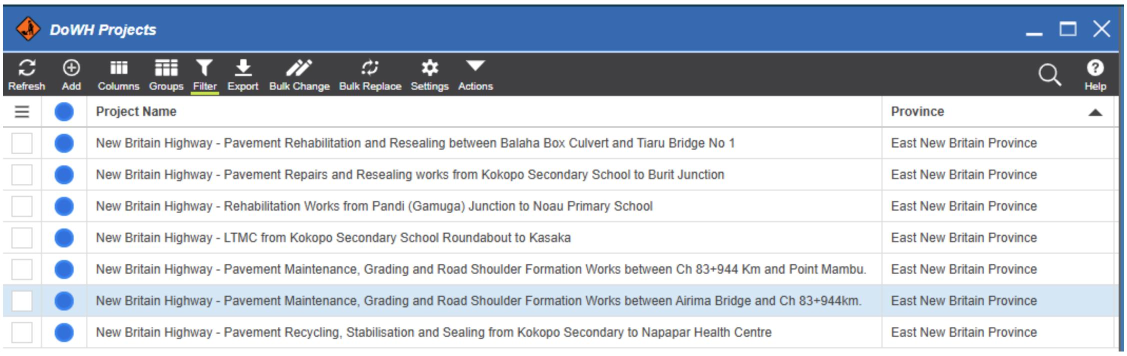
5. You can then adjust the table to more clearly show the list of projects by making the column widths wider or tighter and re-ordering the columns.



6. Use the 'Filter' option to only show the projects that you are interested in. For example, you might want to only see projects in your Region, Province or that are on a specific road.

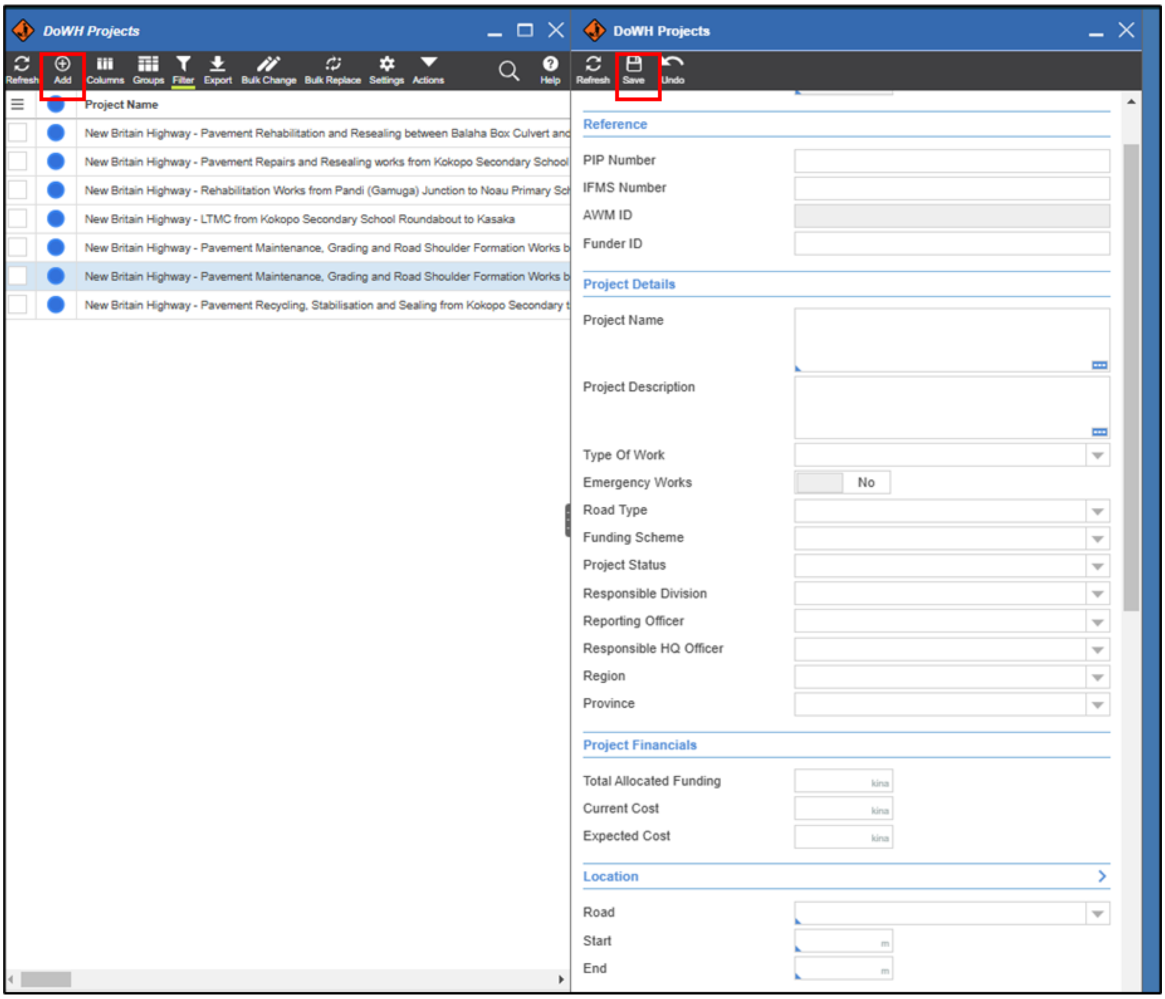


Filtered table only showing East New Britain Province projects:



7. Before you start adding the project, you need to check whether it has already been added or not. The best way to do this is to filter to the Province and/or the Road where the project is located and check that there is not a project name that shows the same type of work at the same location of the road (or structure). If there is already a project, then do not add. Or if you're unsure you can check with your colleagues.

8. A new project can now be added using the 'Add' button located on the black ribbon at the top of the grid. By clicking this button, you open the 'Details' panel which is a blank record where you can enter information about the project.



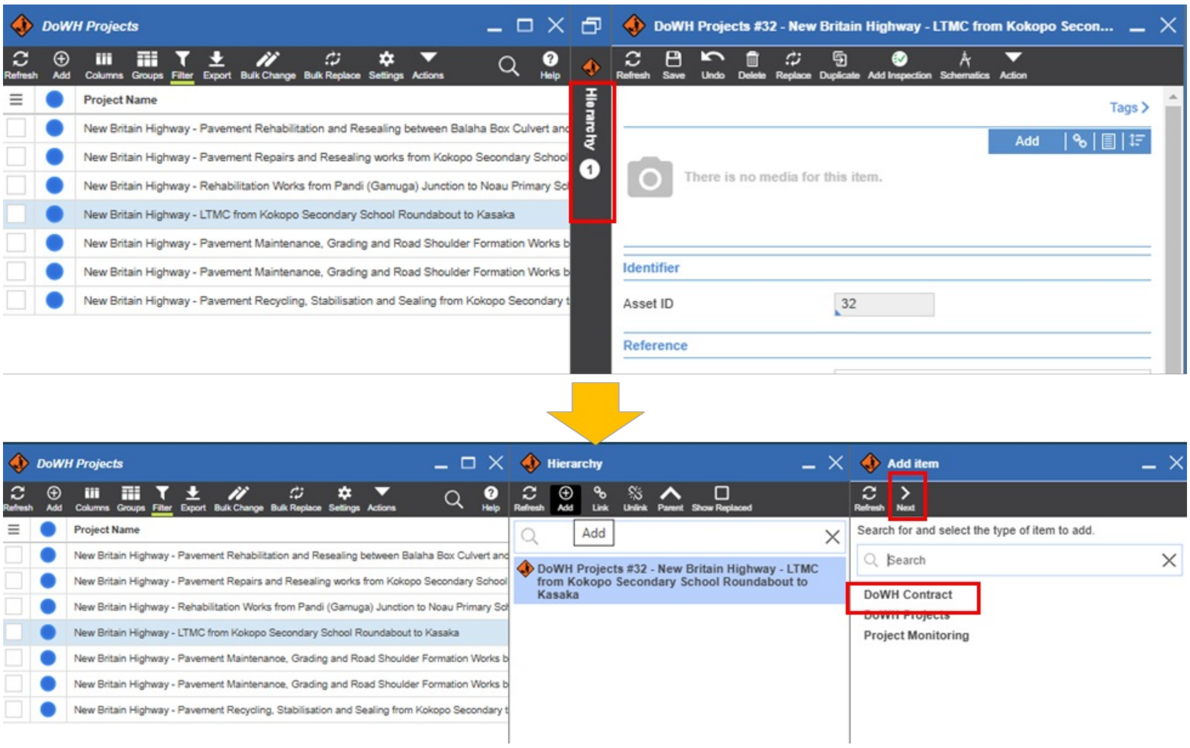
9. See the Field Descriptions article for more details about what data should be entered for which field.

HOW TO - Add a Contract Record into the System

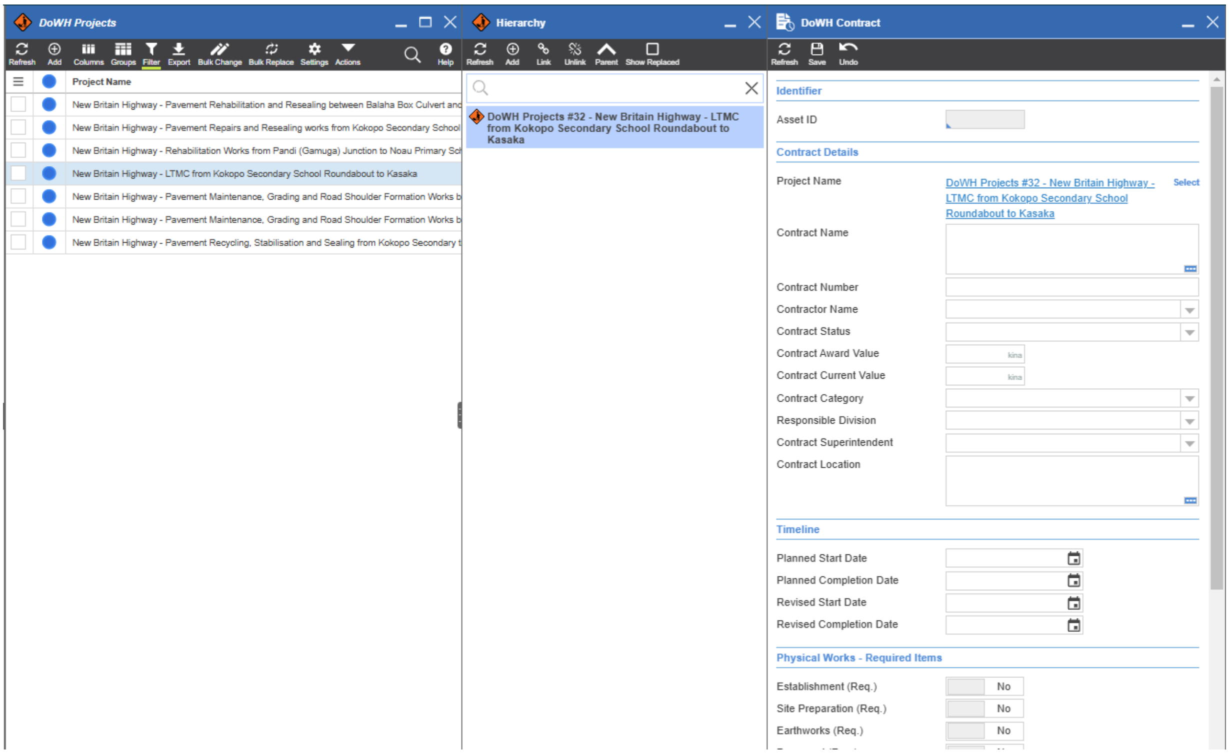
02/04/2025 11:14 am +10

1. A contract record should also be added to the Project if the Contract already exists or is being negotiated and already has a contract number.

2. To add a contract, you need to click on the ‘Hierarchy’ button next to the details panel. With the Project highlighted, click the ‘Add’ button on the top ribbon.



3. This will open a new empty Contract record where you can enter information about the Contract.



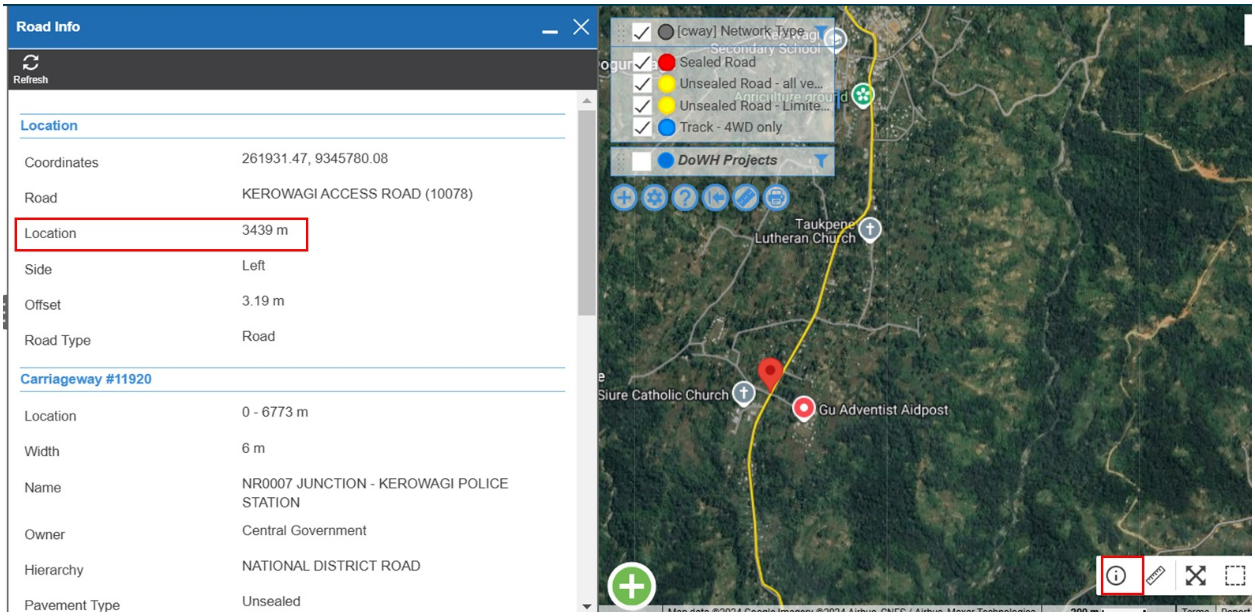
4. See the Field Descriptions article for more details about what data should be entered for which field.

HOW TO - Find the Start and End Locations

02/04/2025 11:15 am +10

To find the Start and End locations, do the following:

- Use the ‘From’ and ‘To’ locations found in the Project Name and Project Description fields as a reference, then you need to find these locations on the map.
- Once you’ve identified the location, you should make sure the Carriageway Section layer is on the map (in Standard view)
- Use the ⍰ (in the bottom right corner) to identify the chainage. When you have selected the ⍰ your cursor will change from an arrow to a cross hair ✛ symbol. When you select a point on the carriageway in this mode, it will bring up a panel on the left, find the ‘Location’ which is a number that represents the chainage location. Enter this in the Start or End (Start should be the From).
- The Start chainage needs to be a lower value than the End chainage, so you may need to switch them around.



If you don’t know the Start and End chainage when you are entering the data, you can just use Start = 0 and End = 1, so that you can Save the record, then go and find the correct chainage on the map and then save it again.

HOW TO - Add a Project that is on a road that is not in the AWM System

16/12/2024 1:33 pm +10

In some cases, there will be projects that need to have a monthly report generated each month but they are not located on a current national road and therefore, are not represented in the AWM System. For example, a sub-national or provincial road or a structure on one of these roads. We can still add these to the System using the method shown in this video.

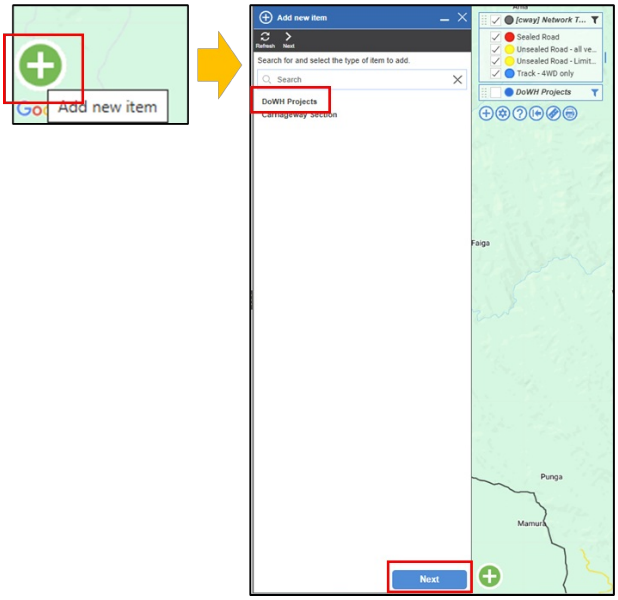
NOTE: If it is a Missing Link project, and the planned route is not in the System, there should be a Data Fix Request created to request it is added to the ‘Carriageway Section’ data layer with a Network Type = ‘Proposed Road’. You can still use this method to add the project while that data fix request is being processed.

Step-by-Step Guide Video

Your browser does not support HTML5 video.

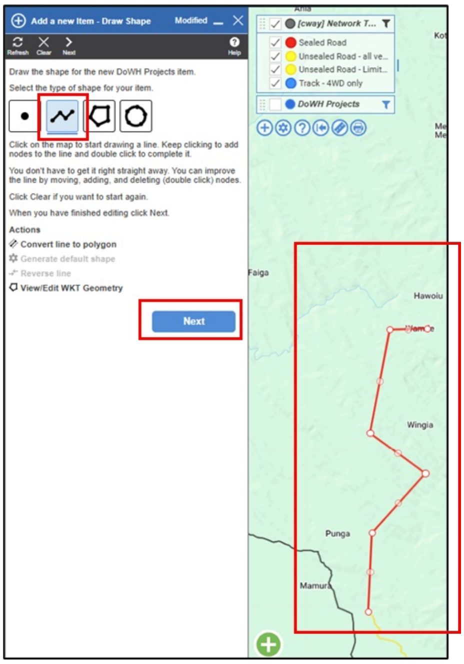
Step-by-step Guide to add a Project not on a National Road

1. Use the green plus ‘Add new item’ button in the bottom left corner. Select the ‘DoWH Projects’ layer and press Next.

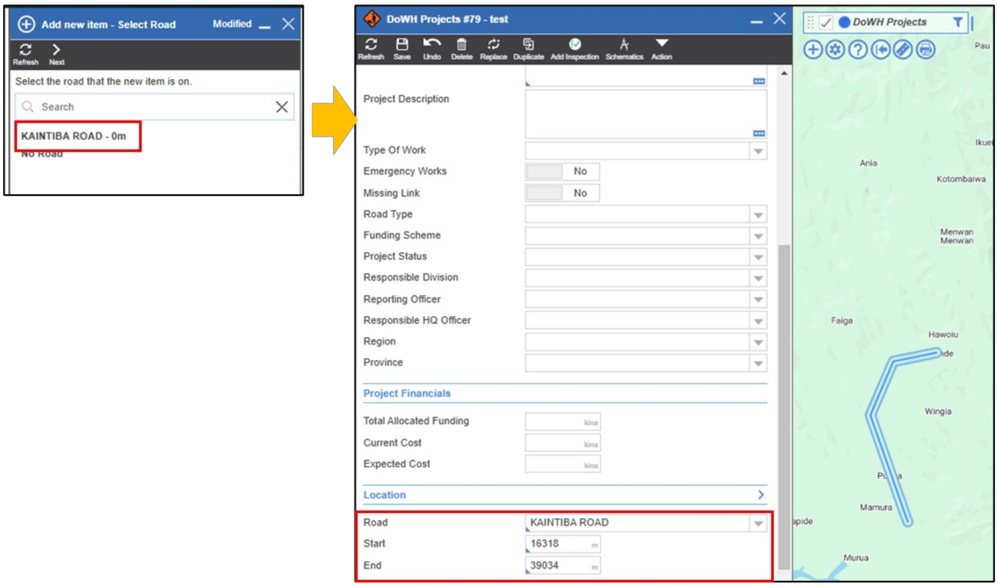


2. You can then draw a line on the map to represent the project location:

- Select the point you want the project to start
- Click where you want the route to turn
- When you are finished you should double click on the last point.
- Then select Next.



3. After you click Next you will be asked to select the road the new project is on. Select the first road that appears in the list. NOTE: The System will allocate the Project to this road, but you will still be able to see the location that you drew on the map. In the PDF report this allocated road will be over-written.



4. You can now enter the project details as you would have normally. See the Field Descriptions section below for more details about what data should be entered for which field.

Frequently Asked Questions

Do I need to fill out every single field?

It is best to provide as much detail as possible about the project and contract. However, if you do not know the right answer, and cannot confirm it with your colleague, then you can leave it blank.

Fields with the blue triangle in the corner indicate this is a 'required field' and you will not be able to submit the form without entering a value.

What do I do if I'm trying to add a new Project but I discover that data is incorrect when I'm searching for the project location?

In this situation you should raise a *Data Fix Request* and recommend the required change.

What if my project is not on one of the roads in the System?

You can still add the project but using a slightly different method to start with.

HOW TO - Edit a Project

17/01/2025 8:05 am +10

This article provides guidance on how to edit projects (and associated contracts) in the AWM system.

Step-by-Step Guide Video

In this video, using an example, we demonstrate how to edit a project record.

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Setting Up for this Work

Materials used as inputs

In order to edit a project and/or contract, you will need some reference documents that contain information about the project. This might include your most recent Monthly or Quarterly project report(s) or a spreadsheet file with a list of projects and associated information such as estimated cost, location, type of work etc.

Relevant Data Layers

To support this process, the user should add the following data layers to the system.

These layers are as follows:

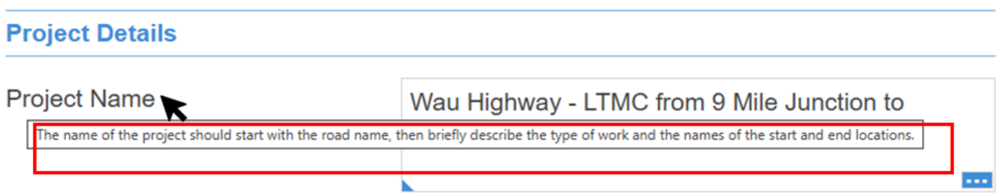
Data Layer	Description
DoWH Projects	Table of all Projects that have been added to the System. Contains information about project location, financials, status etc.
DOWH Contracts	Table of all Contracts that have been added to the System. Containing information about contract financials, contractor details etc.

Data Layer	Description
Carriageway Sections	Each road is split into one or more sections and in AWM these are called Carriageways. A carriageway holds information about the given segment of road, including ownership, dimension data, pavement type, hierarchy (road classification), network type and terrain.
Data Fix Request	Table for recording fixes that need to be made – for this exercise, this is likely to be missing roads or mistakes in the centrelines.

How to edit a Project record

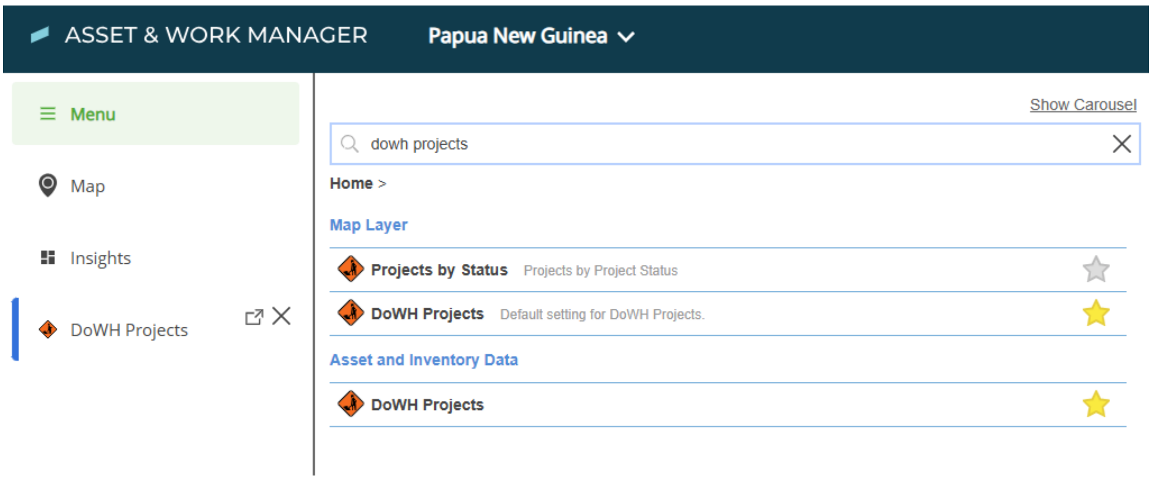
How do I know what information to enter?

A description of what should be entered for each field is available in the Field Descriptions article. When using the table view in the System, you can also hover your mouse over the field to see a brief description of the field (see below example).

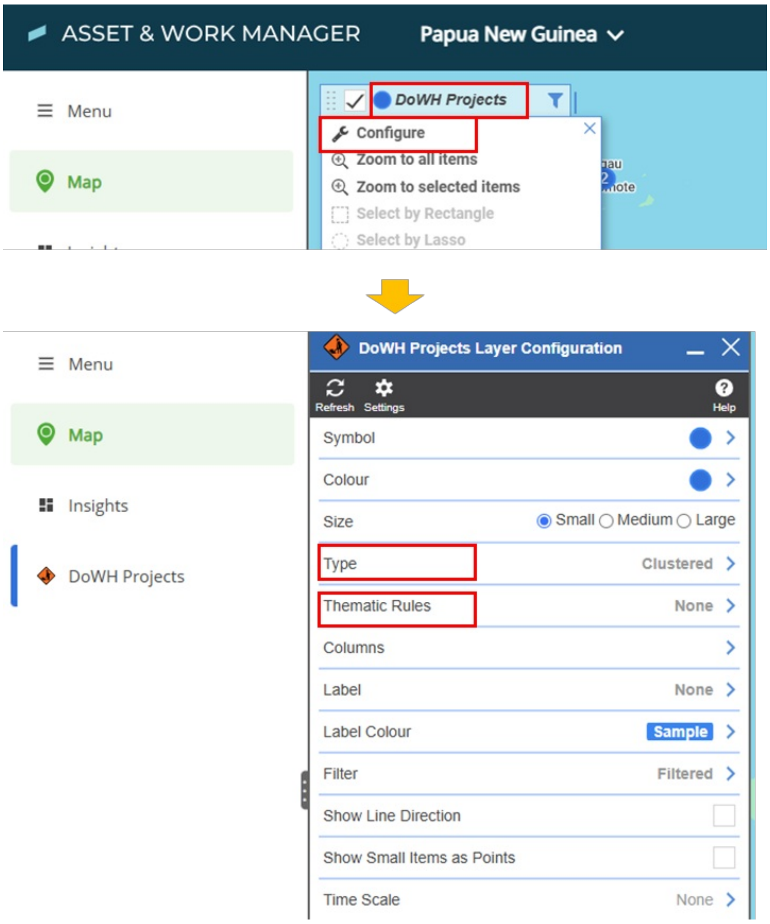


Step-by-step Guide for editing a Project record

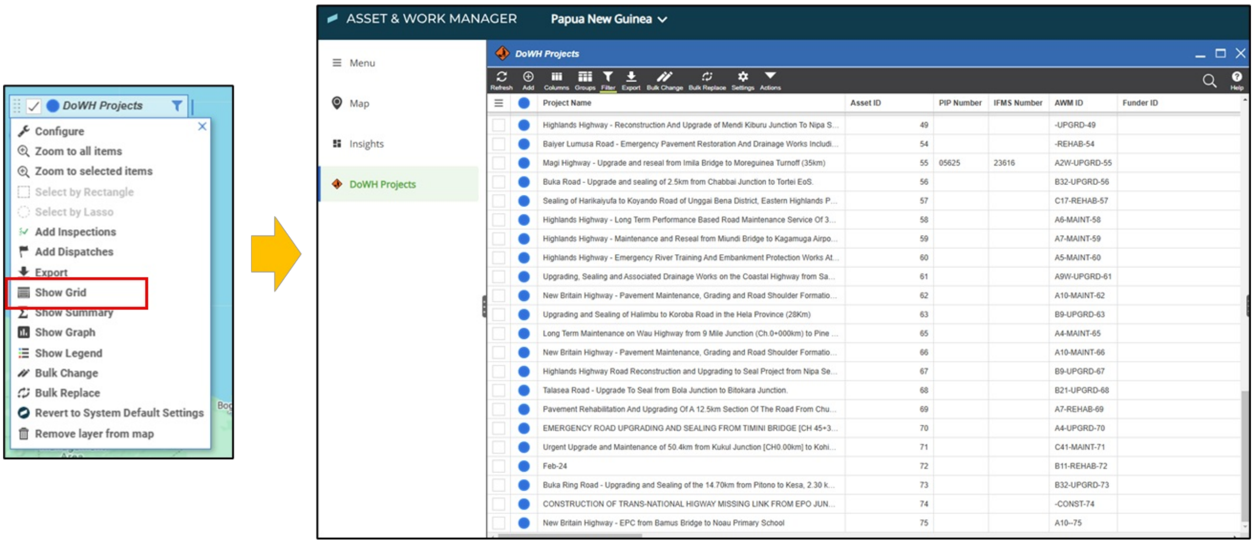
1. In the System, go to the Menu and search for 'DOWH Projects'



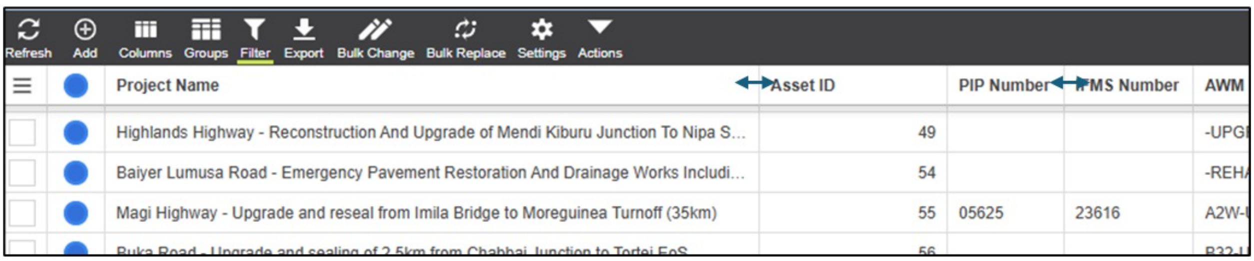
2. Click on the layer name and update configuration using 'Configure' to change how you view the project on the map. For example, you might want to change the 'Type' from *Clustered* to *Standard*, and potentially use Thematic Rules to view Projects by *Type of Work* or *Status* (see example below).



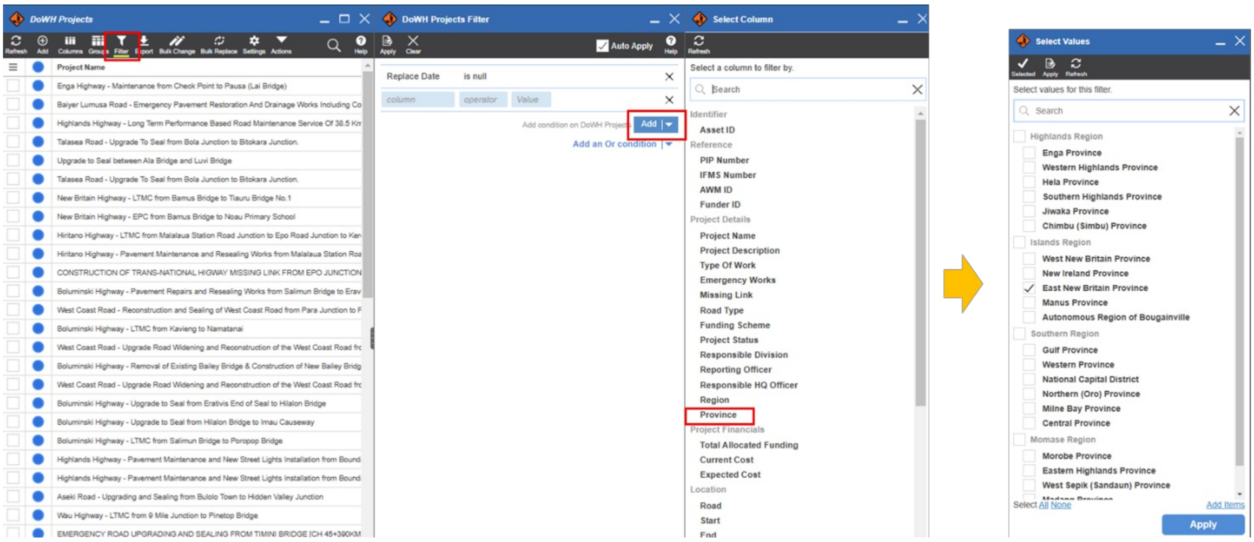
3. To see the list of projects as a data table, click on the layer and select 'Show Grid'.



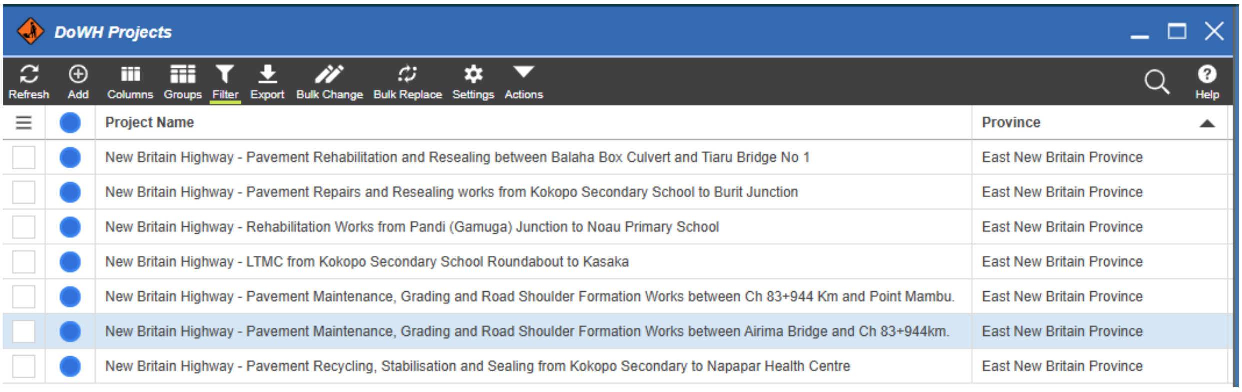
4. You can then adjust the table to more clearly show the list of projects by making the column widths wider or tighter and re-ordering the columns.



5. You can use the ‘Filter’ option to only show the projects that you are interested in. For example, you might want to only see projects in your Region, Province or that are on a specific road.

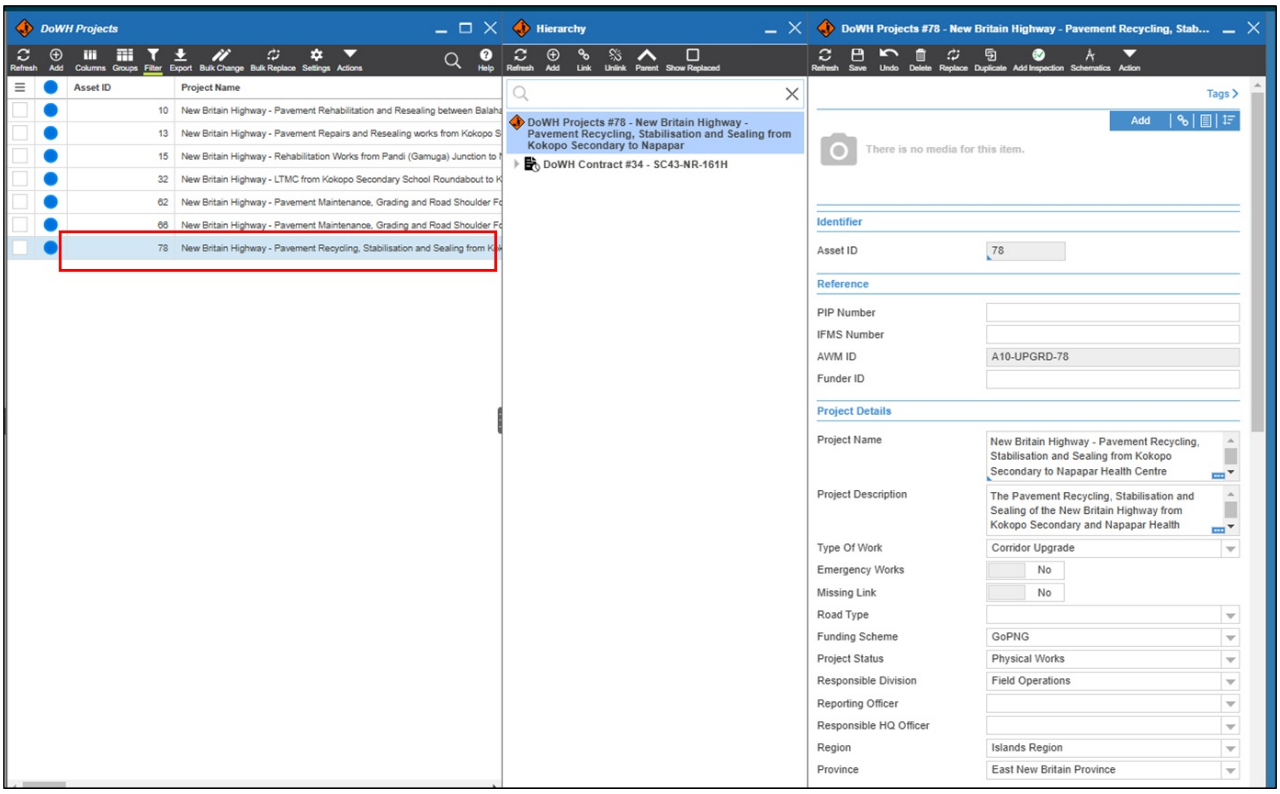


Filtered table only showing East New Britain Province projects:



Project Name	Province
New Britain Highway - Pavement Rehabilitation and Resealing between Balaha Box Culvert and Tiaru Bridge No 1	East New Britain Province
New Britain Highway - Pavement Repairs and Resealing works from Kokopo Secondary School to Burit Junction	East New Britain Province
New Britain Highway - Rehabilitation Works from Pandi (Gamuga) Junction to Noau Primary School	East New Britain Province
New Britain Highway - LTMC from Kokopo Secondary School Roundabout to Kasaka	East New Britain Province
New Britain Highway - Pavement Maintenance, Grading and Road Shoulder Formation Works between Ch 83+944 Km and Point Mambu.	East New Britain Province
New Britain Highway - Pavement Maintenance, Grading and Road Shoulder Formation Works between Airima Bridge and Ch 83+944km.	East New Britain Province
New Britain Highway - Pavement Recycling, Stabilisation and Sealing from Kokopo Secondary to Napapar Health Centre	East New Britain Province

6. Now that you can see all the projects in your Province, you can click on a project record, which will open the ‘Details’ panel which is where you can edit information about the project.

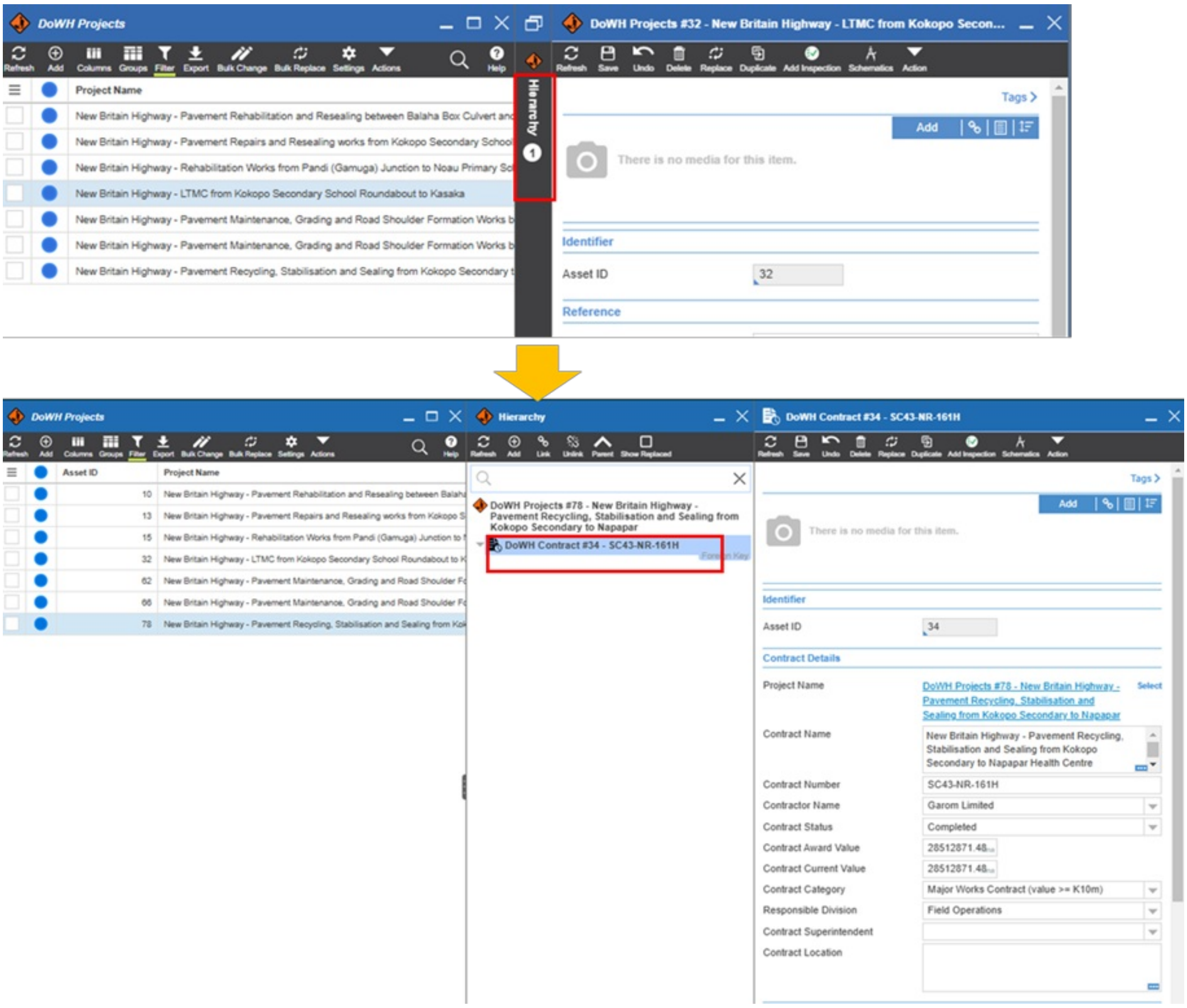


7. See the Field Descriptions article for more details about what data should be entered for which field. Some ways you might want to edit the project:

- Make sure that the Location is correct. To do this you need to edit the *Start* and *End* locations (see video guide for how to do this).
- Update the *Project Status* – if the Project has moved from 'Design' to 'Physical Works', this will need to be updated. Or if the project has been put on hold or cancelled, this also needs to be updated.
- Update the Financial Details – if there has been a variation to increase the project scope, or a reduction in scope, then the *Total Allocated Funding*, *Current Cost* and *Expected Cost* should all be updated.
- Update the personnel responsible for the project. To do this update the *Reporting Officer* and/or the *Responsible HQ Officer*.

Step-by-step Guide for editing the Contract

1. To edit a contract, you need to click on the 'Hierarchy' button next to the details panel. Select the Contract record, which sits below the Project record.



2. This will open the Contract record where you can edit information about the Contract.

3. See the Field Descriptions article for more details about what data should be entered for which field. Some ways in which you might want to edit the contract:

- Update the *Contract Status* – if the Contract has moved from 'Pending' to 'Active, this will need to be updated. Or if the Contract has been put on hold or cancelled, this also needs to be updated.
- Update the Financial Details – if there has been a variation to increase the project scope, or a reduction in scope, then the *Contract Award Value and Contract Current Value* should be updated.
- Update the personnel responsible for the project. To do this update the *Contract Superintendent*.

Frequently Asked Questions

Do I need to fill out every single field?

It is best to provide as much detail as possible about the project and contract. However, if you do not know the right answer, and cannot confirm it with your colleague, then you can leave it blank.

Fields with the blue triangle in the corner indicate this is a 'required field' and you will not be able to submit the form without entering a value.

What if I don't know the right data to enter?

If you don't know the answer, the first thing to do is to speak to your colleagues and ask if they have the right information. If they cannot help you then you can ask the Monitoring and Evaluation team, and/or send an email to support@pngroads.com or elliotmcbride@ghd.com

What if my project is not in the System?

You can add the project using the 'How to add a Project' guidance documentation.

Project Tables - Field Descriptions

08/05/2025 9:26 am +10

DOWH Projects Table

Group	Field Name	Description	Data entry	Required?
Identifier	Asset ID	Auto-generated ID in the System.	Auto-generated	-
Reference	PIP Number	The Public Investment Program (PIP) is the PNG budget appropriation for the fiscal year that has been approved by National Executive Council and the Parliament during the Parliament Budget session. The PIP number determines the budget appropriation that the project is funded from. There may be multiple projects using the same PIP number.	Any characters (maximum 30)	No
Reference	IFMS Number	Integrated Financial Management System (IFMS) is an integrated accounting system used in release of Warrants, Issuance of Cash Fund Certificates, Reconciliation, Approval, printing of cheques, monitoring and reporting of the Financial Management Statement and Expenditures. The IFMS number is the account vote number in line with the PIP number used in disbursing program funds.	Any characters (maximum 30)	No
Reference	AWM ID	Auto-generated ID that is calculated within 24hours of the Project record being created. Combines the AWM road-number, type of work (short code) and the Asset ID.	Auto-generated	-
Reference	Funder ID	Only relevant for Donor-funded projects. This is the unique ID that they use to reference the Project.	Any characters (maximum 30)	No
Project Details	Project Name	The name of the project should start with the road name, then briefly describe the type of work and the names of the start and end locations.	Any characters (maximum 254)	Yes
Project Details	Project Description	A brief description of the project, including the type of work and location information (such as chainage).	Any characters (maximum 254)	Yes

Group	Field Name	Description	Data entry	Required?
Project Details	Type Of Work	The main type of work that the project involves. See the description of each Type of Work in the Knowledgebase under the Projects section.	Dropdown list	Yes
Project Details	Emergency Works	Select 'Yes' if the project is defined as Emergency Works. Emergency Works projects should be less than 500,000 kina.	Boolean (Yes or No)	No
Project Details	Missing Link	Select 'Yes' if the project is part of the Missing Links programme.	Boolean (Yes or No)	No
Project Details	Funding Scheme	The source of the project funding. A Funding Agency might have multiple schemes.	Dropdown list	No
Project Details	Project Status	The current status of the project. See the description of each Status in the Knowledgebase under the Projects section.	Dropdown list	Yes
Project Details	Responsible Division	The Division that is responsible for the monitoring of the project	Dropdown list	No
Project Details	Monitoring Officer	The Officer who is responsible for completing the monthly monitoring update. This would most likely be the PCE or a Project Engineer.	Dropdown list	No
Project Details	Approving Officer	The Officer responsible for approving the project monitoring data each month. For projects managed by a provincial office this will be the PWM.	Dropdown list	No
Project Details	Responsible HQ Officer	The Staff member from Headquarters who is responsible for the monitoring and reporting of the Project.	Dropdown list	No
Project Details	Region	The Region that the Project is located in.	Dropdown list	Yes
Project Details	Province	The Province that the Project is located in. If the Project crosses multiple Provinces, then this is generally the Province that the Project starts from.	Dropdown list	Yes
Project Financials	Original Allocated Funding	The total funding that has been allocated to this project.	Decimal number (no commas or spaces)	No
Project Financials	Current Allocated Funding	This should be updated if the total funding has increased or decreased since the Original Allocated Funding value was provided. This is a lookup to the most up-to-date monthly project monitoring record.	View-only	No

Group	Field Name	Description	Data entry	Required?
Project Financials	Value of Project Works to Date	Refers to the total monetary value of the project work completed to date. This is a sum of the associated Contract (s) Value of Works to Date.	View-only	No
Location	Road	The Road that the Project is on.	Dropdown list	Yes
Location	Start	The Start chainage of the Project.	Whole number (no commas or spaces)	Yes
Location	End	The End chainage of the Project.	Whole number (no commas or spaces)	Yes
Dimensions	Length	The calculated length of the project in metres (End - Start)	Auto-generated	-
Dimensions	Adjustment	The adjusted length of the project - this is used if there is a more accurate measurement of the project length than the calculated value.	Whole number (no commas or spaces)	No
Dimensions	Reason	The reason why the length has been adjusted.	Any characters (maximum 30)	No
Timeline	Planned Start Date	The agreed date that the Physical Works of the Project commences on.	Date in format: dd/mm/yyyy	No
Timeline	Revised Start Date	The updated date if the Start Date has been agreed to be brought forward or extended.	Date in format: dd/mm/yyyy	No
Timeline	Revised Completion Date	The agreed date that the Project is completed on.	Date in format: dd/mm/yyyy	No
Timeline	Planned Completion Date	The agreed date that the Physical Works of the Project commences on.	Date in format: dd/mm/yyyy	No
Report Requirements	Report Required	This determines whether a Project Monitoring monthly reporting record is generated or not. This is calculated based on the Project Status. Only Projects that are in 'Planning and Investigation', 'Design', 'Physical Works' and 'Post Works' require a report. This will update after saving the record.	Auto-generated (Hidden)	-

Group	Field Name	Description	Data entry	Required?
Report Requirements	Land Acquisition (Req.)	Select 'Yes' if Land Acquisition is a part of the project that requires monitoring. This might reflect the number of properties acquired as a proportion of the total number of properties required to be acquired. As stated in *Section 8.6 Project Management* of the *Provincial Works Manager's Manual* it is the responsibility of the PWM to ensure land acquisitions are done prior to the physical commencement of works.	Boolean (Yes or No)	No
Report Requirements	Planning Investigation (Req.)	Select 'Yes' if Planning and Investigation is a part of the project that requires monitoring. In most cases, Major Works projects will have a significant Planning and Investigation stage which should have its progress monitored.	Boolean (Yes or No)	No
Report Requirements	Design (Req.)	Select 'Yes' if Design is a part of the project that requires monitoring. In most cases, Major Works projects will have a significant Design stage which should have its progress monitored.	Boolean (Yes or No)	No
Report Requirements	Physical Works (Req.)	Select 'Yes' if Physical Works is a part of the project that requires monitoring.	Boolean (Yes or No)	No
Report Requirements	Post Works (Req.)	Select 'Yes' if Asset Handover is a part of the project that requires monitoring. *Section 8.5.18 Contract Completion* in the *Provincial Works Manager's Manual* provides a list of the events that are part of this Post-Works stage.	Boolean (Yes or No)	No
Report Requirements	Asset Data Supplied (Req.)	Select 'Yes' if Asset Data Supplied is a part of the project that requires monitoring. This field is used to confirm whether all asset data has been supplied to the Asset Management Branch at the end of the project.	Boolean (Yes or No)	No
Data Entry Notes	M+E Team Notes	A notes section where the Monitoring and Evaluation team can ask questions about the project information and/or make a note of where they did not have the right information/need more information.	Any characters (maximum 254)	No
Data Entry Notes	Provincial Team Notes	A notes section for provincial staff to respond to questions from M+E team, raise any concerns about how they have entered data etc.	Any characters (maximum 254)	No
Audit	Date added	The date that the Project record was added on.	Auto-generated	-

Group	Field Name	Description	Data entry	Required?
Audit	Added by	The user who added the Project record.	Auto-generated	-
Audit	Date changed	The date that the Project record was most recently edited.	Auto-generated	-
Audit	Changed By	The user who most recently edited the Project record.	Auto-generated	-

DOWH Contracts Table

Group	Field Name	Description	Data entry	Required?
Identifier	Asset ID	Auto-generated ID in the System.	Auto-generated	-
Contract Details	Project Name	The name of the Project that the Contract has been procured for.	Lookup to Projects Table	Yes
Contract Details	Contract Name	The name of the Contract agreed with the Contractor	Any characters (maximum 254)	No
Contract Details	Contract Number	The Contract Number (or ID) that is used for reference by DOWH and the Contractor.	Any characters (maximum 60)	Yes
Contract Details	Contractor Name	The name of the Contractor - this is derived from a list of recognised Contractors.	Dropdown list	No
Contract Details	Contract Status	Indicates whether the contract is 'Pending', 'Active', 'Completed', 'On Hold' or 'Cancelled'.	Dropdown list	No
Contract Financials	Awarded Contract Value	The original value of the contract agreed.	Decimal number (no commas or spaces)	No
Contract Financials	Current Contract Value	This will be the same as the Contract Award Value unless there has been a variation to change the contract value and scope (either increased or decreased). This is a look-up to the most up-to-date data from the Monthly Contract Monitoring record.	View-only	No
Contract Financials	Contract Category	The DoWH Contract Category based on the kina value of the contract.	Dropdown list	No
Contract Details	Contract Superintendent	The Contract Superintendent as specified in the contract document.	Dropdown list	No

Group	Field Name	Description	Data entry	Required?
Contract Details	Contract Location	Use to describe the location of the contract (for example, this may be only a section of the project location, in which case the start and end chainage from AWM could be provided).	Any characters (maximum 254)	No
Timeline	Planned Start Date	The agreed date that the Contract commences on. This is likely the same as the Project Planned Start Date.	Date in format: dd/mm/yyyy	No
Timeline	Planned Completion Date	The agreed date that the Contract is completed on. This is likely the same as the Project Planned Completion Date.	Date in format: dd/mm/yyyy	No
Timeline	Revised Start Date	The updated date if the Start Date has been agreed to be brought forward or extended. This is likely the same as the Project Revised Start Date.	Date in format: dd/mm/yyyy	No
Timeline	Revised Completion Date	The updated date if the Completion Date has been agreed to be brought forward or extended. This is likely the same as the Project RevisedCompletion Date.	Date in format: dd/mm/yyyy	No
Physical Works - Required Items	Establishment (Req.)	Select 'Yes' if Establishment is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Site Preparation (Req.)	Select 'Yes' if Site Preparation is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Earthworks (Req.)	Select 'Yes' if Earthworks is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Pavement (Req.)	Select 'Yes' if Pavement is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Surfacing (Req.)	Select 'Yes' if Surfacing is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Drainage (Req.)	Select 'Yes' if Drainage is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Road Markings (Req.)	Select 'Yes' if Road Markings is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Road Structures (Req.)	Select 'Yes' if Road Structures is in the Contract Scope of Works.	Boolean (Yes or No)	No

Group	Field Name	Description	Data entry	Required?
Physical Works - Required Items	River Training and Bed and Bank Protection (Req.)	Select 'Yes' if River Training and Bed and Bank Protection is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Vegetation Control (Req.)	Select 'Yes' if Vegetation Control is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Street Lighting (Req.)	Select 'Yes' if Street Lighting is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Traffic Signals plus ITS (Req.)	Select 'Yes' if Traffic Signals plus ITS is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Street Signs (Req.)	Select 'Yes' if Street Signs is in the Contract Scope of Works.	Boolean (Yes or No)	No
Physical Works - Required Items	Railings and Barriers (Req.)	Select 'Yes' if Railings and Barriers is in the Contract Scope of Works.	Boolean (Yes or No)	No

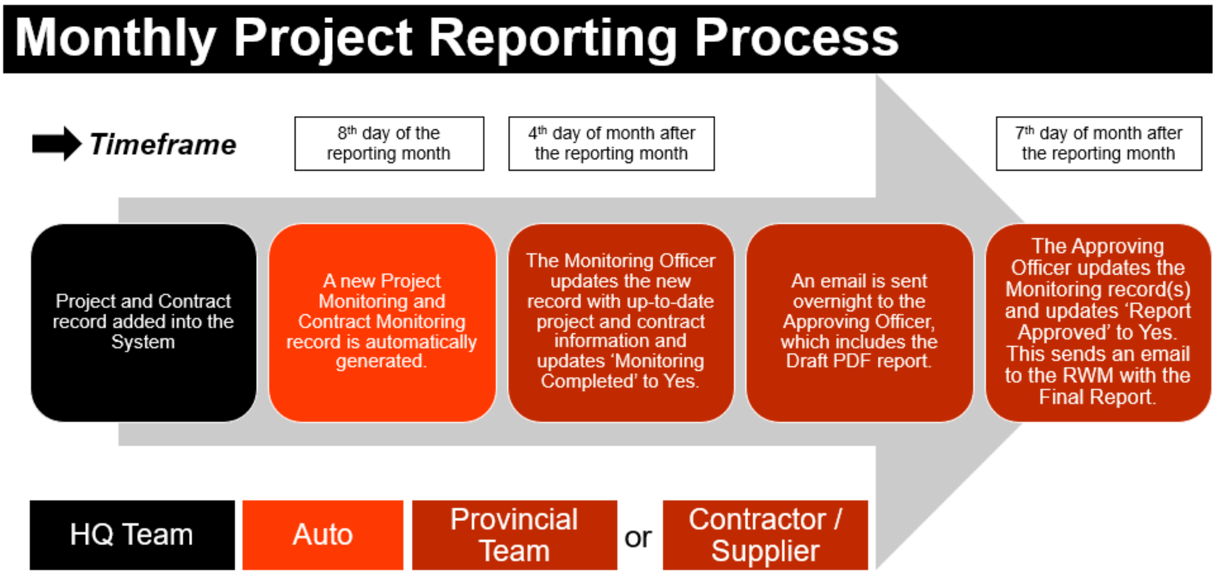
Project Validation Checklist

06/10/2025 4:23 pm +10

1. Is there missing **reference IDs** that could be added? For example, if you are using an ID in your other reporting lines, can we use this in the system? Such as PIP.
2. Is the **Type of Work** correct?
3. Is the **Project Status** correct? For example, if this project is now completed but is still on 'Physical Works' it needs to be updated to 'Completed'
4. Are the **Monitoring Officer** and **Approving Officer** correct? Sometimes these roles change – please update if a role has been delegated or if the officer has moved to a different region and has been replace with a new officer.
5. Is the **Road**, **Start** and **End** chainage correct? Check in the map view that the start and end of the line representing the project is accurate. (The chainage in the System may be slightly different from the chainage you are familiar with). Please note, the AWM system does not yet represent the updated 2025 Gazette.
6. Has the original funding been increased or decreased? (this will need to be adjusted in the **Project Monitoring** record for the month you are editing data). This automatically updates the **Current Allocated Funding.**
7. Do the **Revised Start Date** and/or **Revised End Date** need to be updated? For example, if it has been agreed in contract that the project will run for an extra six months – this should be updated in the Revised End Date.
8. Are the **Report Requirements** correct? For example, does the contract include a Defects Liability Period? If so, please turn this option to Yes.
9. Do you need to add a **DoWH Contract** record? If the project is in the Physical Works stage, we know there must be a contract attached. You can use the Works Kuru to guide you in this process.
10. Once all of this has been checked, you can provide any notes in the **Provincial Team Notes** field. This helps the Network, Monitoring and Evaluation (NME) team understand the changes you have made.
11. Then move the **Project Validated** button to 'Yes'.

Monthly Project Monitoring - Process

28/03/2025 7:36 am +10



HOW TO - Project Monitoring

01/04/2025 11:34 am +10

Step-by-Step Guide Video

The video below provides a guide on the Monthly Project Monitoring process. It is taken from a recording of an online training session held on 28/01/2025. Apologies for the random start and finish as we only saved the best bits!

Your browser does not support HTML5 video.

Purpose

Each month, there is an expectation that the Reporting Officer (this may be a Project Engineer or Principal Engineer) and an Approving Officer (in most cases the Provincial Works Manager) produce a Monthly Project Report.

Using the AWM System, this report will be published automatically, once the user correctly updates / edits and approves the appropriate **Project Monitoring** record in the AWM System.

Setting Up for this Work

Relevant Data Layers

To support this process, the user should add the following data layers to the system.

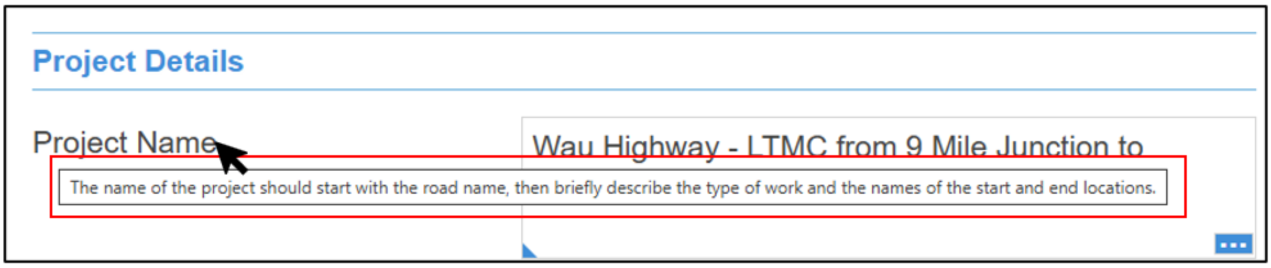
These layers are as follows:

Data Layer	Description
DoWH Projects	Table of all Projects that have been added to the System. Contains information about project location, financials, status etc. The other relevant data layers are available via this layer.

How to update a Project Monitoring and Contract Monitoring record

How do I know what information to enter?

Description of fields and lookup table values can be found at the end of this document in the Appendix. When using the table, you can also hover your mouse over the field to see a brief description of the field (see below example).

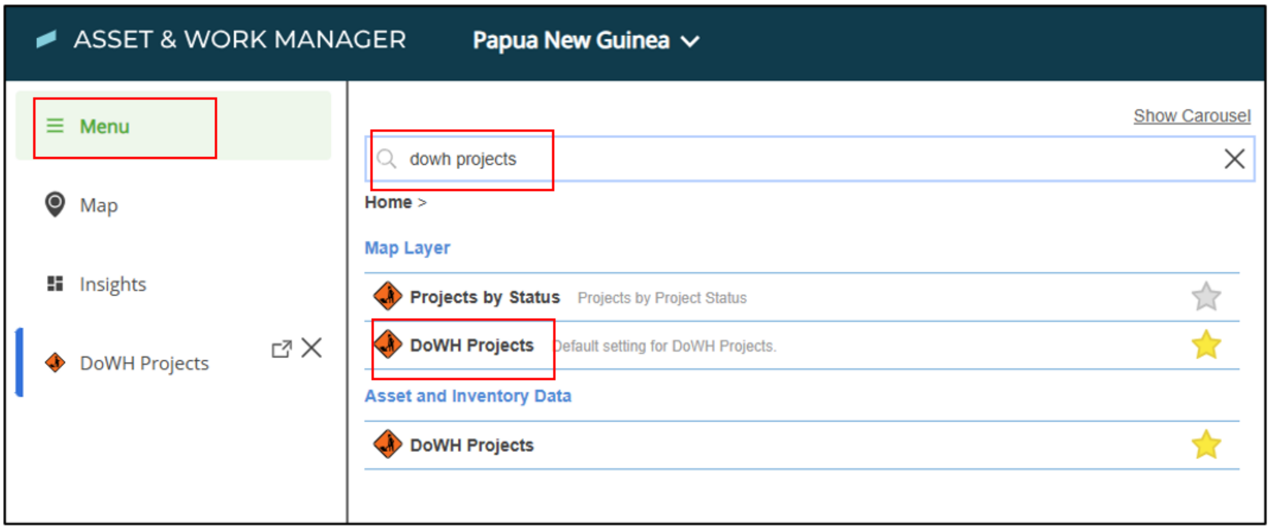


You should also pay attention to the type of data that can be entered as described in Field Description table (data entry column), for example – do not use commas (,) when entering the financial information.

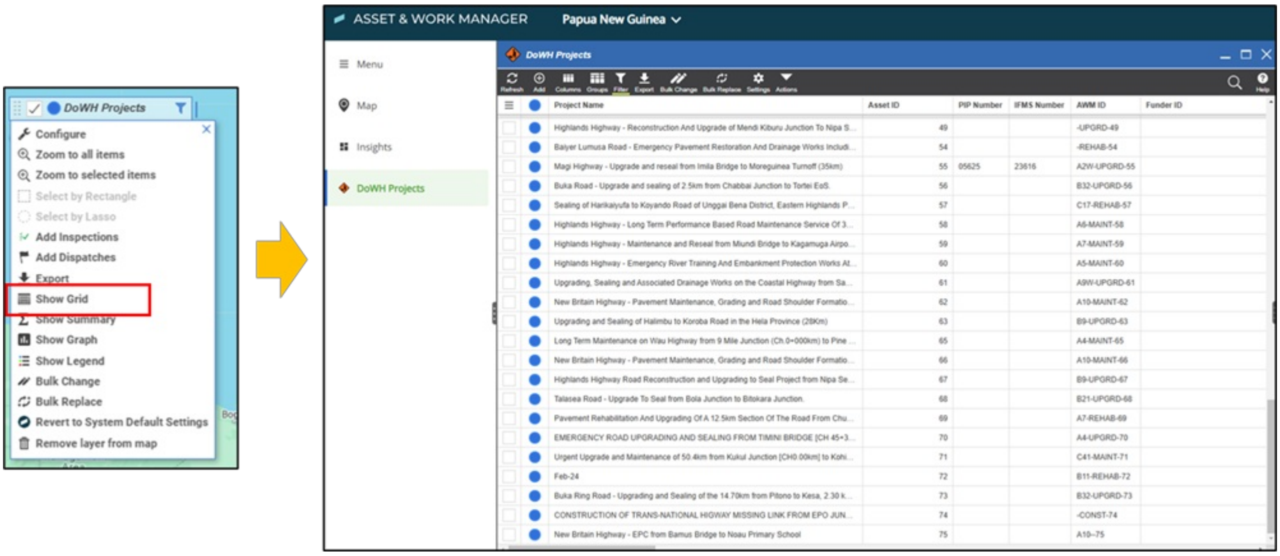
There is also an instruction video titled ‘How to add a Project’ which runs through a complete example. This can be found in the HOW TO - Add Project and Contract Records into the System article.

Accessing the Project and Contract Monitoring records

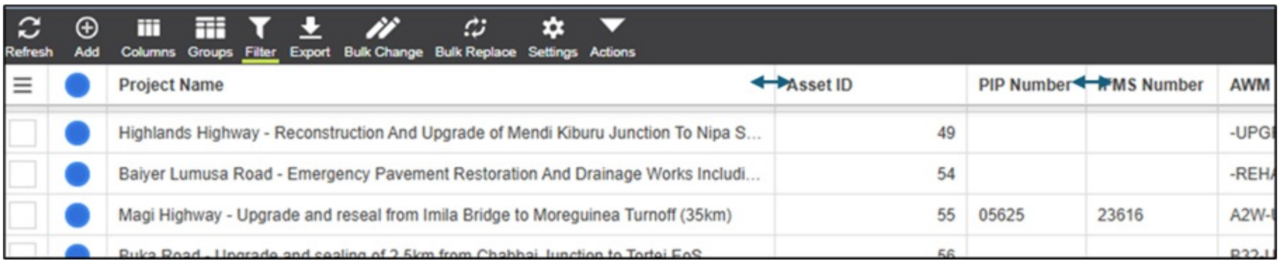
1. In the System, go to the Menu and search for ‘DOWH Projects’



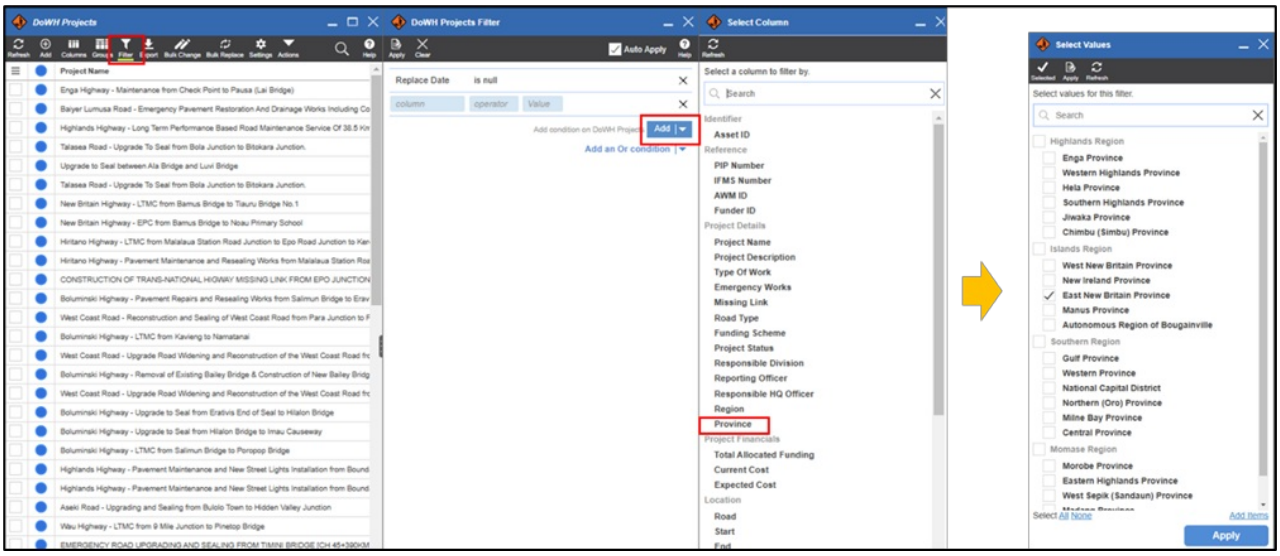
2. To see the list of projects as a data table, click on the layer and select ‘Show Grid’.



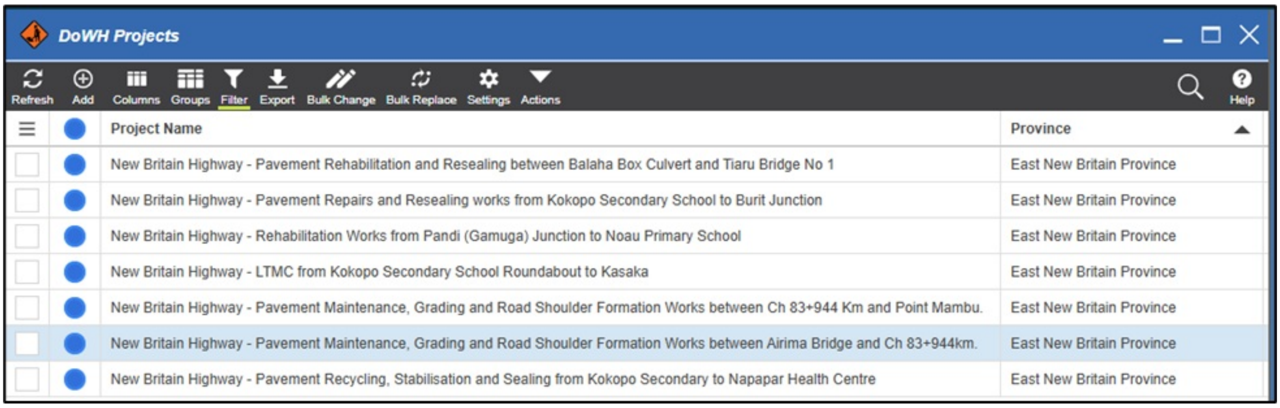
3. You can then adjust the table to more clearly show the list of projects by making the column widths wider or tighter and re-ordering the columns.



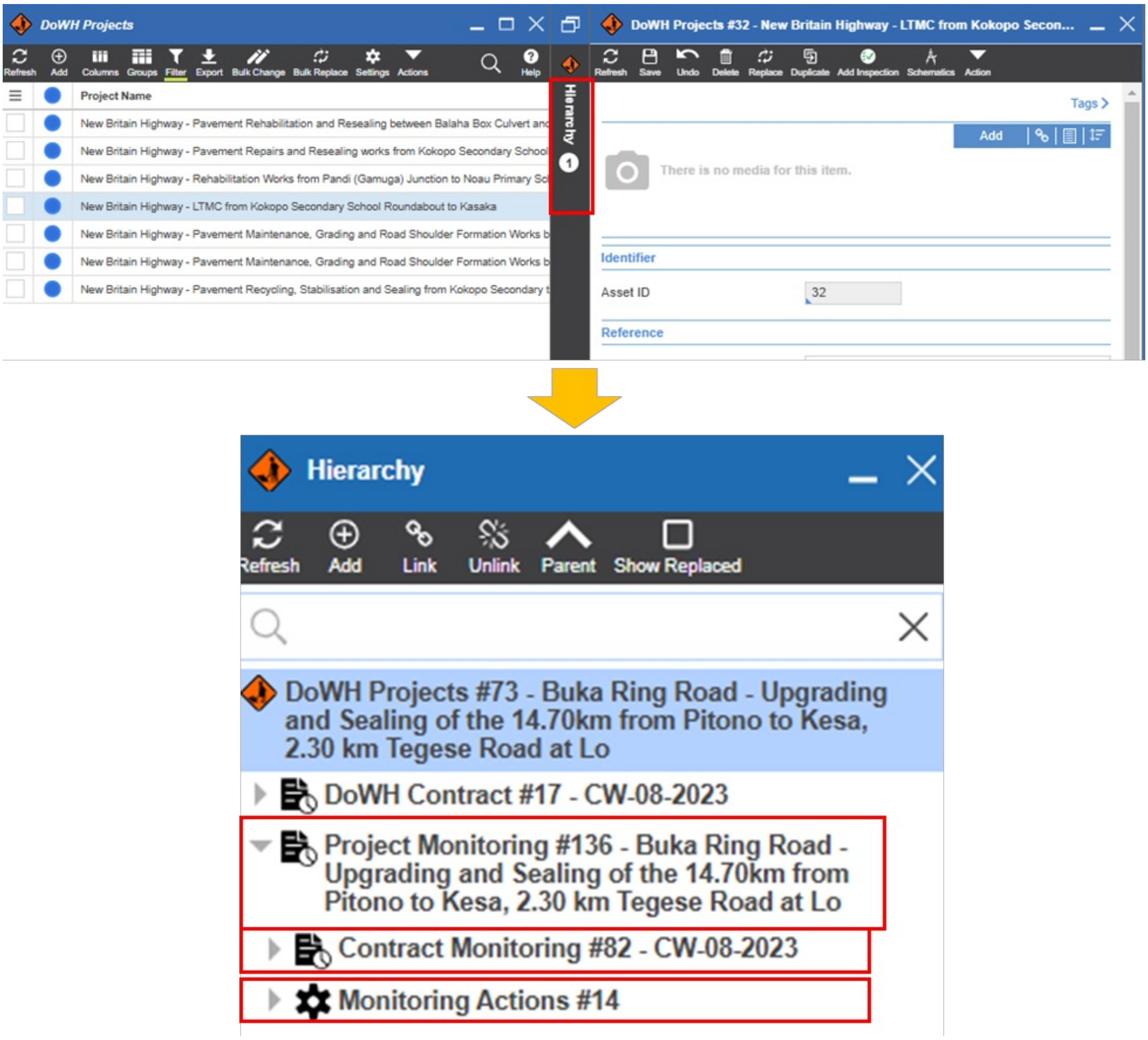
4. You can use the 'Filter' option to only show the projects that you are interested in. For example, you might want to only see projects in your Region, Province or that are on a specific road.



Filtered table only showing East New Britain Province projects:



5. With the Project highlighted in the Grid and the Details panel showing on the right, you should also see the 'Hierarchy' button in the middle. Click on this to expand this panel to see the Project Monitoring record.

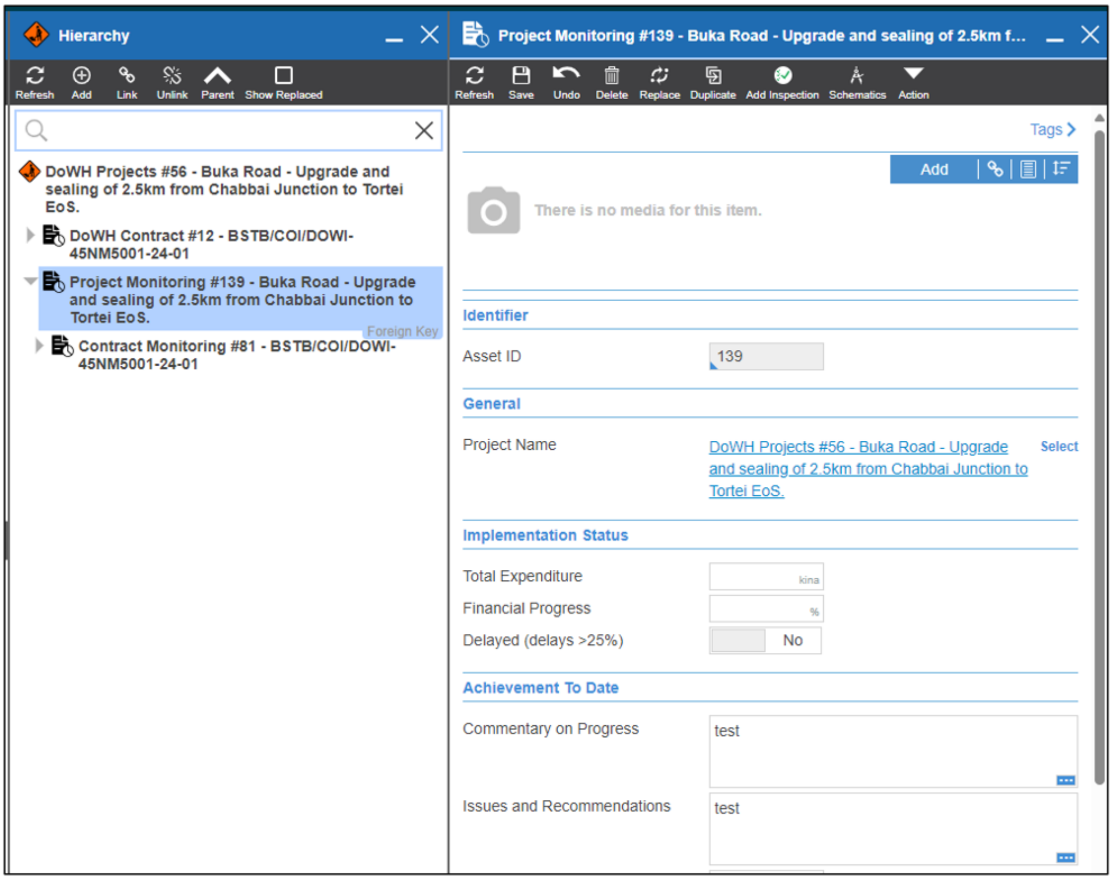


6. As shown above, in the Hierarchy view you should be able to see the Project Monitoring record. When you click on the grey arrow ► next to it, you should also see:

a. The Contract Monitoring record available here (if a Contract exists and should be reported on).

b. The Monitoring Actions record.

7. By clicking on the Project Monitoring record you should see the Monitoring record in the Details panel.



Approving the Project and Contract Monitoring records – Approving Officer

1. The *Approving Officer* is the person responsible for signing off on the report to state that the information is accurate to the best of their knowledge. In most cases, this will be the PWM, but they may delegate this role to a PCE for example. If the project is at a *Planning and Investigation* or *Design* stage, then this may differ.

2. Once the Monitoring Officer has turned the 'Monitoring Completed' option to *Yes* in the Monitoring Actions record, this will trigger an email to be sent to the Approving Officer overnight. This email includes an attachment of the data in Draft Report format which they will use to perform their review.

3. The Approving Officer should read the report and make sure that the financial data, % completed information (for example, the Scope of Works Items on the Contract record) and commentary is all accurate. If they would like to make changes, then they need to request that the Monitoring Officer makes these changes on their behalf, or they update the data in the Project Monitoring and/or Contract Monitoring records themselves.

4. Once the Approving Officer is satisfied that all the information is accurate, then they need to go to the Monitoring Actions record, update the 'Monitoring Approved' button to *Yes* and select Save.

5. This will trigger the final approved report to be sent to the RWM via email with the Approving Officer also cc'd in the email.

Frequently Asked Questions

Do I need to fill out every single field?

It is best to provide as much detail as possible about the project and contract. However, if you do not know the right answer, and cannot confirm it with your colleague, then you can leave it blank.

Fields with the blue triangle in the corner indicate this is a 'required field' and you will not be able to submit the form without entering a value.

What if there are no updates from the previous month?

If there is a significant stoppage to the project, then you could change the Project Status to 'On hold' on the Project record. If it likely that the project will start up again in the following month then it may be easier to keep the Project Status as 'Physical Works' and just write in the commentary that there has been no progress and state a reason why.

What if there is no Contract attached to my Project?

You can still create a report but there will be no Contract information. If there is a Contract but there is just no record in the system, then you need to add a Contract record - see the HOW TO - Add Project and Contract Records into the System guide.

What if I have sent the Draft report but I need to re-send it?

In this case, you should communicate with the Approving Officer which updates you need to make and make sure that these flow through into the final report. But if you do need the draft report to be run again - you can make your changes, then go to the Monitoring Actions record, and update *Monitoring Updated* from Yes to No and then back to Yes (you should see the Date below update) and then select Save. This will send the draft report again.

HOW TO - Monitoring Officer - Project Monitoring Actions

03/04/2025 10:04 am +10

1. The *Monitoring Officer* is the person responsible for collecting data for the project. In most cases this will be the Project Engineer who is also responsible for collating data for the fortnightly project report. If the project is at a *Planning and Investigation* or *Design* stage, then this may differ.

2. When you first click on the record you should see a series of fields for which you need to enter data for. NB// To save you time, some of these values will be carried across from the previous month's report and will need to be updated.

3. See the Field Descriptions Section for more details about what data should be entered for which field. When the data is entered select 'Save'.

4. Add Photos – you should add photos that show the progress or issues that are discussed in the 'Commentary on Progress' and 'Issues and Recommendations' section. This will provide evidence of what is being stated in the report. See the Add Photos to Project Monitoring Records article for a guide on how to do this.

5. If there is a Contract Monitoring record (in most cases there is), then update this also and select Save.

6. Finally, you will need to open the Monitoring Actions record and, if you are happy with the information you have entered for both the Project and Contract Monitoring record, then turn the 'Monitoring Completed' button to Yes and select Save.

7. This will trigger an email to be sent to the Approving Officer (most likely the PWM) with an attachment of the data in Draft Report format which they will use to perform their review. The Monitoring Officer will also be sent this email as a 'cc'. If the Approving Officer would like changes to be made, they may ask the Monitoring Officer to perform these or do these themselves.

HOW TO - Approving Officer - Project Monitoring Actions

03/04/2025 10:04 am +10

1. The *Approving Officer* is the person responsible for signing off on the report to state that the information is accurate to the best of their knowledge. In most cases, this will be the PWM, but they may delegate this role to a PCE for example. If the project is at a *Planning and Investigation* or *Design* stage, then this may differ.

2. Once the Monitoring Officer has turned the 'Monitoring Completed' option to *Yes* in the Monitoring Actions record, this will trigger an email to be sent to the Approving Officer overnight. This email includes an attachment of the data in Draft Report format which they will use to perform their review.

3. The Approving Officer should read the report and make sure that the financial data, % completed information (for example, the Scope of Works Items on the Contract record) and commentary is all accurate. If they would like to make changes, then they need to request that the Monitoring Officer makes these changes on their behalf, or they update the data in the Project Monitoring and/or Contract Monitoring records themselves.

4. Once the Approving Officer is satisfied that all the information is accurate, then they need to go to the Monitoring Actions record, update the 'Monitoring Approved' button to *Yes* and select Save.

5. This will trigger the final approved report to be sent to the RWM via email with the Approving Officer also cc'd in the email.

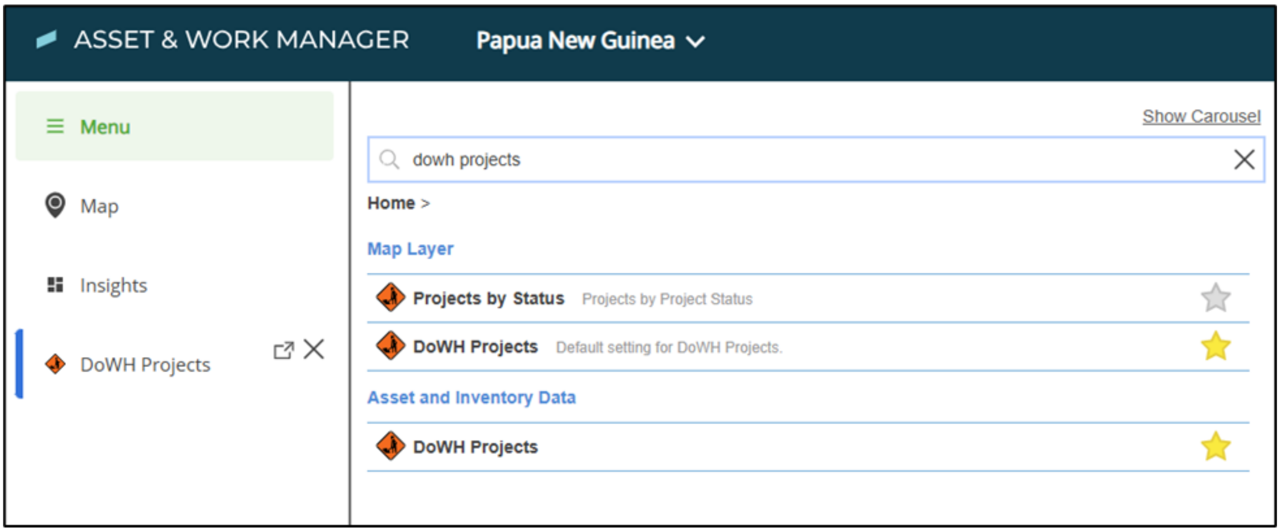
HOW TO - Add Photos to Project Monitoring Records

17/01/2025 7:58 am +10

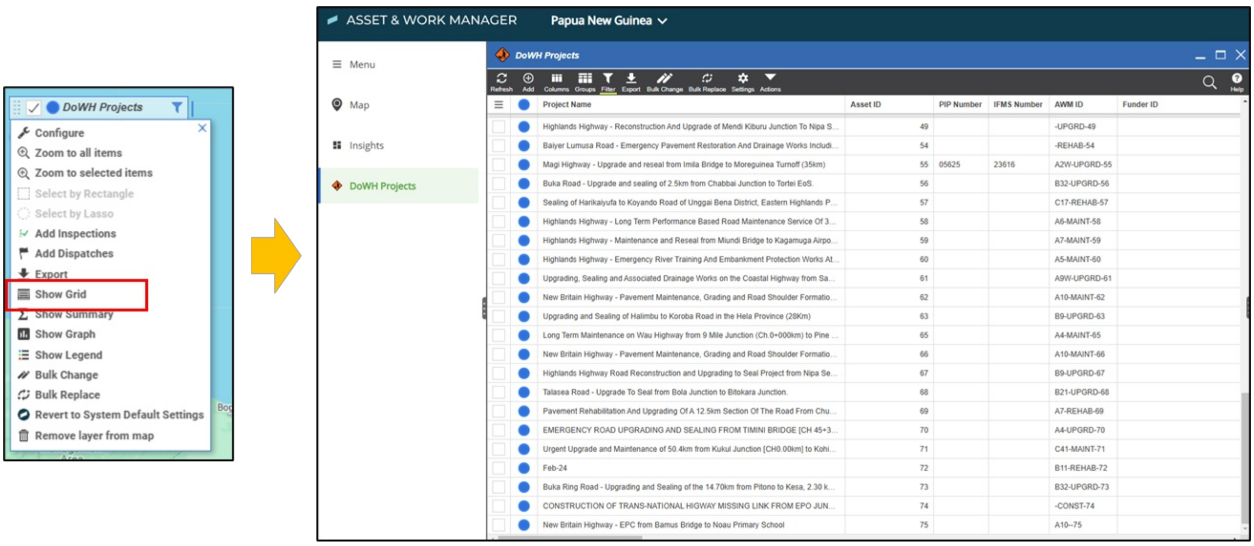
While we want to add progress and issues photos to the project and contract monitoring records, you might want to also add some photos to the Project and Contract records to show some significant before and after photos, and documents such as the actual Contract document.

To add photos to the project, follow the steps below:

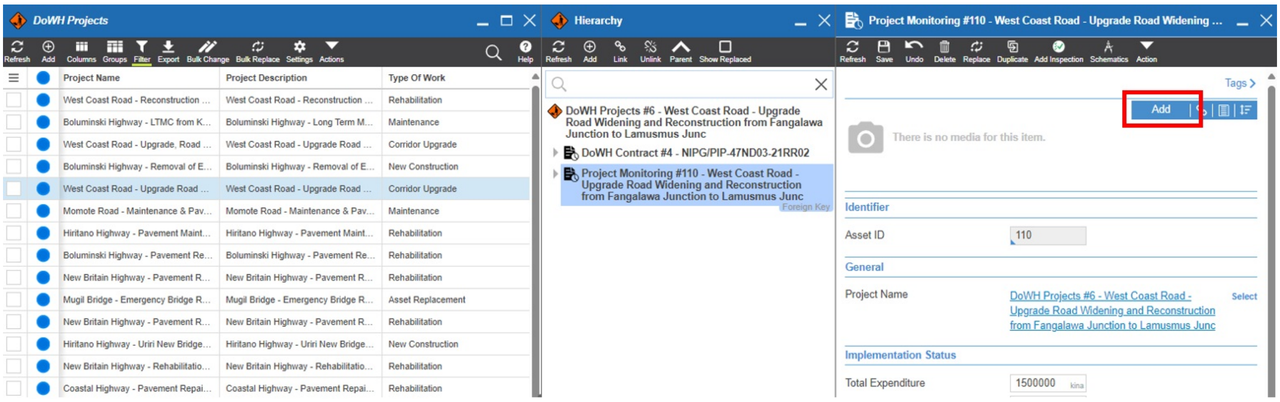
1. Open the project by searching for ‘DOWH Projects’ in the menu



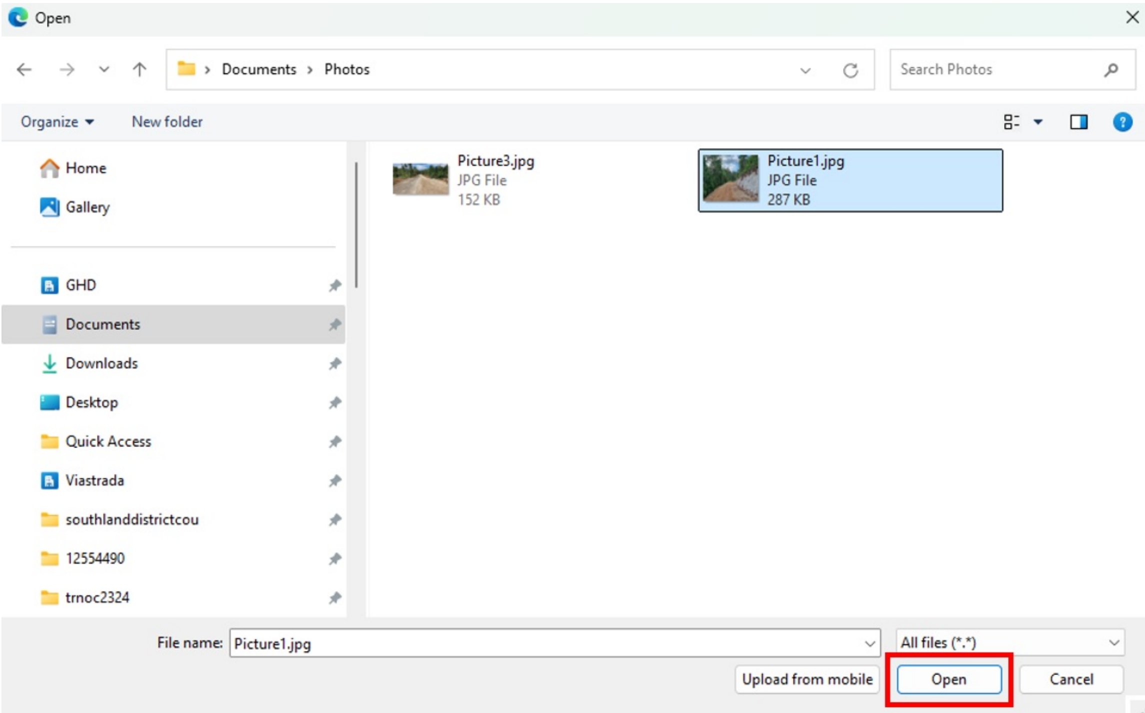
2. To see the list of projects as a data table, click on the layer and select ‘Show Grid’.



3. Select the project you want to open, as well as the Project Monitoring contract. You may you need to click on the ‘Hierarchy’ button next to the details panel to expand this. With the Project and Contract highlighted, click the ‘Add’ button.

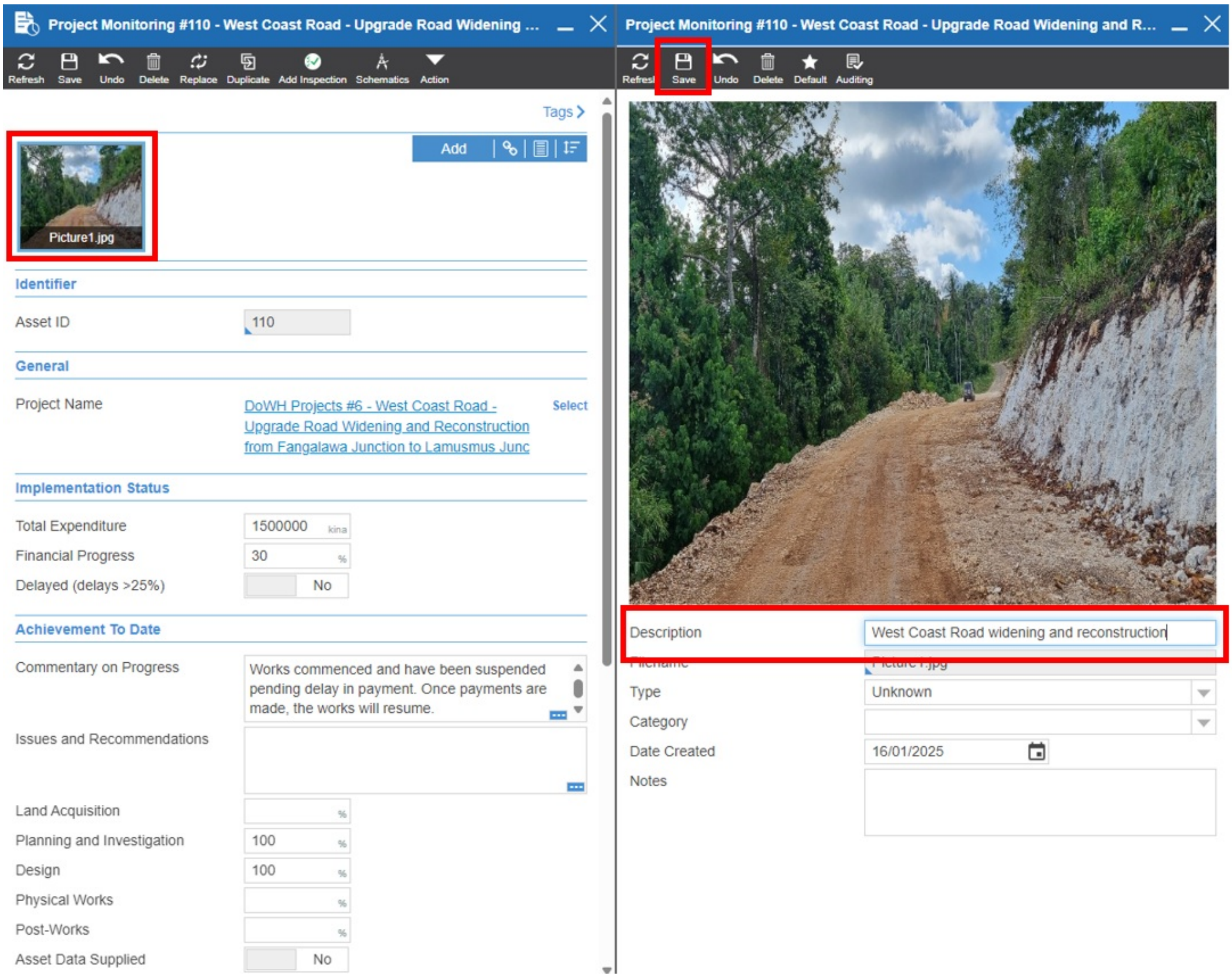


4. This will result in a pop-up of your computer's filing system. Find the image you want to use and click open.

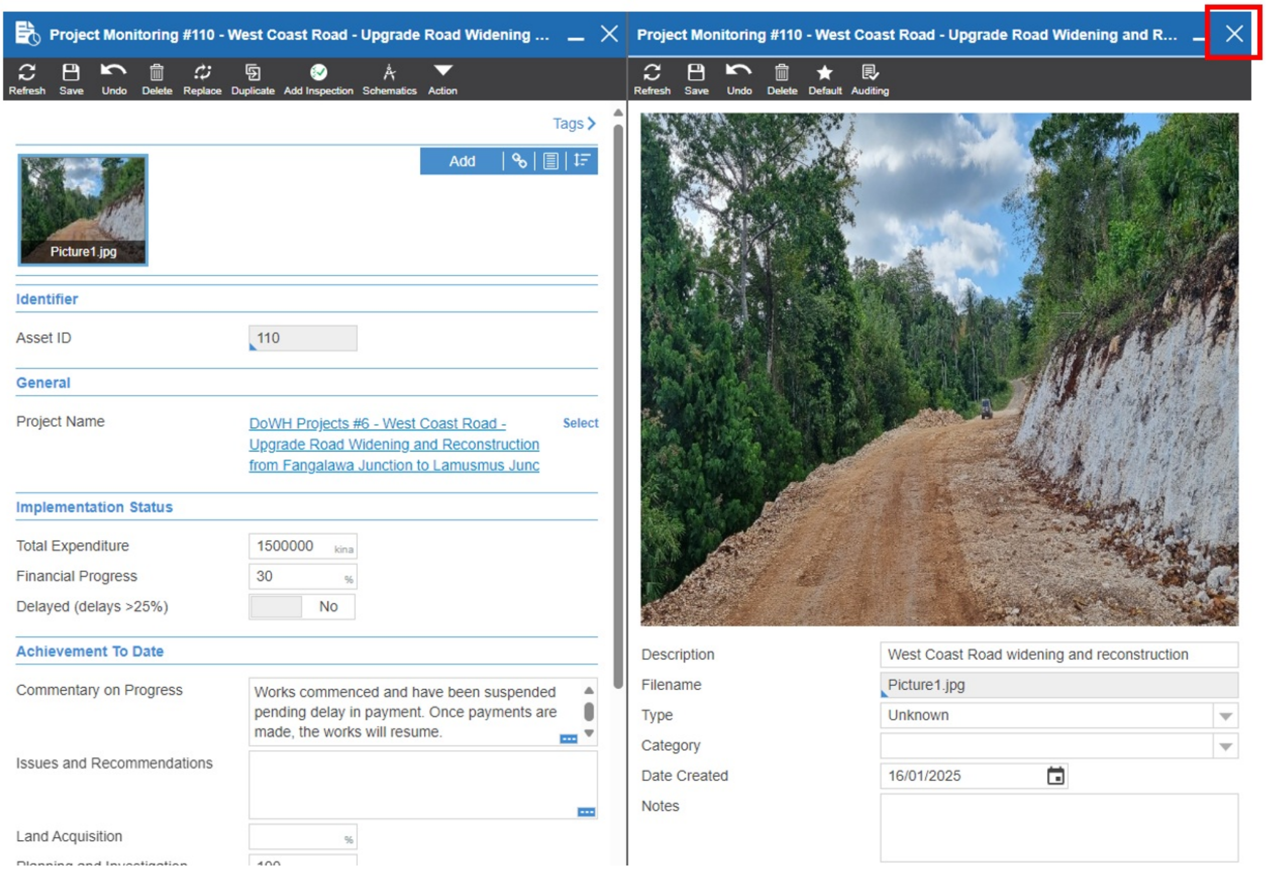


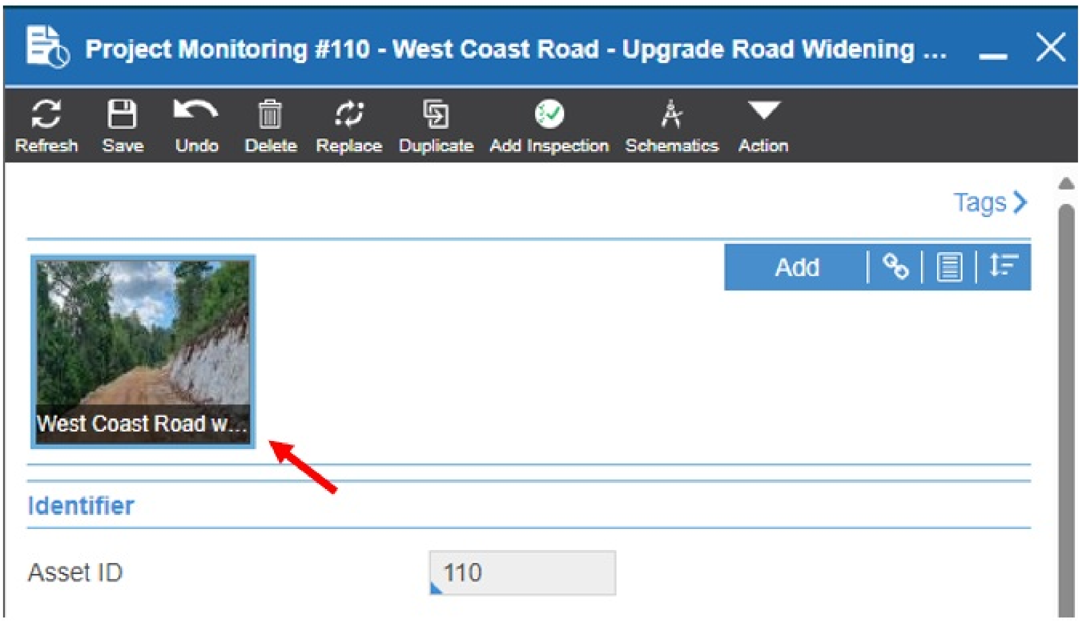
Alternatively, if you are accessing AWM on your mobile phone or tablet, you can upload a photo directly from your photo library on your device.

5. Click on the image to open further information on the image. Enter a description for the image and hit Save.



6. After saving the image description, close the image description tab. You should now see the description over the image.


Project Monitoring #110 - West Coast Road - Upgrade Road Widening ...
Refresh
Save
Undo
Delete
Replace
Duplicate
Add Inspection
Schematics
Action
Tags
Add
Picture1.jpg
Identifier
Asset ID
110
General
Project Name
DoWH Projects #6 - West Coast Road - Upgrade Road Widening and Reconstruction from Fangalawa Junction to Lamusmus Junc
Select
Implementation Status
Total Expenditure
1500000
kina
Financial Progress
30
%
Delayed (delays >25%)
No
Achievement To Date
Commentary on Progress
Works commenced and have been suspended pending delay in payment. Once payments are made, the works will resume.
Issues and Recommendations
Land Acquisition
%
Project Monitoring #110 - West Coast Road - Upgrade Road Widening and R...
Refresh
Save
Undo
Delete
Default
Auditing
Description
West Coast Road widening and reconstruction
Filename
Picture1.jpg
Type
Unknown
Category
Date Created
16/01/2025
Notes


Project Monitoring #110 - West Coast Road - Upgrade Road Widening ...
Refresh
Save
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Delete
Replace
Duplicate
Add Inspection
Schematics
Action
Tags
Add
West Coast Road w...
Identifier
Asset ID
110

Monitoring Tables - Field Descriptions

08/05/2025 9:40 am +10

Project Monitoring

Group	Field Name	Description	Data entry	Require
Identifier	Asset ID	Auto-generated ID in the System.	Auto-generated	-
General	Project Name	The name of the Project that the Monitoring record is attached to. This field links the record to Project table.	Auto-generated	-
General	Report Month	The month that the monitoring report record is relating to.	Auto-generated	
General	Report Deadline Date	The deadline that the monitoring report must be approved by.	Auto-generated	
Achievement to Date	Commentary on Progress	A description of the project progress, including reference to the contracts involved.	Any characters (maximum 5000)	No
Achievement to Date	Issues and Recommendations	A list of issues related to the Project and recommendations of how these issues can be resolved.	Any characters (maximum 5000)	No
Achievement to Date	Land Acquisition	The progress (1-100%) of the Land Acquisition stage of the project. This might reflect the number of properties acquired as a proportion of the total number of properties required to be acquired. As stated in *Section 8.6 Project Management* of the *Provincial Works Manager's Manual* it is the responsibility of the PWM to ensure land acquisitions are done prior to the physical commencement of works.	Number between 0 to 100	No
Achievement to Date	Planning and Investigation	The progress (1-100%) of the Planning and Investigation stage of the project. In most cases, Major Works projects will have a significant Planning and Investigation stage which should have its progress monitored.	Number between 0 to 100	No
Achievement to Date	Design	The progress (1-100%) of the Design stage of the project. In most cases, Major Works projects will have a significant Design stage which should have its progress monitored.	Number between 0 to 100	No
Achievement to Date	Physical Works	The progress (1-100%) of the Physical Works stage of the project.	Number between 0 to 100	No
Achievement to Date	Post-Works	The progress (1-100%) of the Post-Works stage of the project. *Section 8.5.18 Contract Completion* in the *Provincial Works Manager's Manual* provides a list of the events that are part of this Post-Works stage.	Number between 0 to 100	No
Achievement to Date	Asset Data Supplied	Select 'Yes' once the DOWH has been provided Asset data upon the project's completion. Otherwise this stays as 'No'.	Boolean (Yes or No)	No
Achievement to Date	Delayed (delays >25%)	Indicates if there is a greater than 25% delay between the expected Overall Progress versus actual Overall Progress (%).	Boolean (Yes or No)	No
Project Budget	Current Allocated Funding	This should be updated if the total funding has increased or decreased since the Original Allocated Funding value was provided.	Decimal number (no commas or spaces)	No
Project Budget	Total Current Contracts Value	This is the sum of the most up-to-date Current Contract Values.	View-only	No

Group	Field Name	Description	Data entry	Require
Project Budget Status	Value of Project Works to Date	The sum of the Contract 'Value of Works to Date'. I.e., if there are multiple contracts then this value should combine their Value of Works to Date figures. If there is only one contract for the project then it should be the same value.	Auto-generated	No
Project Budget Status	Financial Progress	The calculation of Value of *Project Works to Date / Current Allocated Funding* (represented as a %)	Auto-generated	No

Contract Monitoring

Group	Field Name	Description	Data entry	Required?
Identifier	Asset ID	Auto-generated ID in the System.	Auto-generated	-
General	Contract Number	The Contract Number (or ID) that is used for reference by DOWH and the Contractor.	Auto-generated	-
General	Project Monitoring Report	The Project Monitoring record that this Contract record is attached to.	Auto-generated	-
Implementation Status	Overall Contract Progress	The progress (1-100%) to represent the overall progress of the Contract.	Decimal number (no commas or spaces)	No
Implementation Status	Achievement Since Last Report	Commentary on what has been achieved on the Contract since the previous month (or last time the Monitoring record was updated)	Any characters (maximum 5000)	No
Implementation Status	Issues & Recommendations	A list of issues related to the performance of the Contractor and recommendations of how these issues can be resolved.	Any characters (maximum 5000)	No
Implementation Status	Delayed (delays >25%)	Indicates if there is a greater than 25% delay between the expected Overall Contract Progress versus actual Overall Contract Progress (%).	Boolean (Yes or No)	No
Contract Value	Awarded Contract Value	The original value of the contract agreed. Lookup to the DOWH Contract record.	View-only	No
Contract Value	Current Contract Value	This will be the same as the Contract Award Value unless there has been a variation to change the contract value and scope (either increased or decreased).	Decimal number (no commas or spaces)	No
Contract Financial Status	Value of Works to Date	Refers to the total monetary value of the project work completed to date.	Decimal number (no commas or spaces)	No
Contract Financial Status	Claim Certified	Represents the amount of a contractor's claim for payment that has been reviewed and formally approved.	Decimal number (no commas or spaces)	No
Contract Financial Status	Claim Paid	The total actual amount paid to the contractor to date.	Decimal number (no commas or spaces)	No
Contract Financial Status	Financial Progress	The calculation of *Value of Works to Date / Current Contract Value* (represented as a %).	Auto-generated	No
Physical Works	Establishment	The progress (1-100%) of the Establishment stage of the project.	Number between 0 to 100	No
Physical Works	Site Preparation	The progress (1-100%) of the Site Preparation stage of the project.	Number between 0 to 100	No

Group	Field Name	Description	Data entry	Required?
Physical Works	Earthworks	The progress (1-100%) of the Earthworks stage of the project.	Number between 0 to 100	No
Physical Works	Pavement	The progress (1-100%) of the Pavement stage of the project.	Number between 0 to 100	No
Physical Works	Surfacing	The progress (1-100%) of the Surfacing stage of the project.	Number between 0 to 100	No
Physical Works	Drainage	The progress (1-100%) of the Drainage stage of the project.	Number between 0 to 100	No
Physical Works	Road Markings	The progress (1-100%) of the Road Markings stage of the project.	Number between 0 to 100	No
Physical Works	Road Structures	The progress (1-100%) of the Road Structures stage of the project.	Number between 0 to 100	No
Physical Works	River Training and Bed and Bank Protection	The progress (1-100%) of the River Training and Bed and Bank Protection stage of the project.	Number between 0 to 100	No
Physical Works	Vegetation Control	The progress (1-100%) of the Vegetation Control stage of the project.	Number between 0 to 100	No
Physical Works	Street Lighting	The progress (1-100%) of the Street Lighting stage of the project.	Number between 0 to 100	No
Physical Works	Traffic Signals plus ITS	The progress (1-100%) of the Traffic Signals plus ITS stage of the project.	Number between 0 to 100	No
Physical Works	Street Signs	The progress (1-100%) of the Street Signs stage of the project.	Number between 0 to 100	No
Physical Works	Railings and Barriers	The progress (1-100%) of the Railings and Barriers stage of the project.	Number between 0 to 100	No

Monitoring Actions

Group	Field Name	Description	Data entry	Required?
Identifier	Asset ID	Auto-generated ID in the System.	Auto-generated	-
General	Project Monitoring	The Project Monitoring record that this Monitoring Actions record is attached to.	Auto-generated	-
General	Monitoring Officer	This is the Officer who is responsible for updating the 'Monitoring Completed' button.	Auto-generated	-
General	Monitoring Completed	Move to 'Yes' after the initial data has been entered and the Draft Report is ready to be sent to the Reviewer(s).	Boolean (Yes or No)	No
General	Monitoring Completed Date	The date that the Draft Report is sent - this is generated by the Fabric system and is sent back to AWM (to provide assurance that the report data has been received and processed).	Auto-generated	-
General	Approving Officer	This is the Officer who is responsible for updating the 'Monitoring Approved' button.	Auto-generated	-

Group	Field Name	Description	Data entry	Required?
General	Monitoring Approved	Move to 'Yes' after the data has been reviewed and amended (if required). This will activate the final PDF Report to be generated and sent.	Boolean (Yes or No)	No
General	Monitoring Approved Date	The date that the Final Report is sent - this is generated by the Fabric system and is sent back to AWM (to provide assurance that the report data has been received and processed).	Auto-generated	-

Updates to Project Monitoring process - May 2025

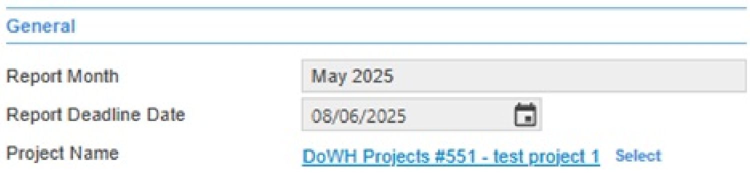
15/05/2025 7:17 am +10

Due to feedback provided from Department staff, we have made some changes to the Projects and Project Monitoring modules of the AWM System.

This article provides more detail about these updates, including the updated field descriptions. We will use an example of a project with two contracts to demonstrate.

Update to Project Monitoring Header

Now when you open the Project Monitoring record, you will see the report month and when it is due to be approved.



Entering Financial Data on Project and Contract setup

We have set up the entry of financial data throughout the duration of the project to be entered on the Project and Contract Monitoring record but displayed as 'view-only' fields (in grey) on the **DoWH Project** and **DoWH Contract** records. This is so that a user can quickly see the most up-to-date financial data about the project.

DoWH Projects

When you create a Project, you are only asked to input the 'Original Allocated Funding' for the project.

Example: we know we have a budget of 1,200,000 kina so we would enter this in the Original Allocated Funding field.

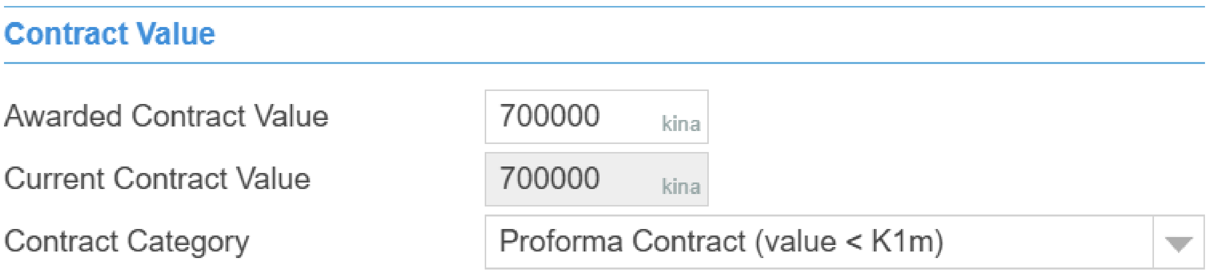
Field	Description	Data Entry
Original Allocated Funding	The total funding that has been allocated to this project.	Decimal number (no commas or spaces)

Field	Description	Data Entry
Current Allocated Funding	This should be updated if the total funding has increased or decreased since the Original Allocated Funding value was provided. This is a lookup to the most up-to-date monthly project monitoring record.	View-only
Value of Project Works to Date	Refers to the total monetary value of the project work completed to date. This is a sum of the associated Contract(s) Value of Works to Date.	View-only

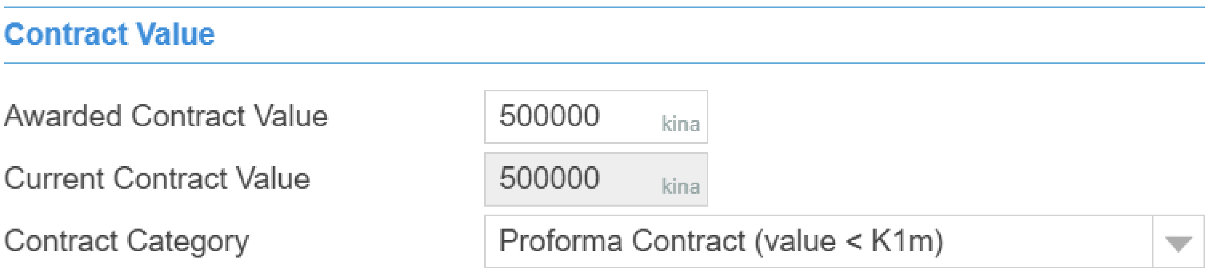
DoWH Contracts

When you create the Contract as part of that Project, you will be asked to input the ‘Awarded Contract Value’ and select the Contract Category.

Contract 1:



Contract 2:



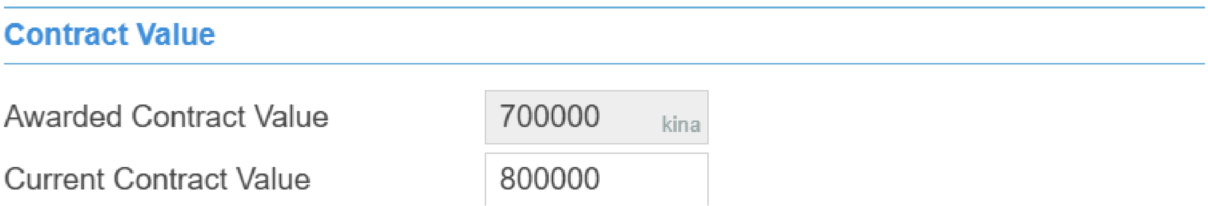
Field	Description	Data Entry
Awarded Contract Value	The original value of the contract agreed.	Decimal number (no commas or spaces)

Field	Description	Data Entry
Current Contract Value	This will be the same as the Contract Award Value unless there has been a variation to change the contract value and scope (either increased or decreased). This is a look-up to the most up-to-date data from the Monthly Contract Monitoring record.	View-only
Contract Category	The DoWH Contract Category based on the kina value of the contract.	Dropdown list

Contract Monitoring

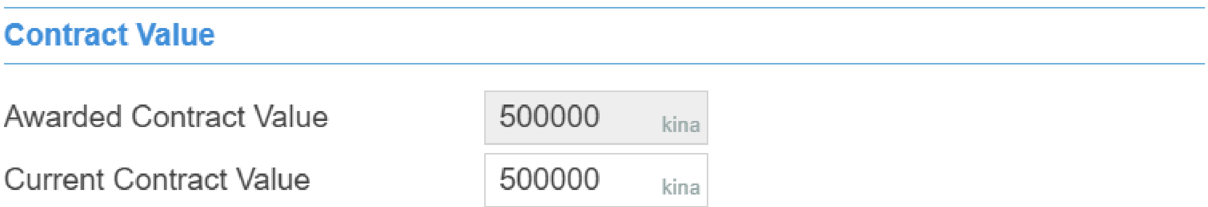
Now when you go to update the Contract Monitoring table you will have the ability to update the current contract value under the Contract Value section.

Contract 1:



Example: The Current Contract Value has been updated to 800,000 kina because of a variation in the contract.

Contract 2:



Field	Description	Data Entry
Awarded Contract Value	The original value of the contract agreed. Lookup to the DOWH Contract record.	View-only
Current Contract Value	This will be the same as the Contract Award Value unless there has been a variation to change the contract value and scope (either increased or decreased).	Decimal number (no commas or spaces)

The Contract Financial Status section is where you enter data relating to how the budget is being spent each month on the project.

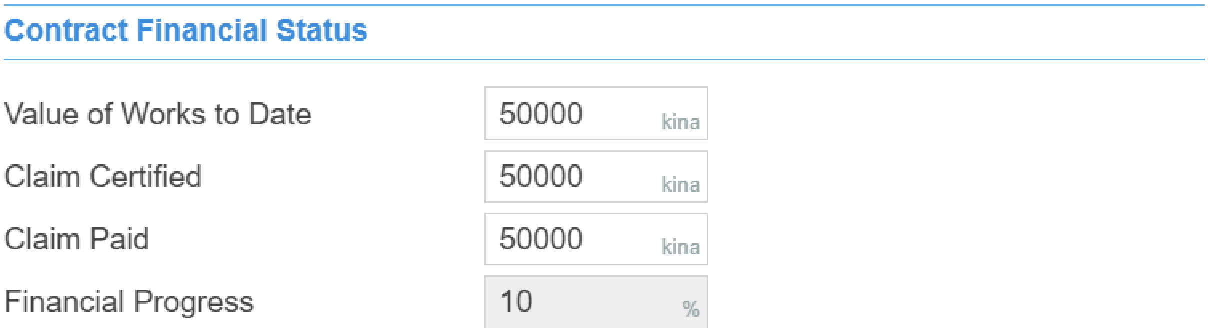
Contract 1:

NOTE: The Financial Progress calculation is updated when the record is saved.

In this example, Value of Works to Date = 100,000, Current Contract Value = 800,000.

Financial Progress = 100,000 / 800,000 = .125 (13%)

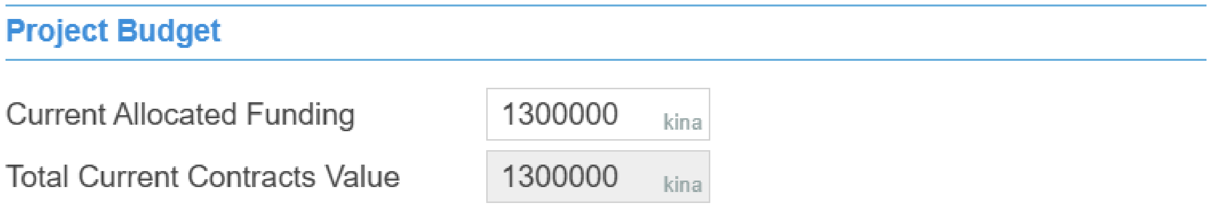
Contract 2:



Field	Description	Data Entry
Value of Works to Date	Refers to the total monetary value of the project work completed to date.	Decimal number (no commas or spaces)
Claim Certified	Represents the amount of a contractor's claim for payment that has been reviewed and formally approved.	Decimal number (no commas or spaces)
Claim Paid	The total actual amount paid to the contractor to date.	Decimal number (no commas or spaces)
Financial Progress	The calculation of *Value of Works to Date / Current Contract Value* (represented as a %).	Auto-generated

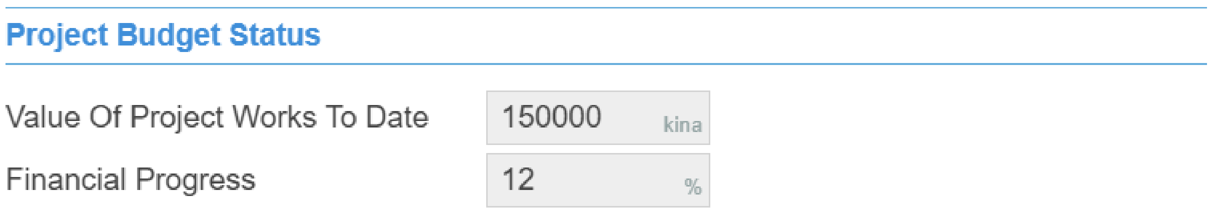
Project Monitoring

Under the Project Monitoring record there is a Project Budget and Project Budget Status section.



Example: Since we agreed to add a variation of an additional 100,000 kina for Contract 1,it is agreed that the allocated funding is increased from 1,200,000 to 1,300,000.

Field	Description	Data Entry
Current Allocated Funding	This should be updated if the total funding has increased or decreased since the Original Allocated Funding value was provided.	Decimal number (no commas or spaces)
Total Current Contracts Value	This is the sum of the most up-to-date Current Contract Values.	View-only



Example: Together, the two contracts 'Value of Works to Date' equals 150,000 (100000+50000), the updated 'Current Allocated Funding' equals 1,300,000.

Financial Progress = 150,000 / 1,300,000 = 11.5 (12%)

Field	Description	Data Entry
Value of Project Works to Date	The sum of the Contract 'Value of Works to Date'. I.e., if there are multiple contracts then this value should combine their Value of Works to Date figures. If there is only one contract for the project then it should be the same value.	Auto-generated
Financial Progress	The calculation of Value of *Project Works to Date/ Current Allocated Funding* (represented as a %)	Auto-generated

After Monitoring Updates

Once records are updated in the Monitoring records, you will see the DoWH Projects and Contracts records will be updated with the most up-to-date information.

DoWH Projects

Project Financials

Original Allocated Funding	1200000 kina
Current Allocated Funding	1300000 kina
Value Of Project Works To Date	150000 kina

DoWH Contracts

Contract 1:

Contract Value

Awarded Contract Value	700000 kina
Current Contract Value	800000 kina
Contract Category	Proforma Contract (value < K1m)

Contract 2:

Contract Value

Awarded Contract Value	500000 kina
Current Contract Value	500000 kina
Contract Category	Proforma Contract (value < K1m)

User Management

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Why permissions are important

- Data protection is extremely important and needs to be managed carefully.
- Within any organisation there will be many RAMM users with varying roles and responsibilities.
- The permissions in RAMM around access, and which actions can be performed on assets and other data are extensive.
- The Database Owner has the ability to control who has access to the database, which RAMM applications they can use, and specifically what actions they can perform within each application.

Database Management Roles

Database Controller and Database Owner

There aren't too many differences between the roles. The **Database Owner** would be the first point of contact for whom thinkproject will go for approval when adding new users to your database or altering the permissions for existing users, that person will also act as one of our main contacts for all things client related where RAMM is concerned.

The **Database Controller** then is a similar, perhaps backup role in case the Owner is not available, and has the same permissions as the above. For this, It's usually best to have two different users for the role.

Area of access to RAMM

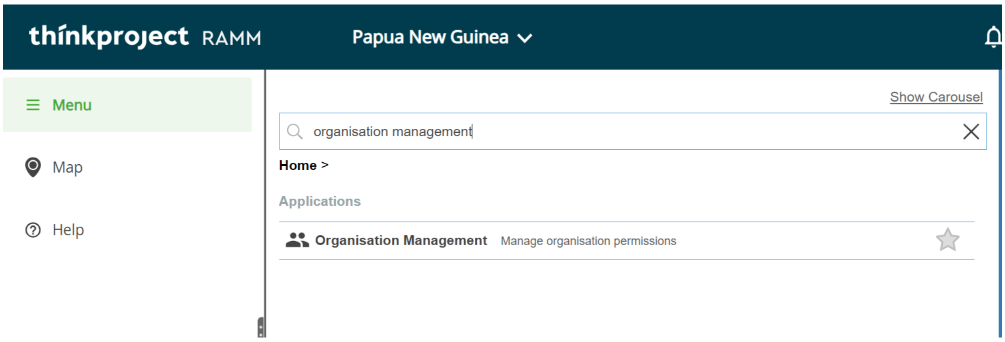
Initially, a user requires access to the database. Once access is granted, there are then further permissions for:

- **Asset Management** - Permissions allowing access to Security Zones (Areas), and to different assets in that Security Zone, as well as permissions for specific RAMM applications.
- **Work Management** - Permissions to create a Project/Contract and perform work on the assets in the database. Projects/Contracts are linked to a Security Zone. You can learn more about Work Management in our Jobs/Dispatches course.

Asset management

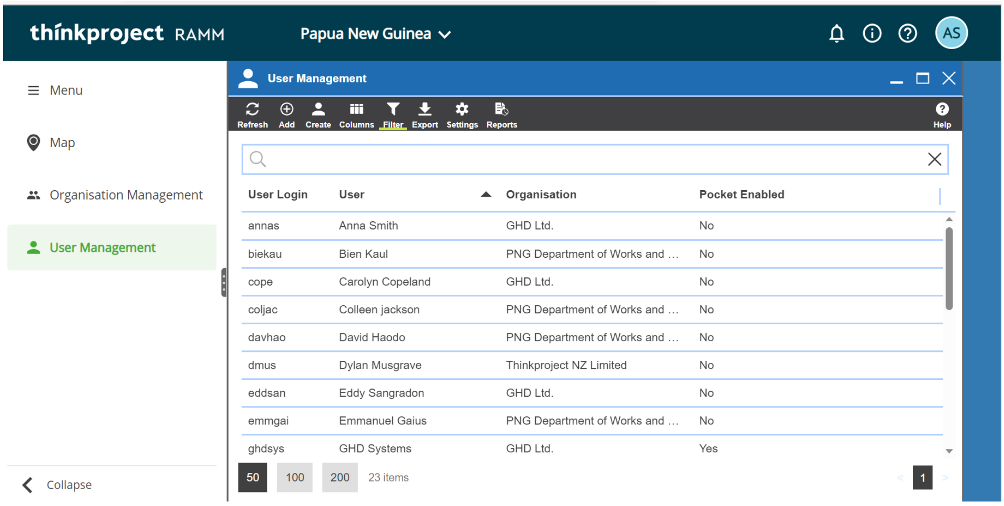
- *Security Zone Access - Asset Management*
- Within each database there will be one or more Security Zones. Users are granted access to the zone or zones where the assets are that they are responsible for maintaining.
- Within each Security Zone individual users can be granted permissions in these areas:
- **General** - Range of general database permissions for the Security Zone
- **Assets** - Permissions for individual assets
- **Staff** - Permissions for editing staff access
- **Specialist** - Permission to access more specialised RAMM applications.

Organisation management- where you create a new user log-in or update your password



User management- lets you view user permissions

Current Users with access

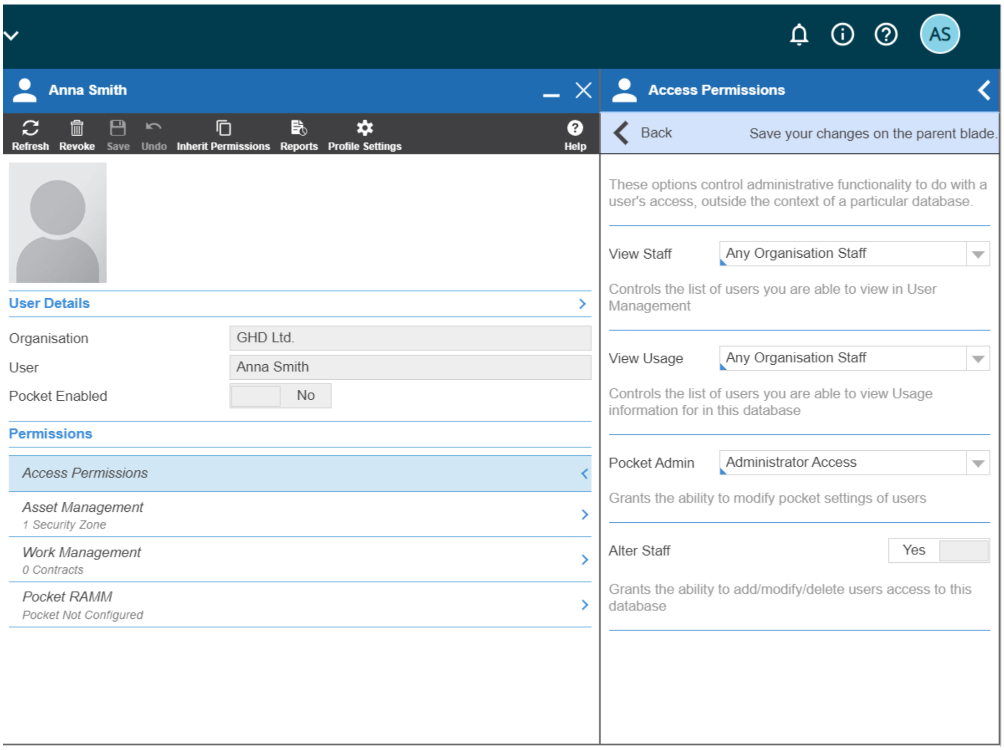


Permission areas in RAMM

Access permissions- tells you if the user has permission to view other users and/or if the user can edit other user permissions

Asset Management - shows you the security zone/s a user has access to as well as the users level of permissions in terms of updating/editing asset and inventory data

Work Management - shows all of the contracts a user has access to



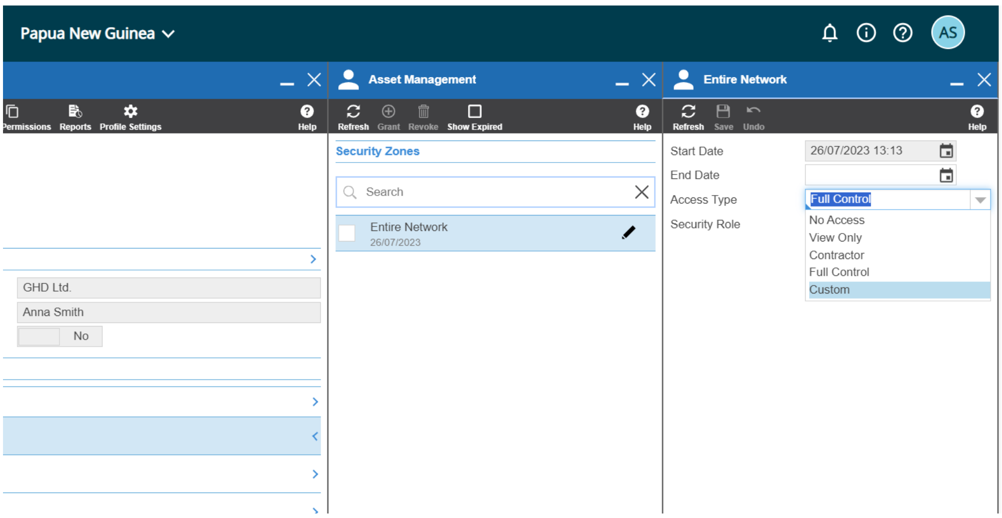
Asset management permission levels

view only access - where you cannot edit asset data but can view all data

Full control - where you can edit all asset data

Contractor - default RAMM permissions set up for a contractor

Custom – where you can edit/view pre-selected asset data



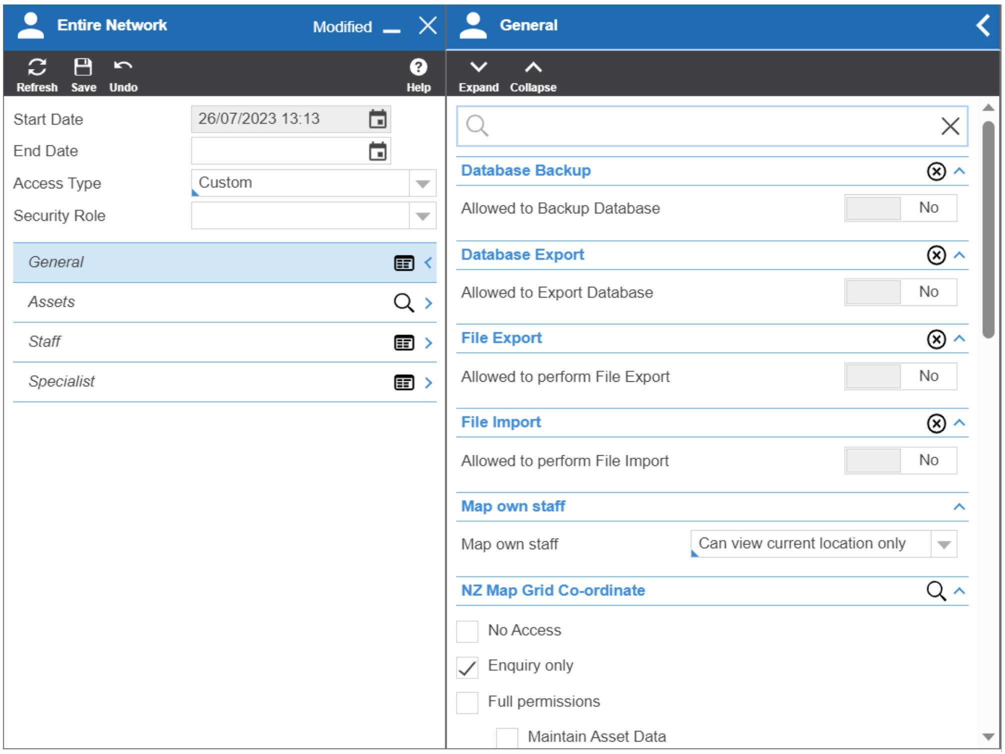
Custom RAMM settings

General- covers permissions for things such as exporting data from the database/importing files, adding UDTs, SQL access

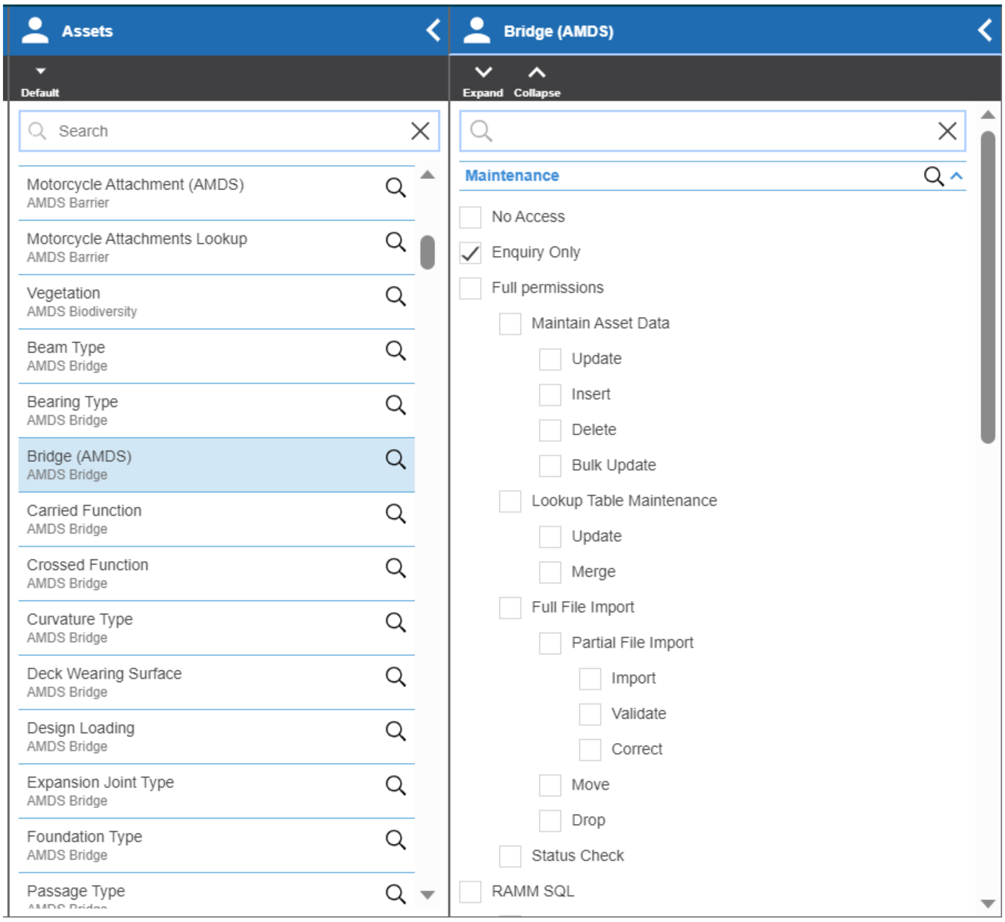
Assets- covers permissions for individual asset types

Staff- covers permissions for other RAMM users

Specialist- covers permissions for RAMM functions that are specialised such as high speed data, forward works programming, centreline segments



Bridge asset permissions example



Update

Insert

Delete

Bulk Update

Approve (if turned on for the asset type)

RAMM permissions key facts

- RAMM permissions can be customized to only include certain assets per user
- Anyone can have view only access for all asset data
- generally 1-2 users will be able to update/edit user permissions as well as add new users
- Currently the entire PNG road network is a single security zone

RAMM help videos

https://go.ramm.com/?help=UserManagement

https://go.ramm.com/?help=OrganisationManagementQuickStart

An overview of the Asset Hierarchy feature

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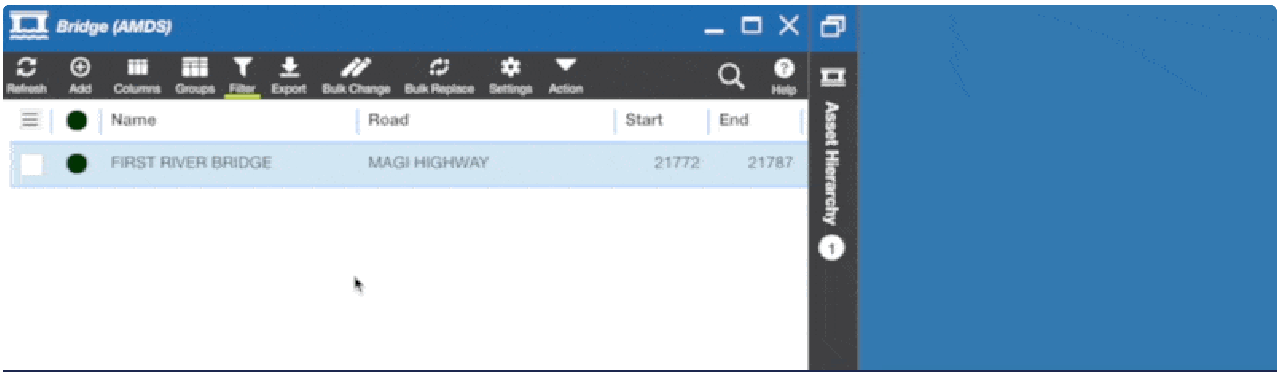
The RAMM Asset Hierarchy feature allows for relationships to be defined between different items in the database. Relationships are created by adding links between related records.



Opening the Asset Hierarchy screen for the selected record.

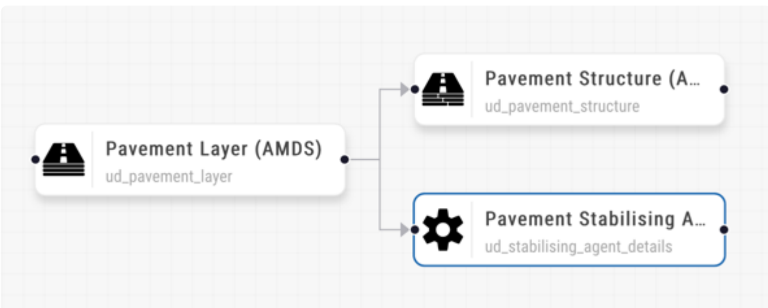
When linking items together, one record becomes the parent record and the other becomes the child record. Links can be added between records in the same table or between records across different tables. For example, an asset in the Berm (AMDS) table could be linked to an asset in the Footpath (AMDS) table.

Records can also be unlinked if the relationship is no longer relevant/applicable.

Dependent Records

Some types of RAMM records must be linked to a parent record, where they are dependent on that parent record for important information such as location or classification details.

For example, records in the **Pavement Stabilising Agent** table have no location information on their own, so they must be joined to a parent **Pavement Layer** or **Subgrade Layer** record.



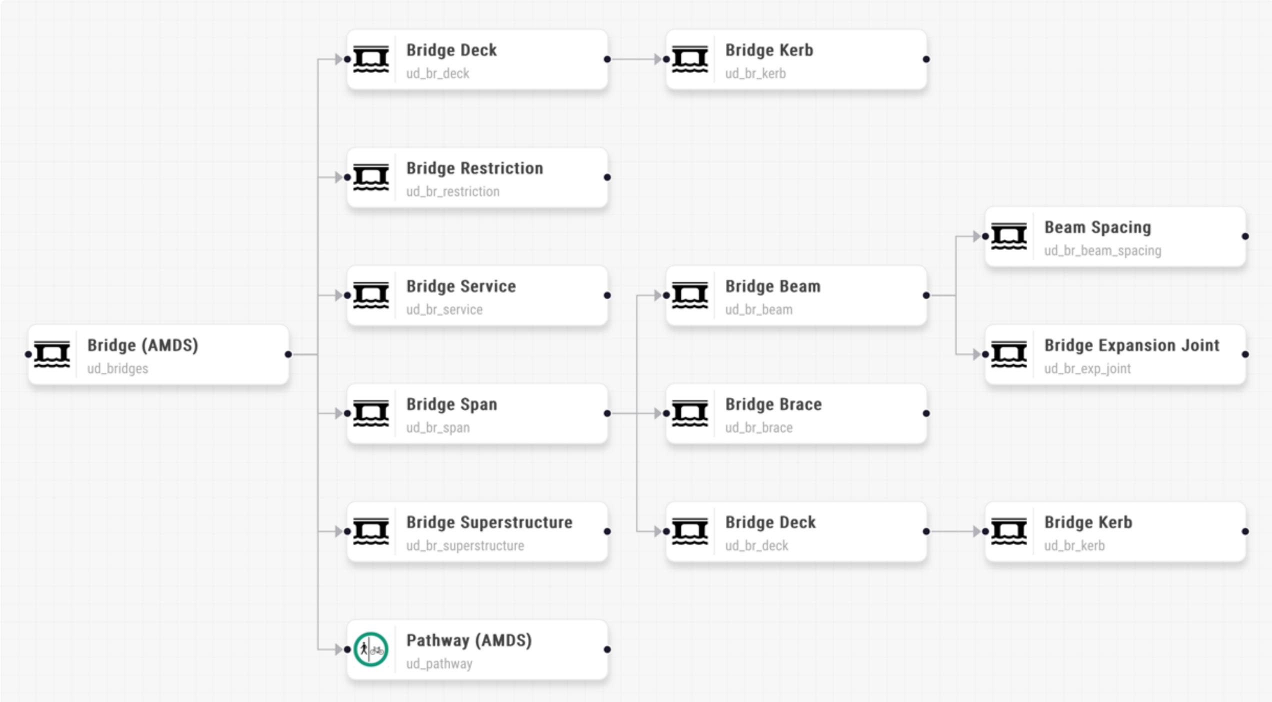
The highlighted Pavement Stabilising Agent table is related to the Pavement Layer (AMDS) table.

Complex Linking

Multiple levels of links can be defined to model complex relationships between records.

A single record may have no links, a single link to another record, or it can be linked to many other records. A single record can hold a mix of parent and child roles when linked to multiple other records.

Refer to the diagram below which shows fourteen tables configured in the Bridge linking hierarchy.



The link configuration for the Asset Hierarchy screen for Bridge assets.

Link Types

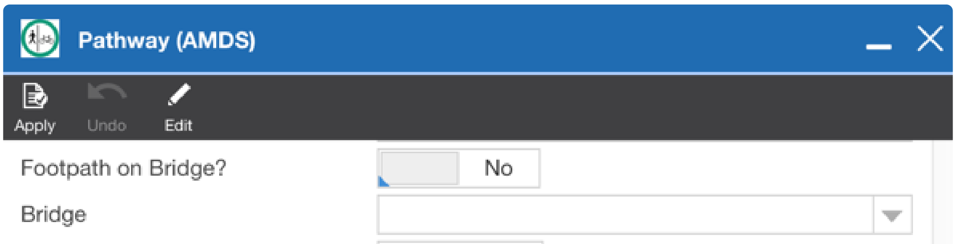
The link types available in the Asset Hierarchy screen, and their intended uses, are as follows:

- **Component:** For use when the child record forms part of the parent item.
- **Attachment:** For use when the child record is related to, or associated with the parent record in some manner, but does not form part of the parent item.
- **Lighting Component**: For use when joining the components of Luminaire, Outreach and Pole Structure.
- **Rehabilitation**: For use when joining Pavement Stabilising Agent details to Pavement Layers or Subgrade Layers.

Foreign Key Relationships

Relationships can also exist in the database in the form of**Foreign Key** relationships. These are relationships defined directly within a record, as part of the overall table design.

An example of this can be seen in the pathway table. When a pathway asset is located on a bridge, the bridge is defined directly within the pathway asset record.



If a Pathway asset is located on a Bridge, this is included as part of the definition of the asset record.

As Foreign Keys have a different implementation to the link types previously outlined above, *Foreign Key* is not a selectable link type option when adding links in the Asset Hierarchy screen.

Common Link Examples

Assets in the following groups are often linked to other assets/items in the database. The table names commonly linked to or from have been listed for each group.

- **Barriers**
  - Barrier (AMDS)
  - Barrier Terminal (AMDS)
  - Crash Cushion (AMDS)
  - Other related objects these assets are connected to or mounted on.

- **Bridges**
  - Bridge (AMDS)
  - Other related assets that are installed on, connected to, or mounted on the bridge.

- **Drainage**: where *Headwall* records are linked to parent *Culvert* records.
  - Culvert (PNG)
  - Headwall (AMDS)

- **Intelligent Transport Systems**
  - Camera (AMDS)
  - Controller (AMDS)
  - Electronic Sign (AMDS)
  - Other related objects these assets are inside of / located within.

- **Pavements;** where *Pavement Stabilising Agent* records are linked to parent *Pavement Layer* or *Surface Layer* records.
  - Pavement Layer (AMDS)
  - Pavement Stabilising Agent (AMDS)
  - Subgrade Layer (AMDS)

- **Street Lights**

    - Controller (AMDS)
    - Luminaire (AMDS)
    - Outreach (AMDS)
    - Pole Structure (AMDS)
    - Other related objects these assets are connected to, mounted on or located within.

- **Surfaces;** where *Additive Details* and *Adhesion Agent Details* records are linked to parent *Surface Layer* records.
    - Surface Layer (AMDS)
    - Additive Details (AMDS)
    - Adhesion Agent Details (AMDS)

- **Traffic Signals**
    - Aspect (AMDS)
    - Controller (AMDS)
    - Pole Structure (AMDS)
    - Target Board(AMDS)
    - Traffic Signal (AMDS)
    - Other related objects these assets are connected to, mounted on or located within.

Support Structure assets (Pole Structure, Outreach, Gantry, and Mast) will usually be linked to other assets, but have not been explicitly included as a standalone asset group in the list above.

AWM Basics

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System Name: Asset & Work Manager (AWM) - formerly called RAMM

Software Company: ThinkProject

New User

If you are a new user, you will need to be issued with a login. Request a login by contacting support@pngroads.com.

You will need to include the username, email address, mobile phone number, role and province.

KnowledgeBase

The DoWH have set up a knowledgebase to support asset management, road management and the use of AWM by DoWH staff and external parties.

The knowledge base is called: WorksKuru

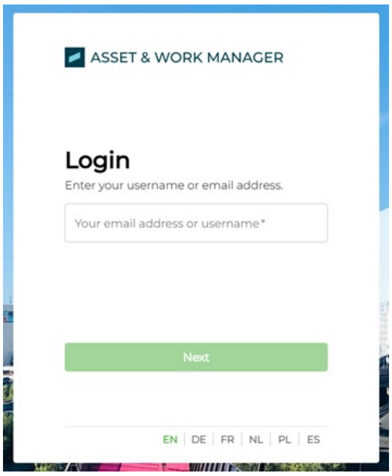
Website: help.pngroads.com

AWM Access & Login

Website Address: https://go.ramm.com

Login process:

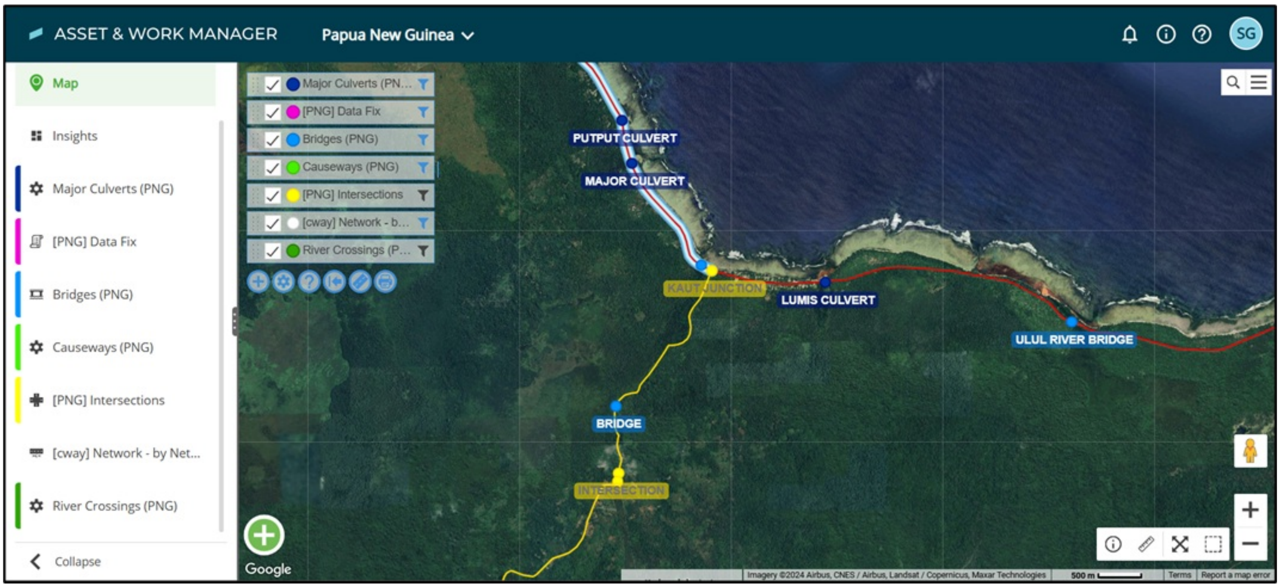
1. Enter the web address into your web browser or used your saved bookmark
2. Enter username (this will be your email address in the future)
3. Click on 'Next'



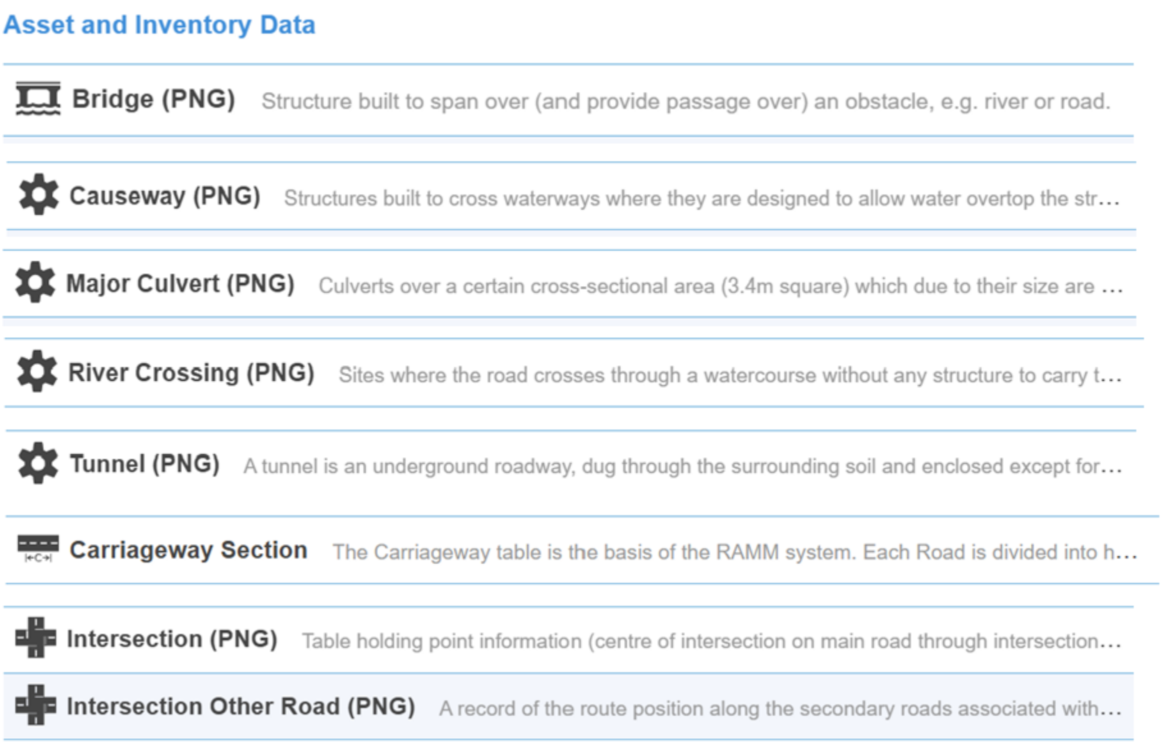
4. Enter your password and click on 'Log In'

5. Select the database you want to use (switch between the Master database and the Training database)

AWM Map Screen

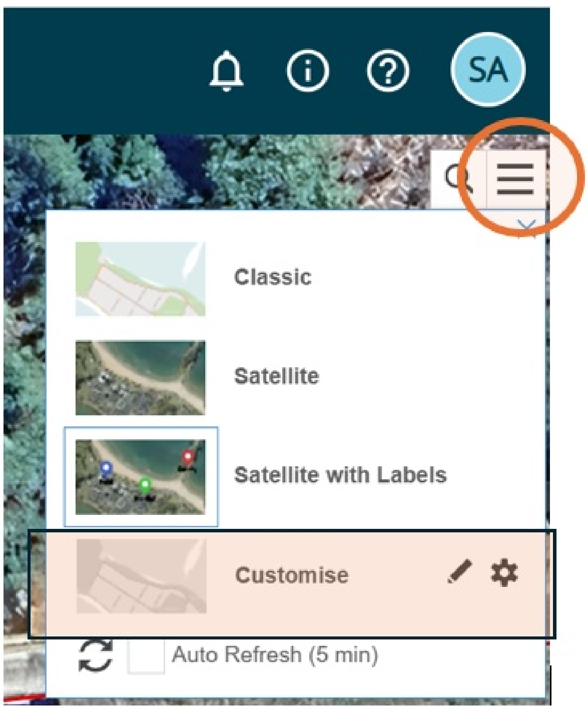


List of Current Information Available as at Rollout



Other Base Layers

Select Hamburger to access other Base Layers or to use a Custom Base Layer.



AWM Layers, Views and Layer Packages

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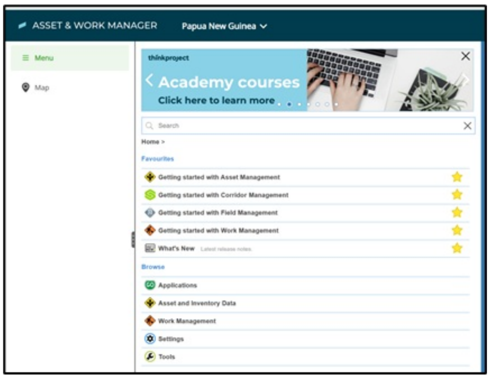
Viewing information in Map and Grid

Select Menu in the top left corner.



To find assets and other information you can click on the 'Asset and Inventory' icon in the list or search directly for what you require.

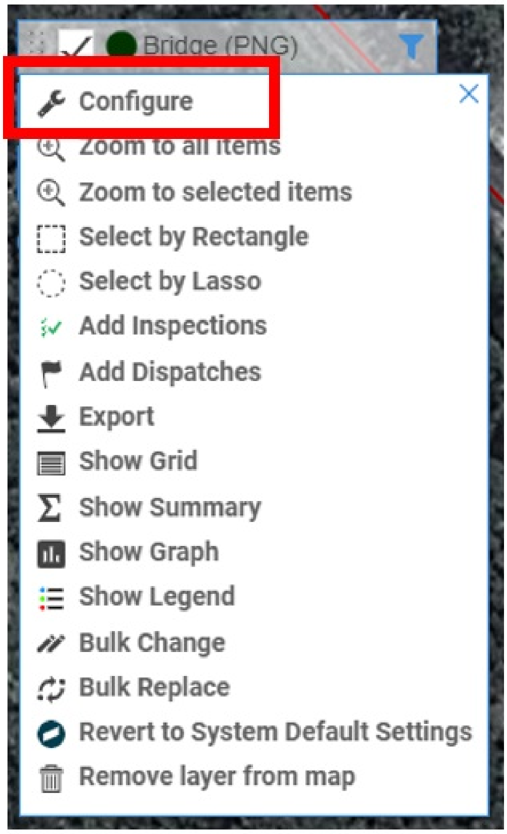
Search for the asset data as per the available information show in the list above.

Note you can 'star' items to set them as a favourite.

Viewing small items on the map

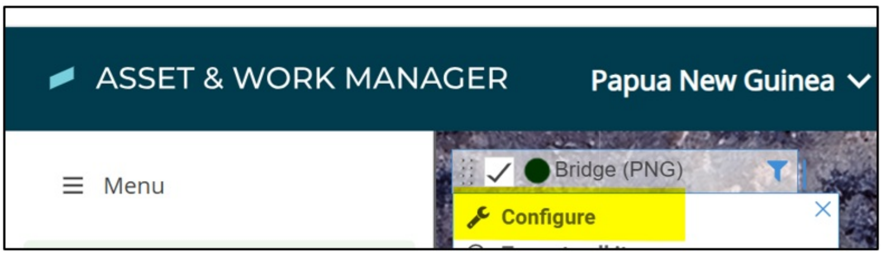
When using the Standard view where all assets are drawn on the map in their proper location rather than Clustered, smaller assets can often be difficult to spot/locate as you zoom out:

In the "**Configure**" menu, you can find an option "**Show Small Items as Points**" – ticking this will cause the asset to display as a point at more distant zooms, making it easier to spot them – note the difference in the same bridge compared to the screenshot above:



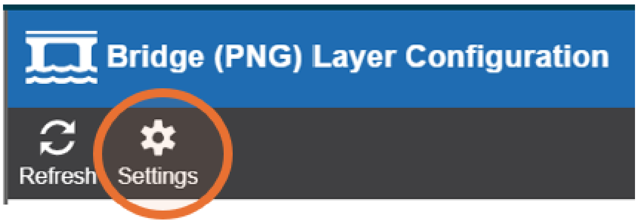
Customising and saving views

Select '**Configure**'

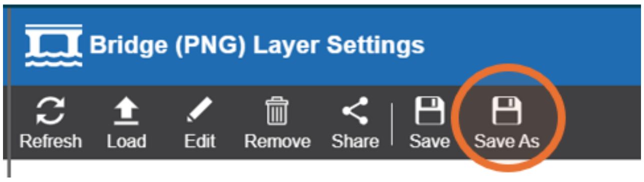


To Save any setting you make for future use:

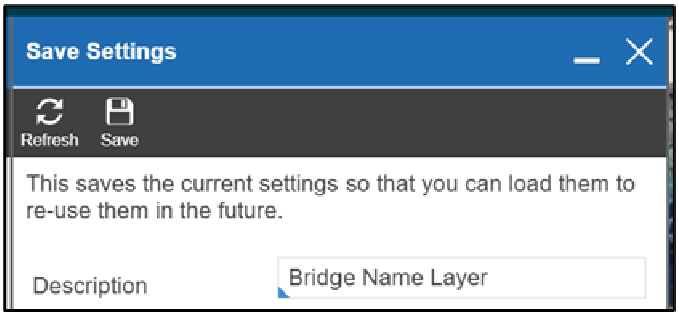
Press 'Settings'



‘Save As’ to save your settings (map layer).

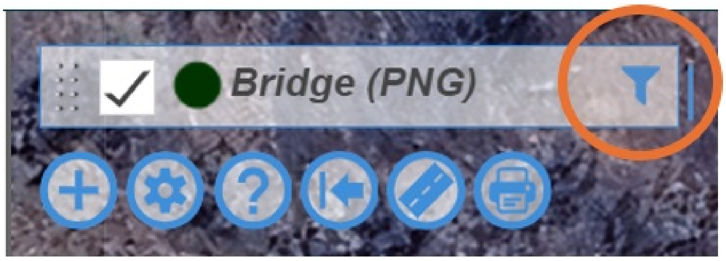


Provide a new name and then press ‘Save’.



Filtering data

Select filter icon to do a quick filter from the Map Layer Label.

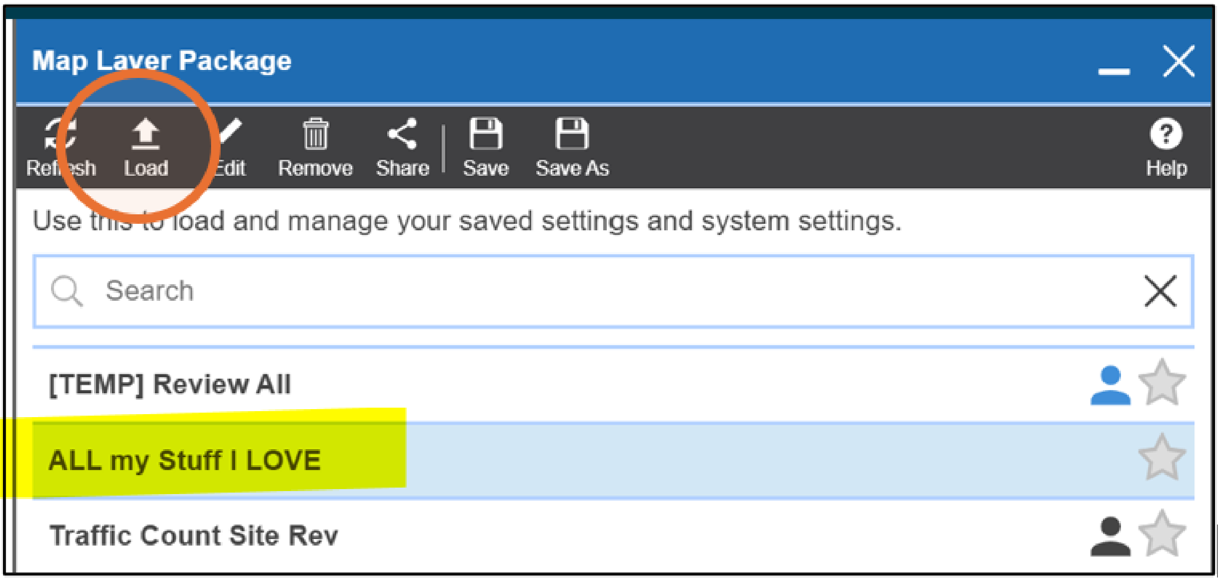


Map layer packages

The Map Layer Packages can be accessed through the small cog icon in the menu at the top left of the map screen.

Click ‘Settings Cog’ to display the list of available Layer Packages.

Select the required Map Layer Package and click on ‘Load’.



Double clicking the map layer package itself can often cause it to load duplicate copies of the views in the package – see “Removing a Map Layer” below in this case).

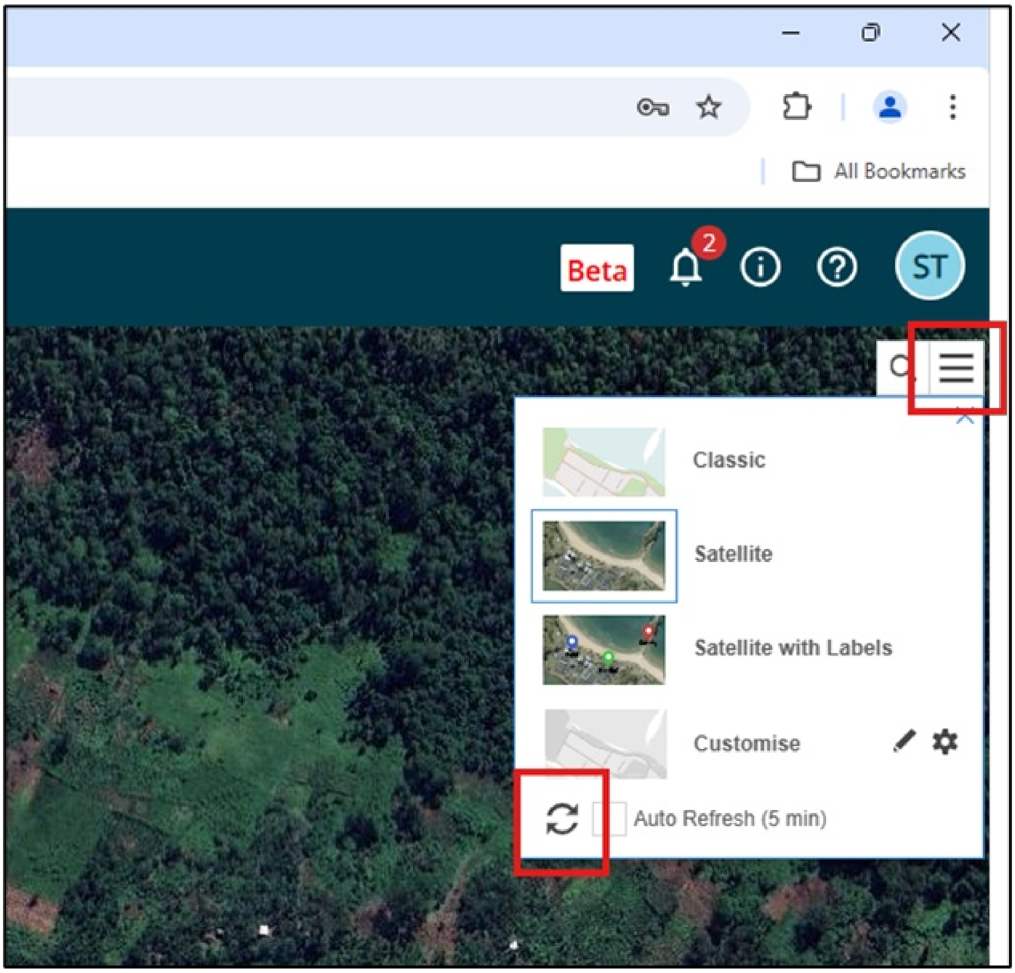
Loading a Map Layer Package will close out any layers that you already had open on the map.

Refreshing the data on the map

Sometimes it can be useful to force the map to refresh the data you have displayed – either because someone has made a change to a record since you opened the map layers, and you wish to see the change, or because the deleted record hasn’t dropped off the map (when deleting to history).

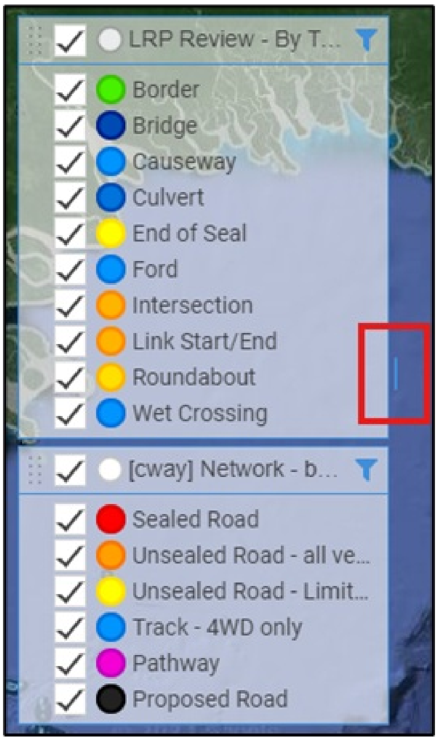
In this case, you can click on the refresh map button in the menu in the top right of the map to refresh the map which will make the record disappear from the map.

Only do this while zoomed in on the map, as it refreshes all visible data on the map which make take some time if you’re zoomed out with a lot of data displayed on the map.



Expanding the Map Layers Window

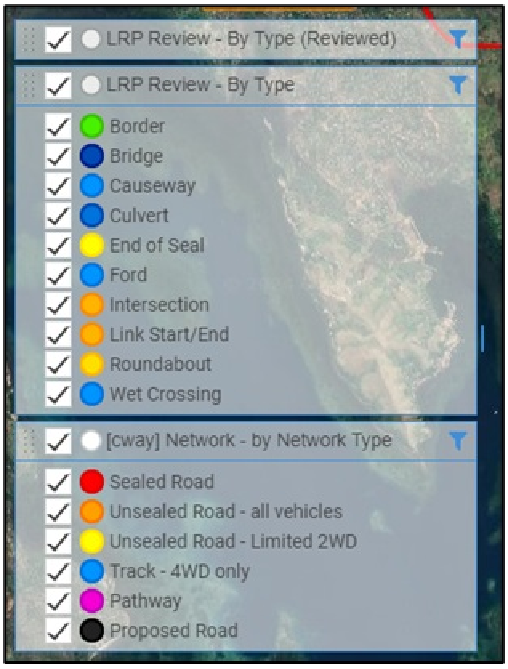
As per the screenshot below, sometimes the map layers window is not wide enough to read all of the layer names.



To expand the window to be able to read the names:

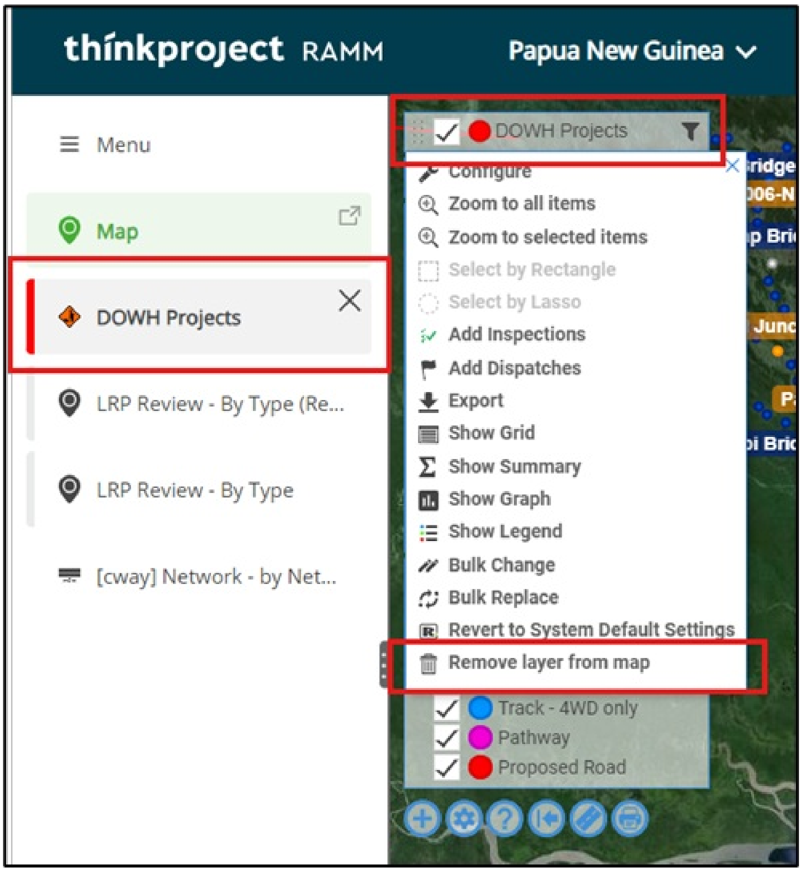
1. Move the mouse over the highlighted blue bar, and the mouse should change to an arrow pointing left and right.
2. Hold down the left mouse button and drag the window to expand or shrink as desired.

Layers after expanding them:



Removing a Map Layer

To remove a map layer from the list you need to click on the map layer header on the map and select Remove Layer from Map (clicking the close button on the grid layer on the left-hand side of AWM only closes the grid, not the map layer). In the screenshot below, choosing the x on the grid list to the left-hand side of AWM would only close the DOWH Projects grid while leaving the map layer intact, choosing "Remove Layer from Map" from the drop-down menu will close both:


thinkproject RAMM
Papua New Guinea
Menu
Map
DOWH Projects
LRP Review - By Type (Re...
LRP Review - By Type
[cway] Network - by Net...
DOWH Projects
Configure
Zoom to all items
Zoom to selected items
Select by Rectangle
Select by Lasso
Add Inspections
Add Dispatches
Export
Show Grid
Show Summary
Show Graph
Show Legend
Bulk Change
Bulk Replace
Revert to System Default Settings
Remove layer from map
Track - 4WD only
Pathway
Proposed Road

AWM Navigation

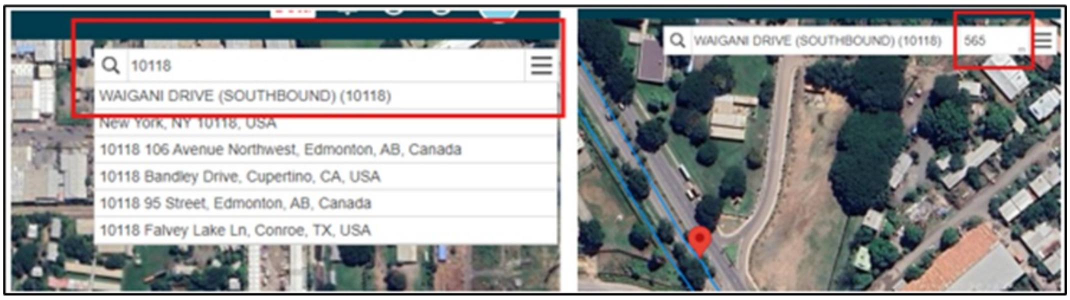
13/12/2024 10:32 am +10

Finding a road or location on the network

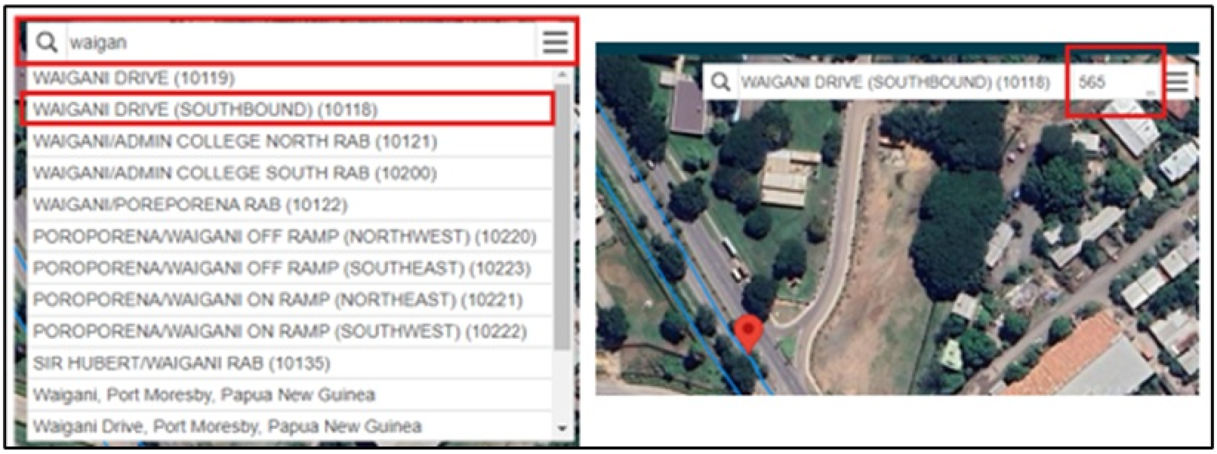
The search bar in the top right corner of the map allows you to quickly jump to specific locations on the map.

There are four ways to use the bar (all examples are using Waigani Drive at the main entrance to the Department of Works and Highways headquarters):

1. Enter the Road ID of the road you are looking for and enter the distance along that road to go to the specific location.

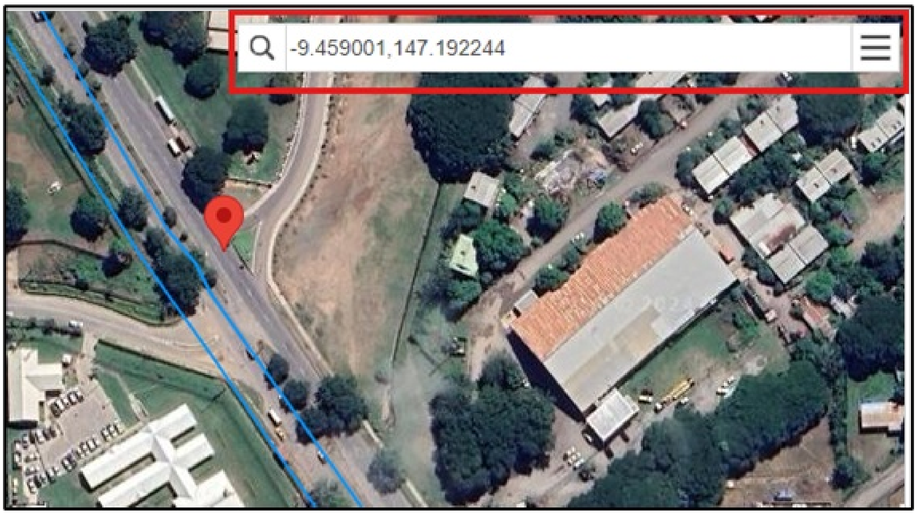


2. Enter the Road Name (or enough of a portion of the name to filter the list down only a few options) of the road you are looking for and enter the distance along that road to go to the specific location. Note all the road names in ALL CAPS are part of the road network setup in AWM.

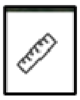
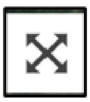
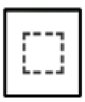


3. For a more general location, you can enter the name of the location (such as a village name) and if google has the location identified in its map data, you can select the location to go to it (be careful to check the full description offered in case you end up in another country instead).

4. Latitude and longitude values can be entered in the format Lat, Long as decimal figures to go to a specific location without needing to know the road id or distance down the road (see 'The i Tool - Getting the details of a location in AWM' below to see how you can then get the Road ID, Name, and distance down the road to use). Make sure to keep the negative values for southern Latitudes.



Other Navigation Tools

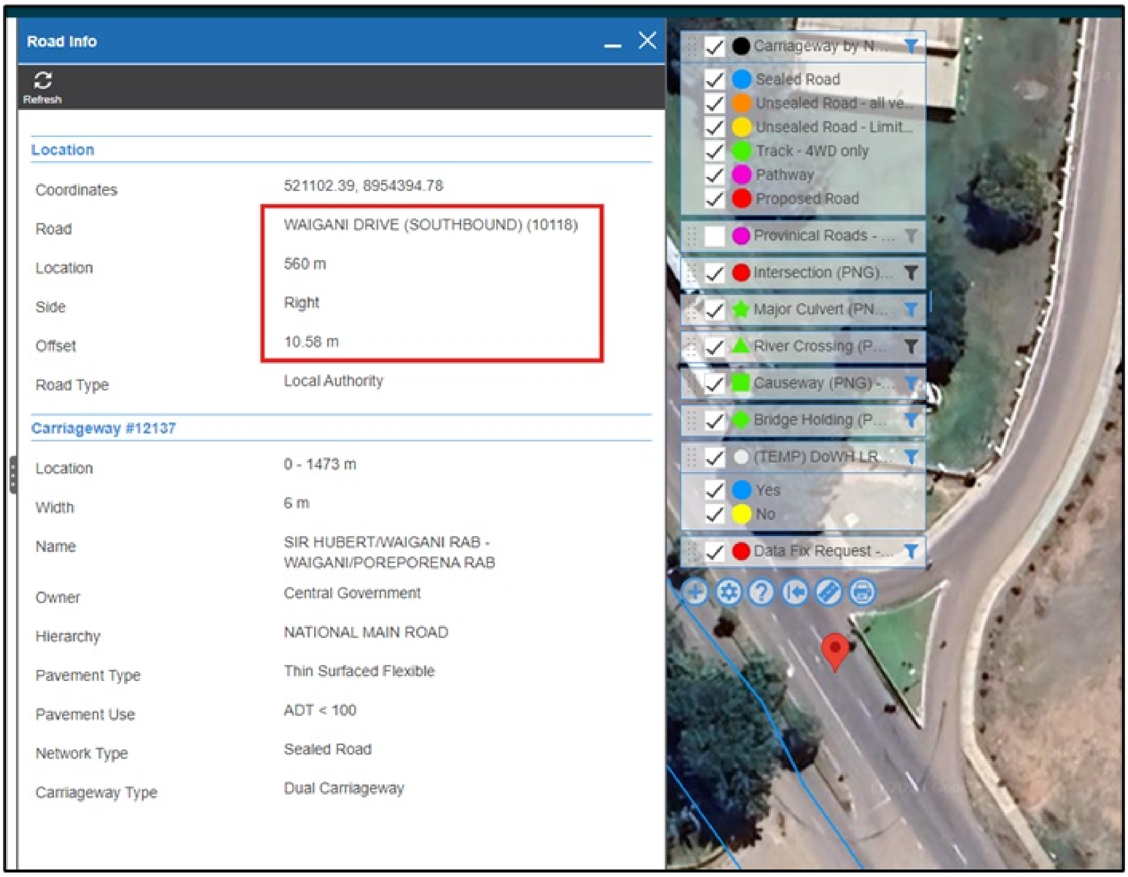
	Information from map
	Measure on map
	Zoom to Extents
	Zoom to Area

Zoom in and out

The i Tool - Getting the details of a location in AWM

To locate a spot in AWM terms, use the i button located at the bottom right of the map view and click on the point you need to locate.

This will load up the location data, giving you the road name (with ID), location along that road, along with the side and offset from the centreline to your selected point (along with a easting and northing value):



Using this on two points along the road is a quick way of identifying which direction the road is running in when you are unsure of this.

AWM Working with Records

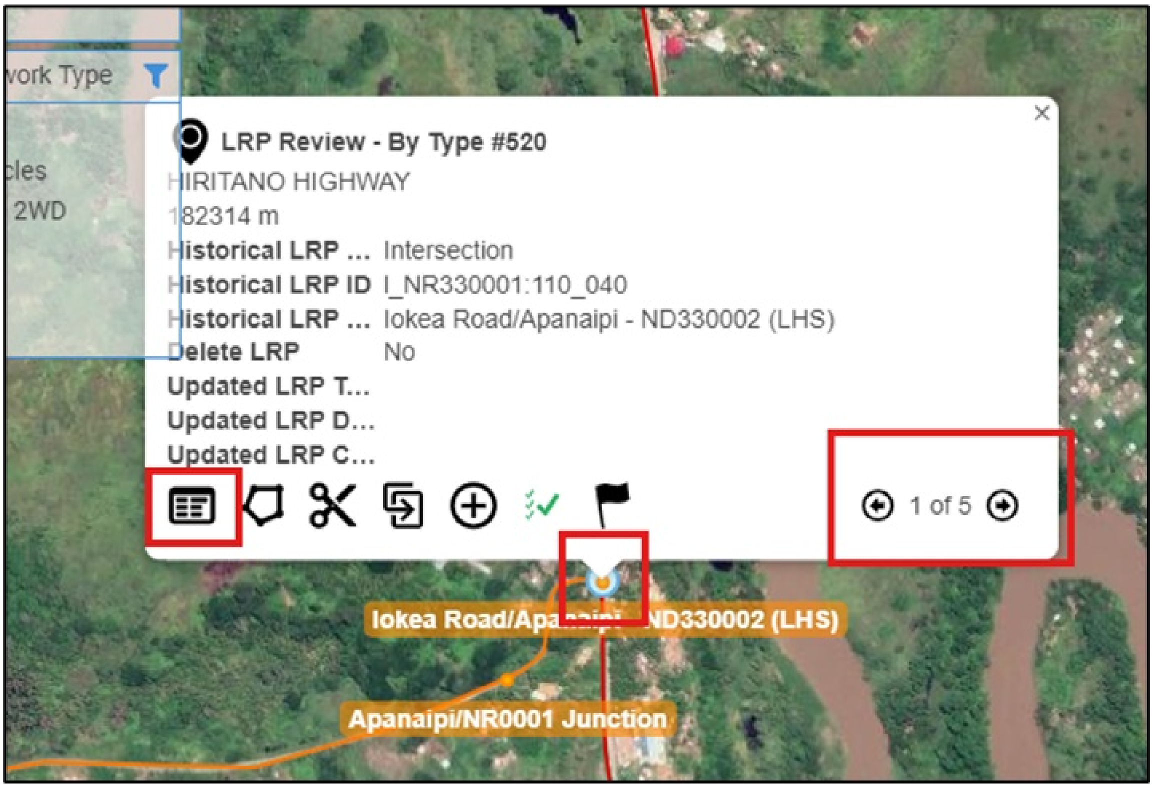
13/12/2024 10:18 am +10

Open a record

1. Click on the record on the map.

2. If there are multiple records at that location, navigate through to the record you need using the arrow buttons on the bottom right of the pop-up.

3. Click on the button on the left side of the pop-up to load the record.



Editing a record

Once the record is open, the data can be filled in as required.

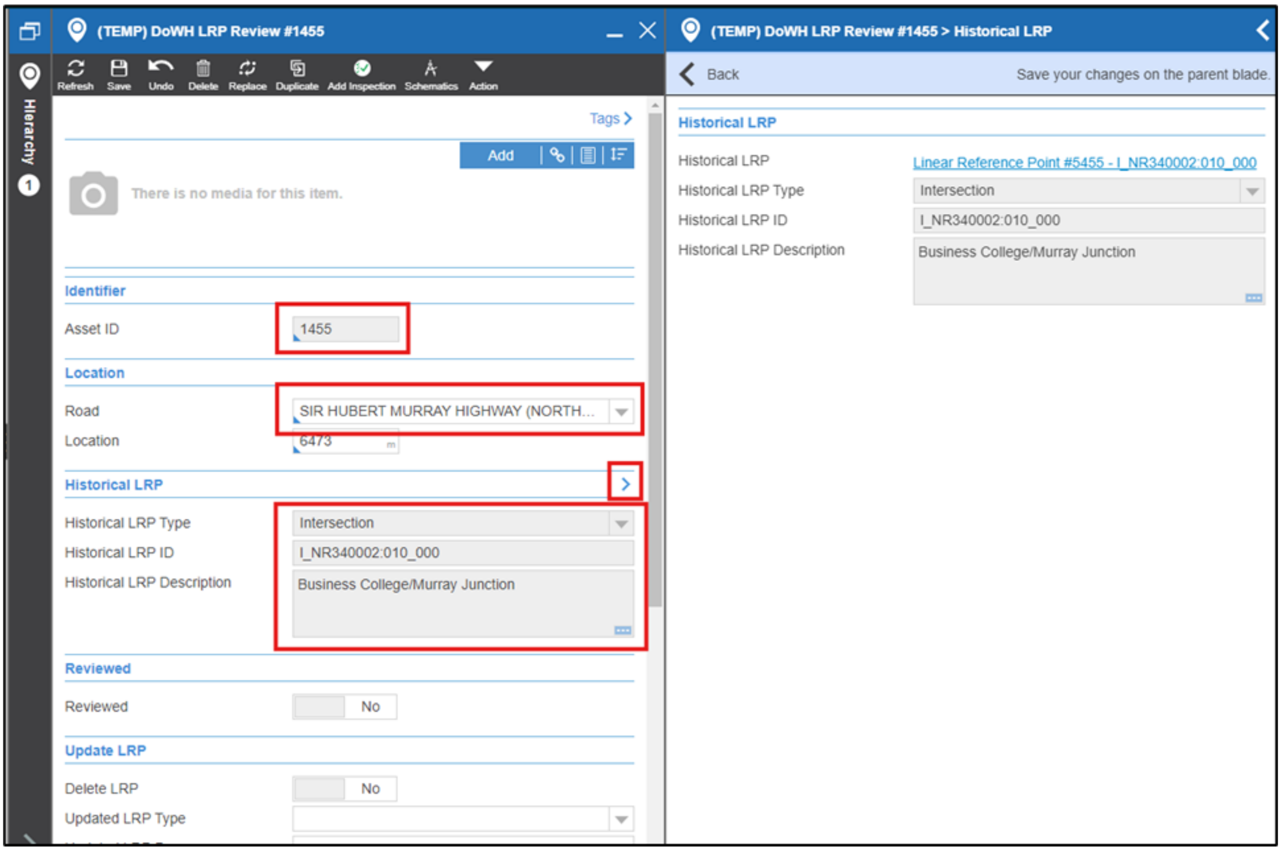
Some things to note while editing:

- Greyed out fields such as those under the Historical LRP section shown in the screenshot cannot be edited.
- Fields with a little blue triangle in the bottom left (Asset ID and Road Name in the screenshot as examples) are required fields and must have data in them to be able to save the record.
- Note that the Asset ID field is a special case – the system will populate this field for you.
- Fields with a drop-down list (Road Name in the screenshot) rely on a on a list of lookup values – this list may take some time to load depending on your connection and the size of the lookup list. You can either use the drop down and scroll through the list or type a portion of the value you want, and the system will provide a filtered list for you to select from
    - For example, if you type "Poro" in the roadnames, you will get a filtered list back that includes among others Poro Moro Road and Poroporena Highway, while typing "Poroporena" will ensure you only get the roads associated with Poroporena – the two main road sections, along with the roundabouts and

on/off ramps.

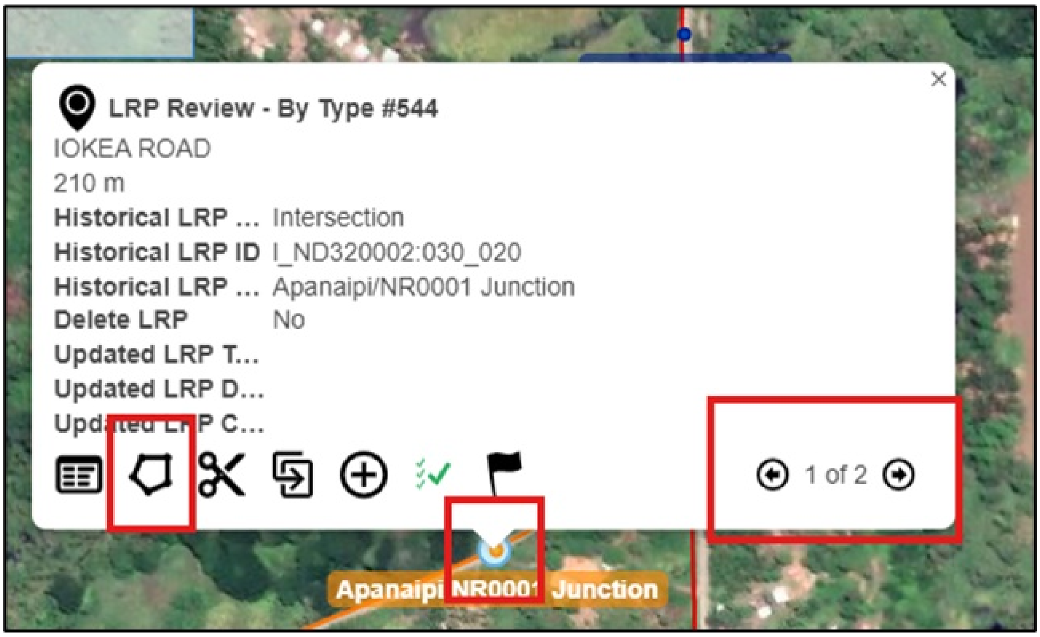
- The main form doesn't always show all the fields for a given section – if the blue section heading has an arrow ">" at the right, this can be clicked to open the secondary form for that section, as shown in the screenshot.

Generally, this is done where there are fields that aren't used very often or are of limited importance – just remember if there's a blue arrow on the main form, there are more fields than you can see on the main form alone.



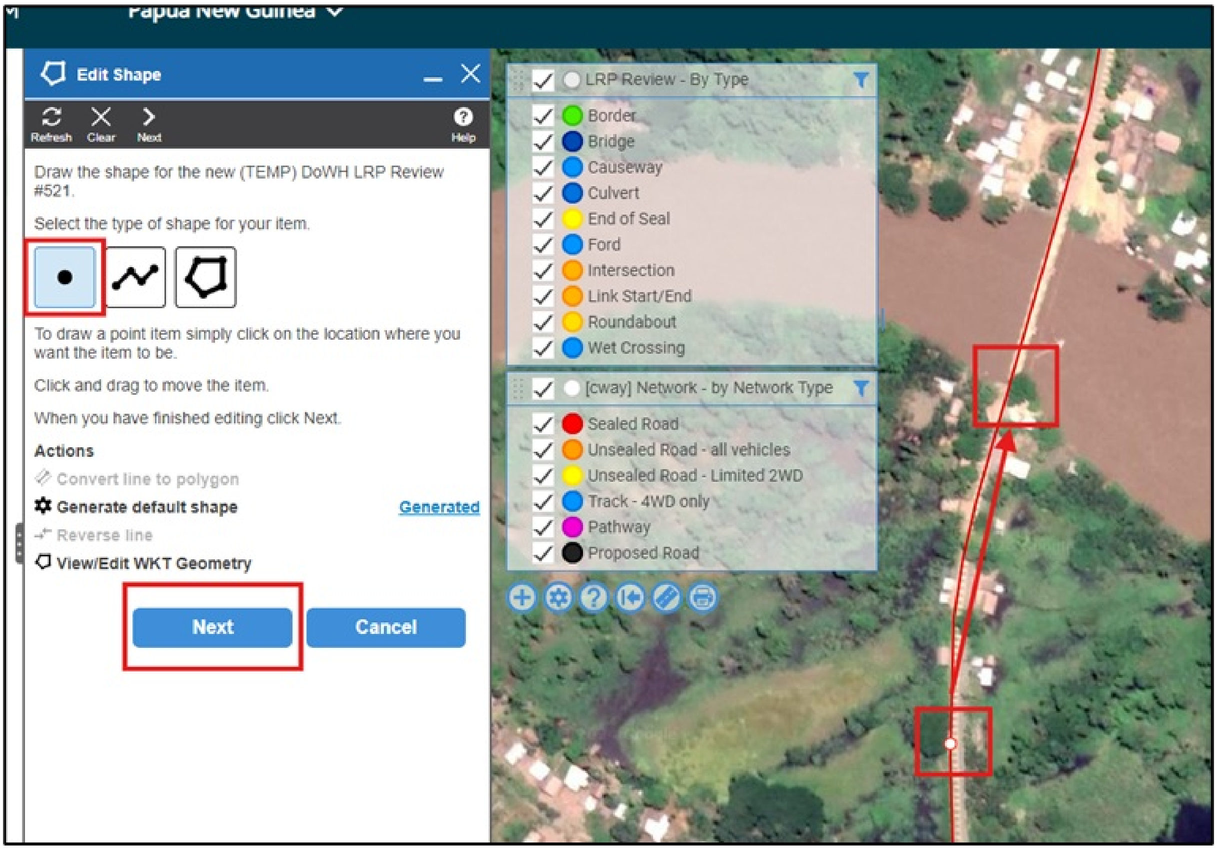
Shift a record on the map

1. Click on the record on the map.
2. If there are multiple records at that location, navigate through to the record you need using the arrow keys.
3. Click on the 2nd button on the left side of the pop-up to edit the location.



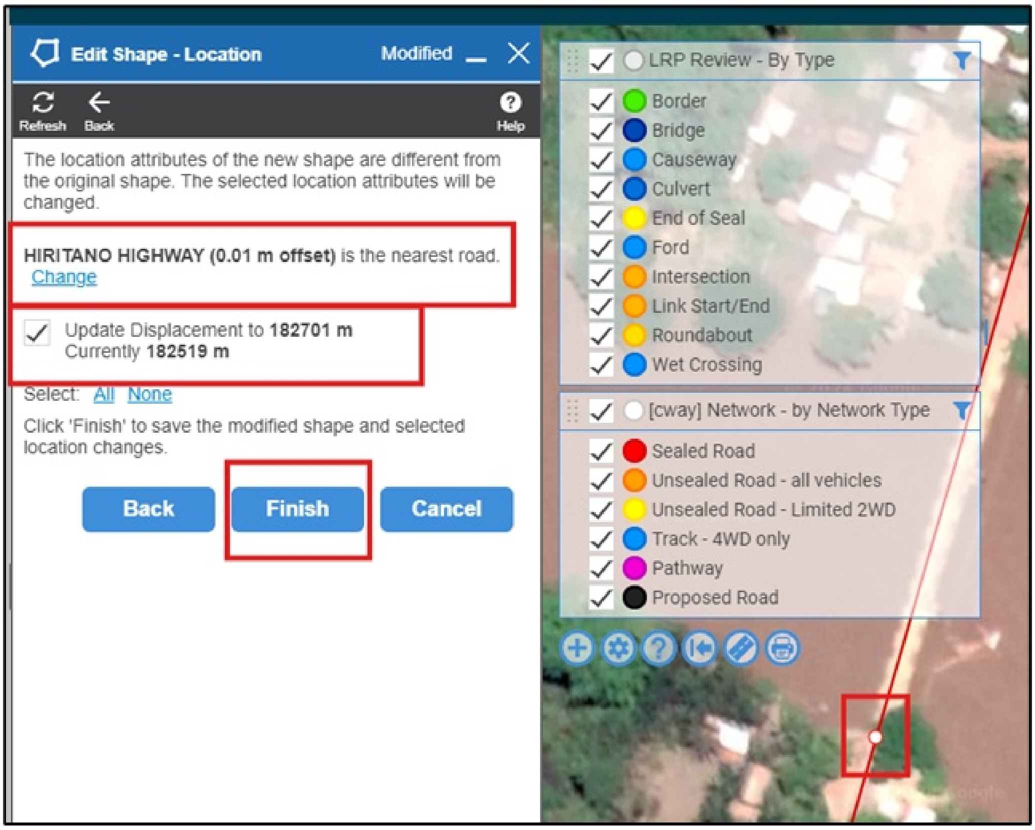
This will load up the edit location menu. While this is open, do the following:

1. Check that point is selected (for other assets, line or area may be appropriate but for this exercise we are only dealing with a point asset).
2. Drag the red dot from its current location to the correct location (in the example below, to the first abutment of the bridge).
3. Once it's in its correct location, click Next to do the next part of the location update.



This brings up the location data for the new position.

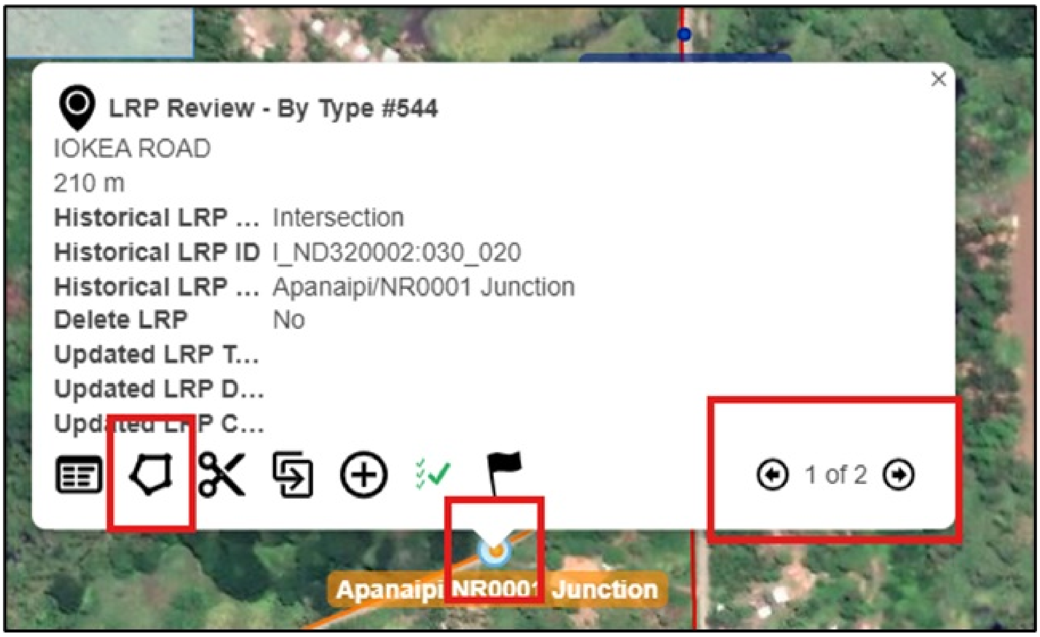
- If the location is on the correct road, only the displacement needs to be updated (make sure that the tick box is checked).
- If the location should be on a different road (often occurs with points around an intersection for example), click the Change link by the Road Name – in this case, it will list all the nearby roads it could be associated with, and the displacement value will be automatically updated based on the road chosen.
- Once you're happy with the new location, click Finish to update the record.



Editing the shape of a record

This is very similar to shifting the record.

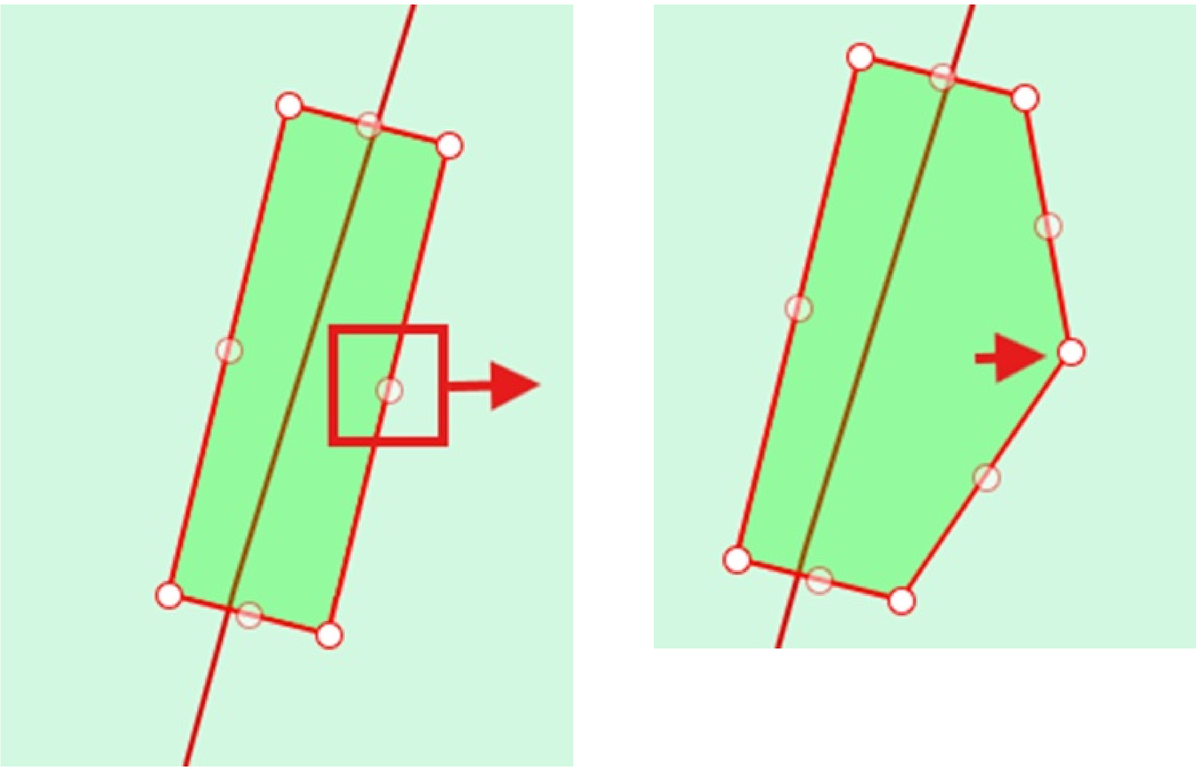
1. Click on the record on the map.
2. If there are multiple records at that location, navigate through to the record you need using the arrow keys.
3. Click on the 2nd button on the left side of the pop-up to edit the location.



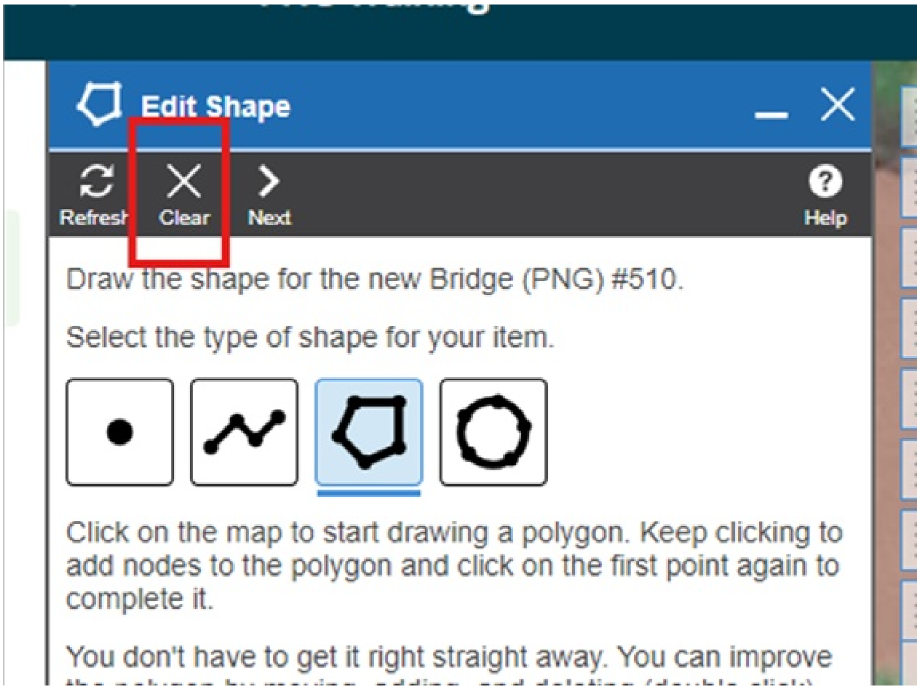
This will load up the edit shape menu.

Each shape is made up of two types of point (except for point shapes which are literally a single point):

- Bright white dots which are the actual points that define the shape – these can be dragged to change the shape or can be double clicked to delete them.
- Faded dots midway along the lines between these bright white points – these can be dragged to create new points to further modify the shape – once they have been used to create a new point, it will turn bright white with new faded dots at the mid points of the lines either side:



If you are only making minor changes compared to the overall shape, it's probably easier to drag the individual points to modify the shape, otherwise if the changes are major, you can use the clear button at the top of the menu to start completely fresh:

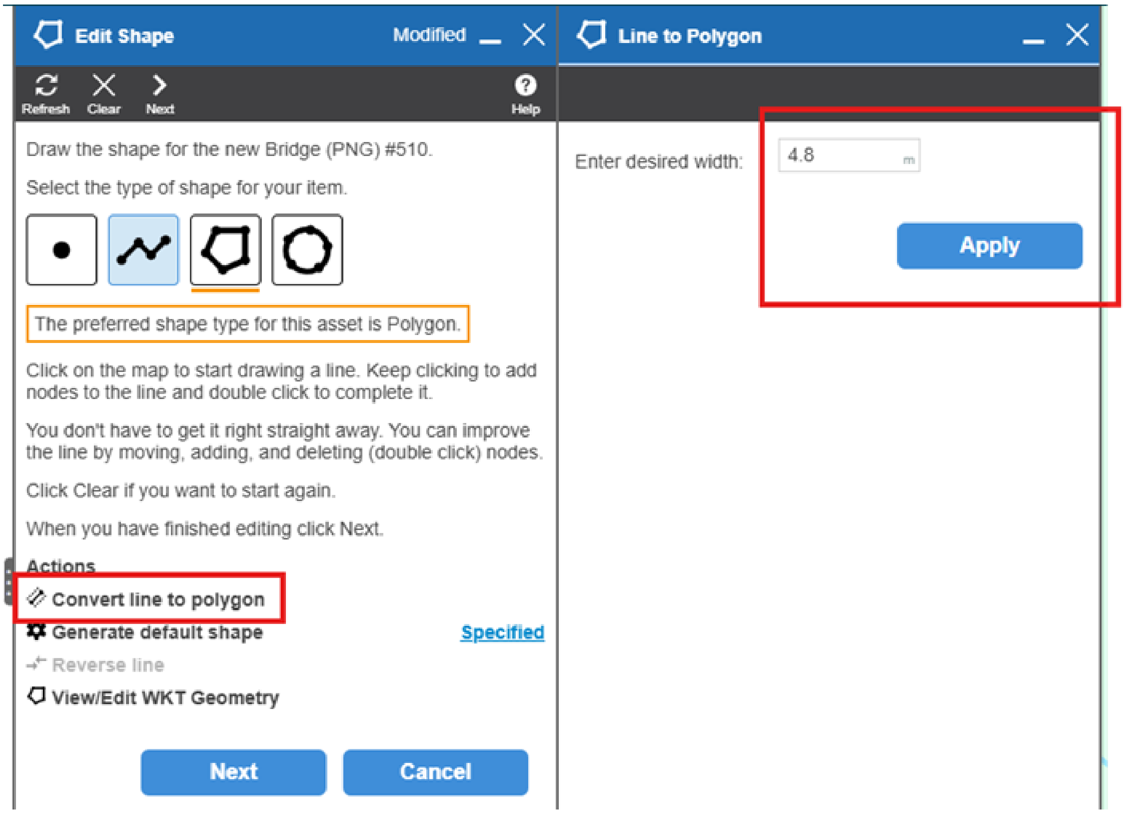


What needs to be done depends on what sort of shape you are trying to modify or draw:

1. Point records are very simple – either use clear, then click on the location to add the new point or drag the point from its current location to the new location.

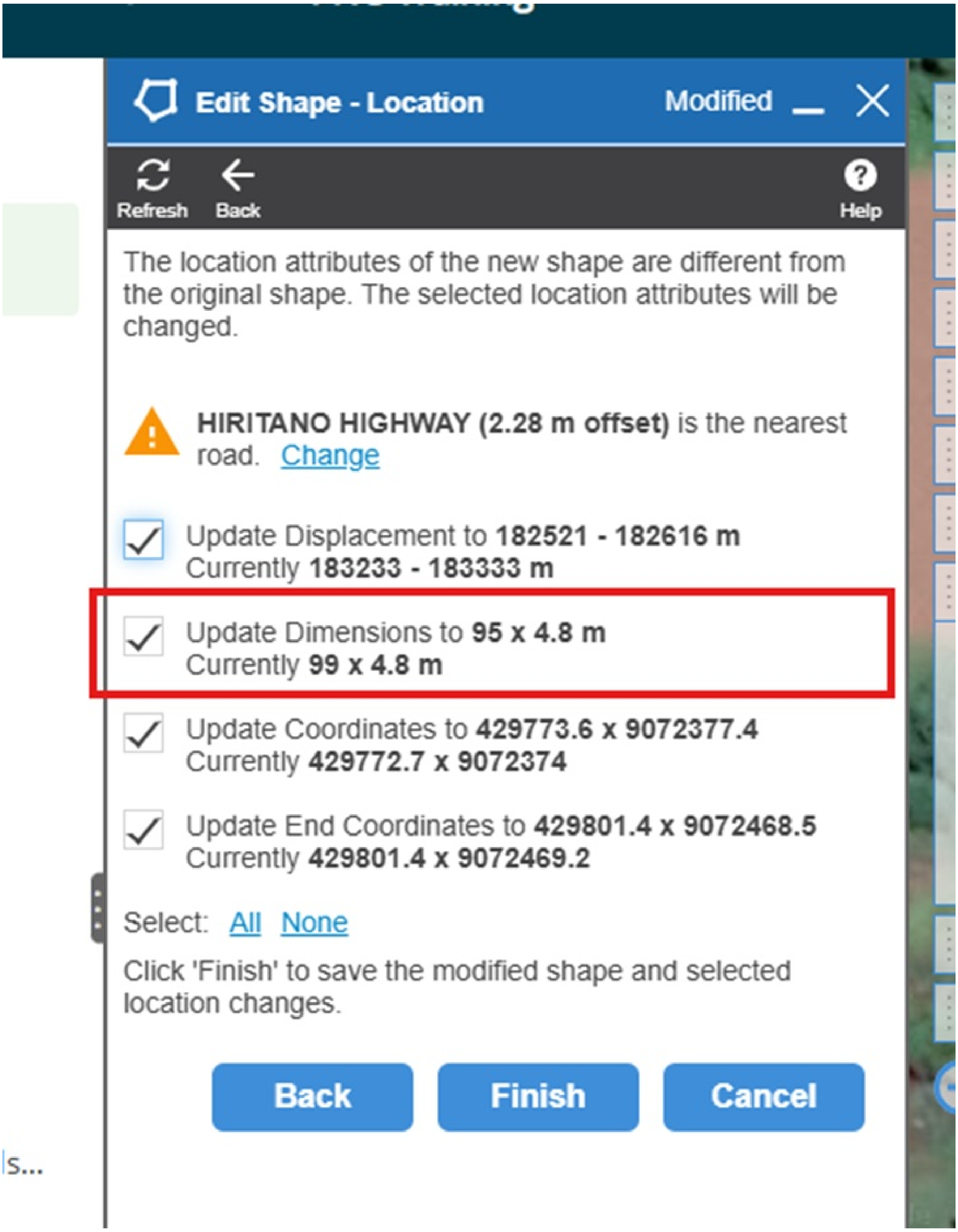
2. Line records either drag the individual points to their new locations, using the faded points to add any necessary new points, or double clicking existing white points to delete them, or start completely fresh clicking at each point you want to add to the new line, double clicking the very last one you add to finish the line.

3. Polygons can be like lines if you are modifying them using the combination of existing points and the faded dots to add new points, but can be done one of two ways when starting from scratch:
   - Select Polygon and click on the map for each point that defines the shape, double clicking on the last point to finish the shape – note that you don't have to make the last point meet the first point – the system will complete the shape between your first and last points created.
   - For assets which are regular in shape (such as bridges) you can use a line (following the process as given in (2) above) to draw the line, and then use the option in the edit shape menu to "Convert Line to Polygon" which will prompt you to enter a width for the shape – (if the record has a width field, it will take a couple of moments but it will populate the prompt with the width):



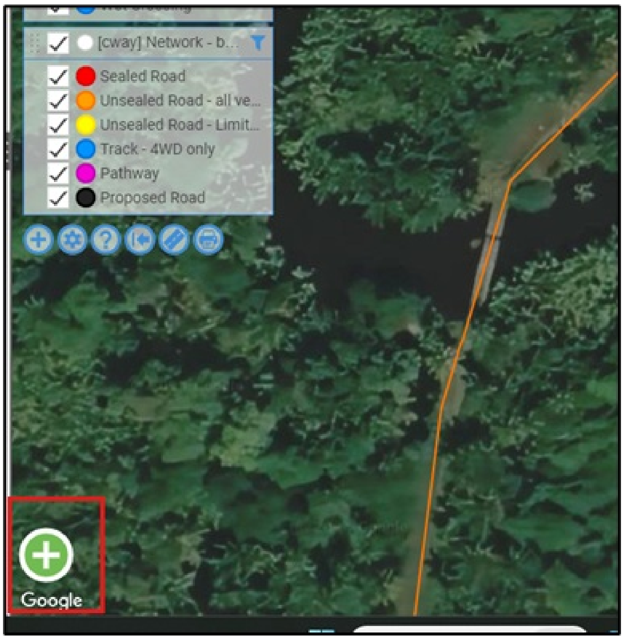
This will draw a polygon centred along the line that you've drawn – this is the quickest way to do a regular-shaped polygon.

Clicking Next on the Edit Shape menu will apply the shape and calculate any changes that should be made to the record based on the new shape you have applied. Note that if you are confident that the existing dimensions for the record are correct, you can turn off the specific update for the dimensions while updating the co-ordinates and route position of the record:

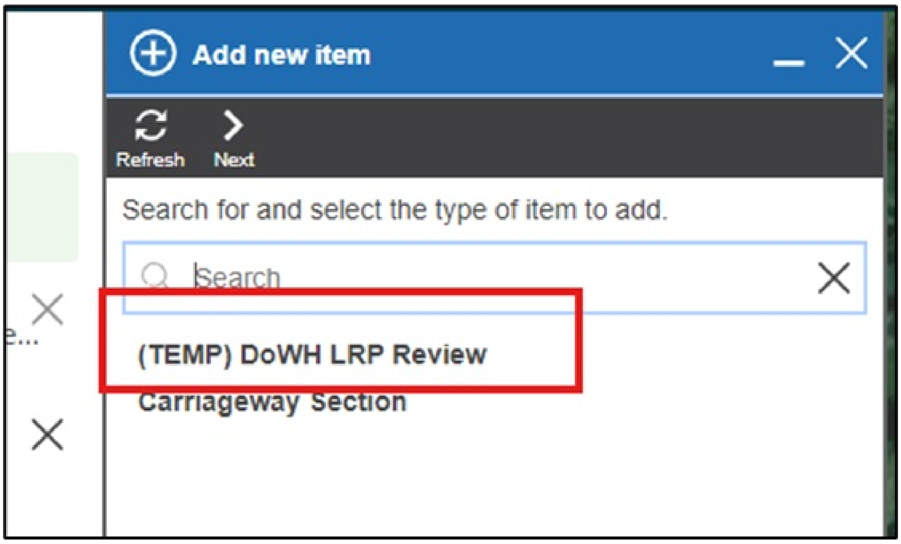


Adding a record

Click the green plus button in the bottom left of the map screen.



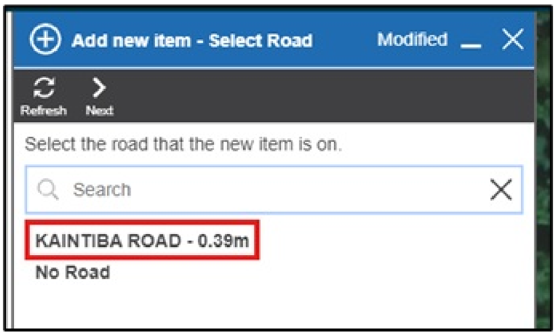
This then opens a menu with all the different asset types you have showing as layers on the map, for this example, we will use the (TEMP) DoWH LRP Review asset type – selecting the asset type will automatically take you to the next step.



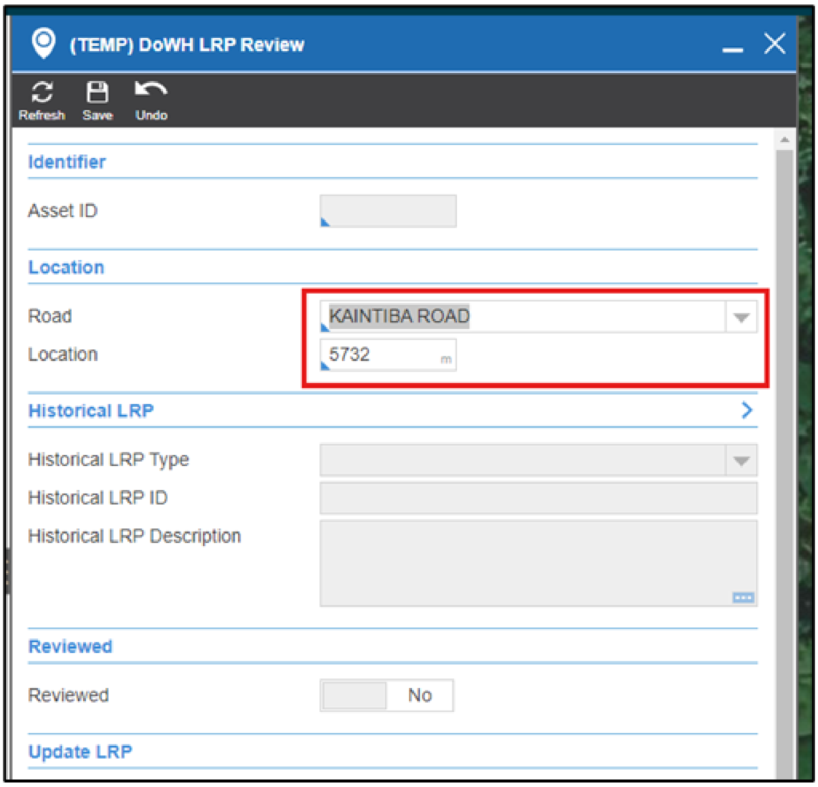
This then opens the menu to add a shape to the map to locate the new asset.

At this point, you can follow the instructions for **editing a shape** to draw the shape on the map. Note that as you are creating the record from scratch it will not pop up with a changes tab like editing a shape, but rather will prompt you to select the road to assign the record to – selecting the road you want will take you to the asset record screen so make sure you pick the road you want.

Note that the value in metres behind the road name is the offset from that road's centreline – this is a good way of double-checking which road you intend to place the asset on.

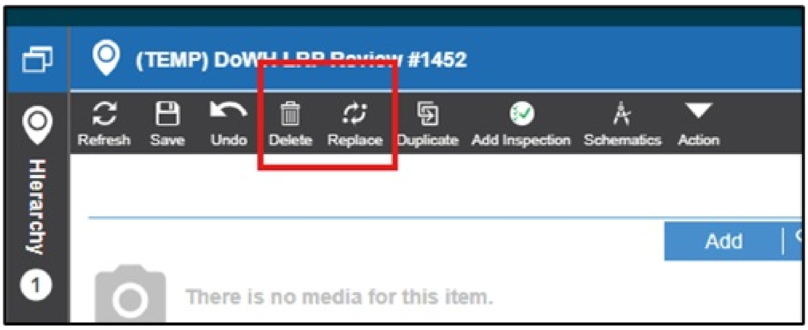


This will then bring up the new record for editing, with the location data populated based on what you selected (if you selected No Road the road and location fields would be blank). See the section on editing a record for what to do but note that as this is a new record all required fields must be populated before you can save the record.



Deleting a record

To delete a record, open the record you wish to delete and click on the delete button in the top menu:

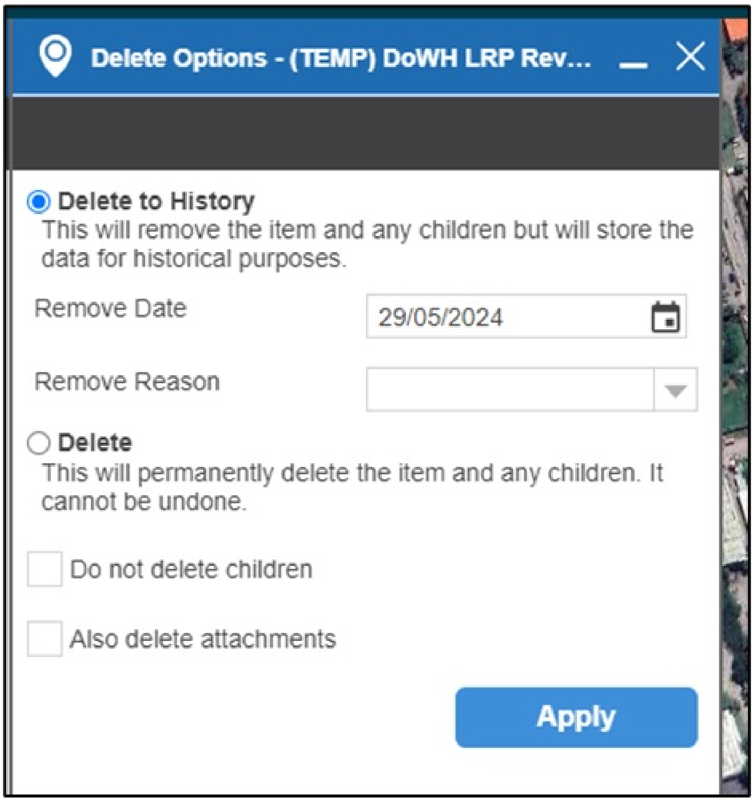


This will bring up the delete menu – the option you choose here depends on why the record is being deleted.

Generally, the first option "Delete to History" is the one you should choose (note that sometimes a particular asset will not have this option – most do however). This end dates the record which AWM then filters out for general use on the map, while keeping the historical record in the database – useful for example when a major culvert is replaced with a bridge, having the historical record of the culvert can be useful for understanding the nature of the area at a point in the past.

If the record was created in error (a LRP created for a bridge where there is obviously no such bridge for example), the second option "Delete" can be selected – this will delete the record from the database completely. **This option should only be chosen when the record should not exist (it has no historical information/value or should never have been created).**

- Note that when picking the "Delete" option, generally you would want to leave the two tick boxes below it unticked – normally you want to delete the child records associated with the one you are deleting (spans for example, are a child record for a bridge – if the bridge is deleted, you'd want to delete the associated spans).
- Attachments on the other hand are records that are linked to the record you are dealing with but not an integral part of the record – for example the guard rail on the approach to the bridge may be linked (attached) to the bridge to indicate that it forms part of the approach to the bridge, but if the bridge is deleted, the guard rail may still exist. **These "attached" records should be carefully reviewed to ensure that all of them should be deleted before ticking the delete the attachments option.**



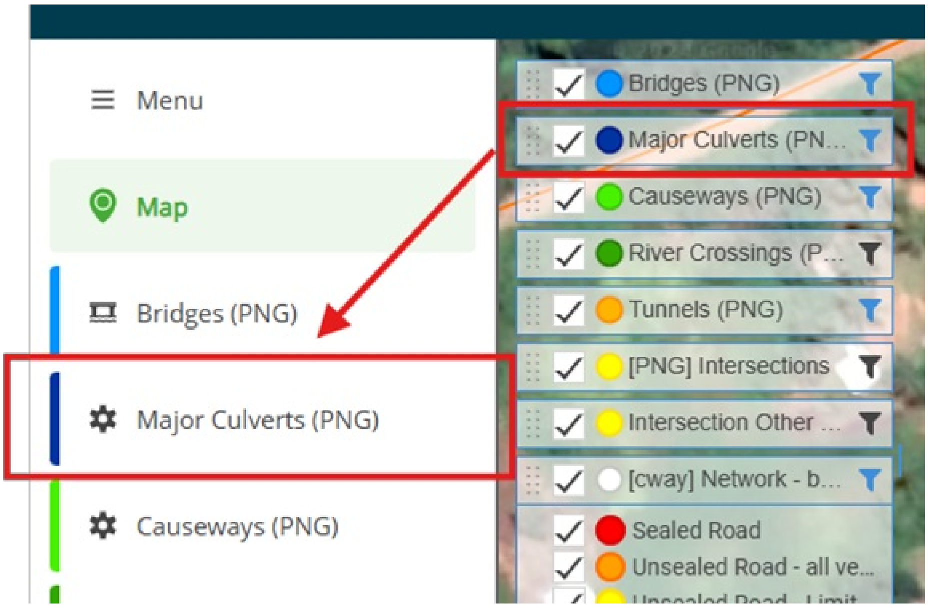
AWM Working with the Grid

13/12/2024 10:34 am +10

As well as working with the map, which is the most common way of working in AWM, you can also work with the individual layers in a grid environment which can be useful for looking at larger sets of data.

Finding the Grid

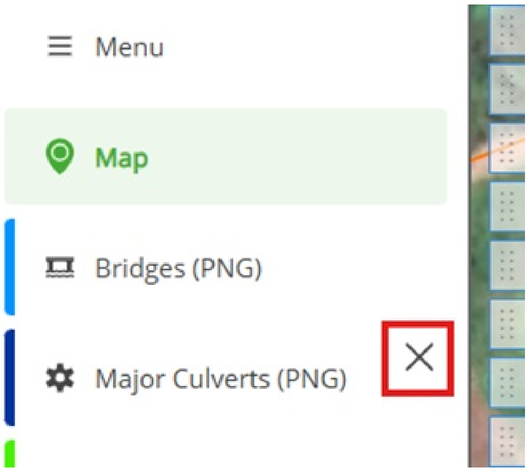
For each layer you add to the map, a corresponding grid is added to the left-hand side of the application:



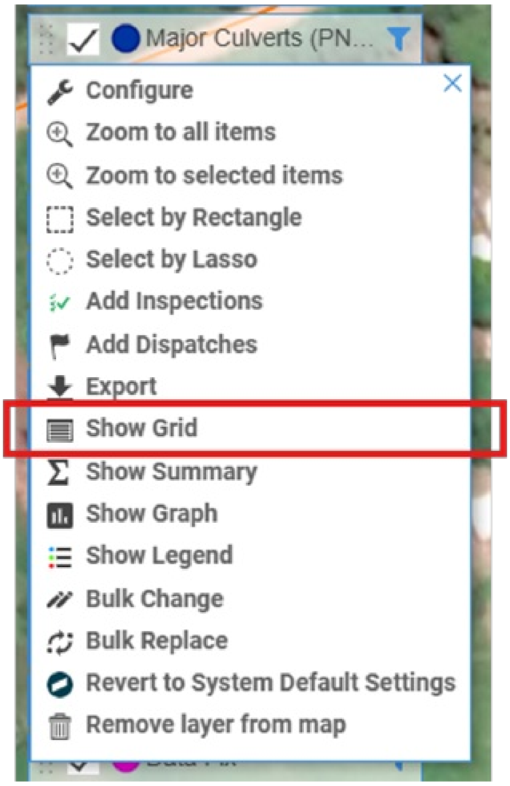
The grid itself can be accessed by clicking on that name in the left-hand menu.

Closing and Recovering the Grid

When you mouse over the grid on the left-hand side, a “x” will appear at the right-hand side of the grid name – clicking this will close the grid (but not the layer on the map).

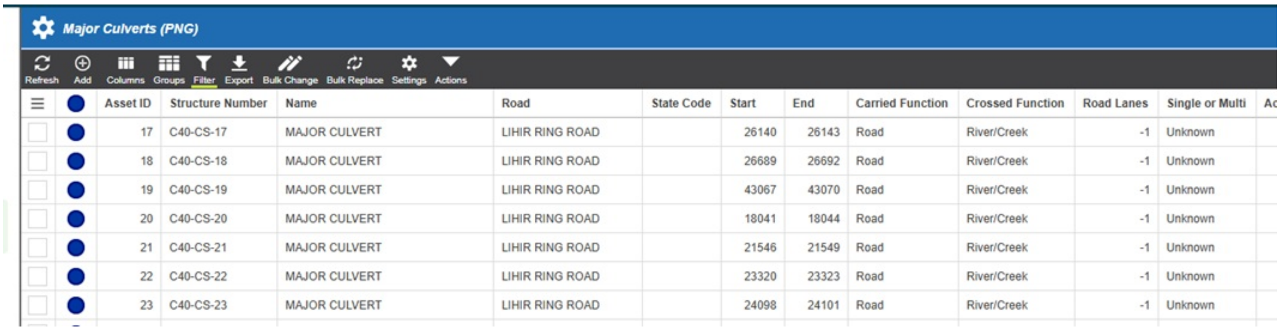


To recover the grid after you’ve closed it, click on the layer in the map, and choose the “Show Grid” option from the menu that pops up to bring the grid back up on the left-hand side:



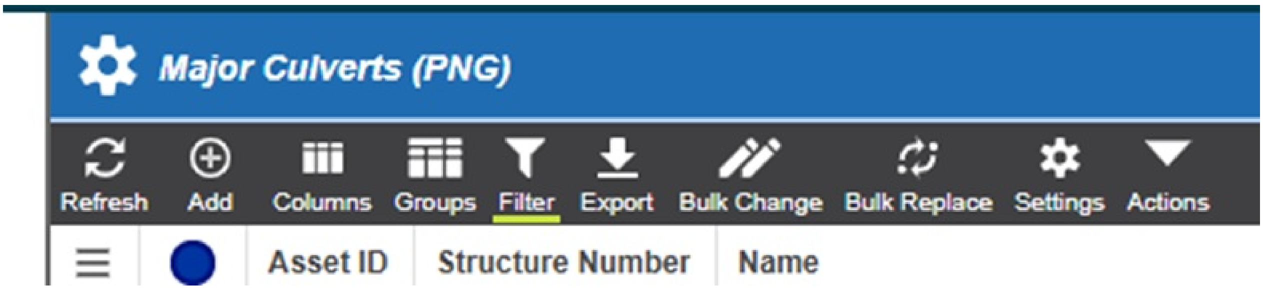
The Grid itself

Clicking on the layer name in the left-hand menu brings up the grid:



Individual records can be selected in the grid by clicking in the small tick boxes on the left hand side of the grid – this can be useful for quickly grabbing some records to export, but generally it's better to use filters.

At the top is the action menu:

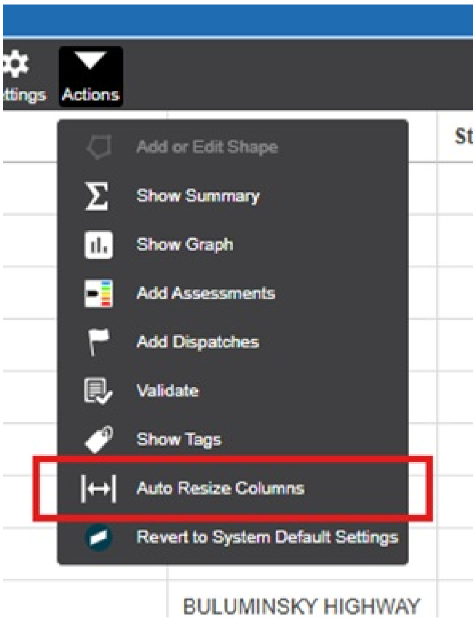


Key items in here are:

- Refresh – updates the current grid (can be useful to pick up changes colleagues have made while you've been in the grid.
- Add – you can create a record from the grid rather than the map – the process here is slightly different as the

record's shape is generated from the location and dimension data that you enter rather than deriving the location/dimension data from the shape.

- Columns – this allows you to specific the fields of the record you wish to see in the grid (generally the grid only shows a subset of the information on a record)
- Filter – you can modify the filter applied to the grid here – note that this filter is ALSO applied to the layer on the map.
- Export – useful for exporting data out of AWM to share with others who may not have access to the system
- Settings – allows you to choose between the saved views you may have set up as described in "**Customising and saving views**"
- Actions – there is one option here that is useful "Auto Resize Columns", which will size the columns to match the headings and data in the columns, potentially getting more data on screen

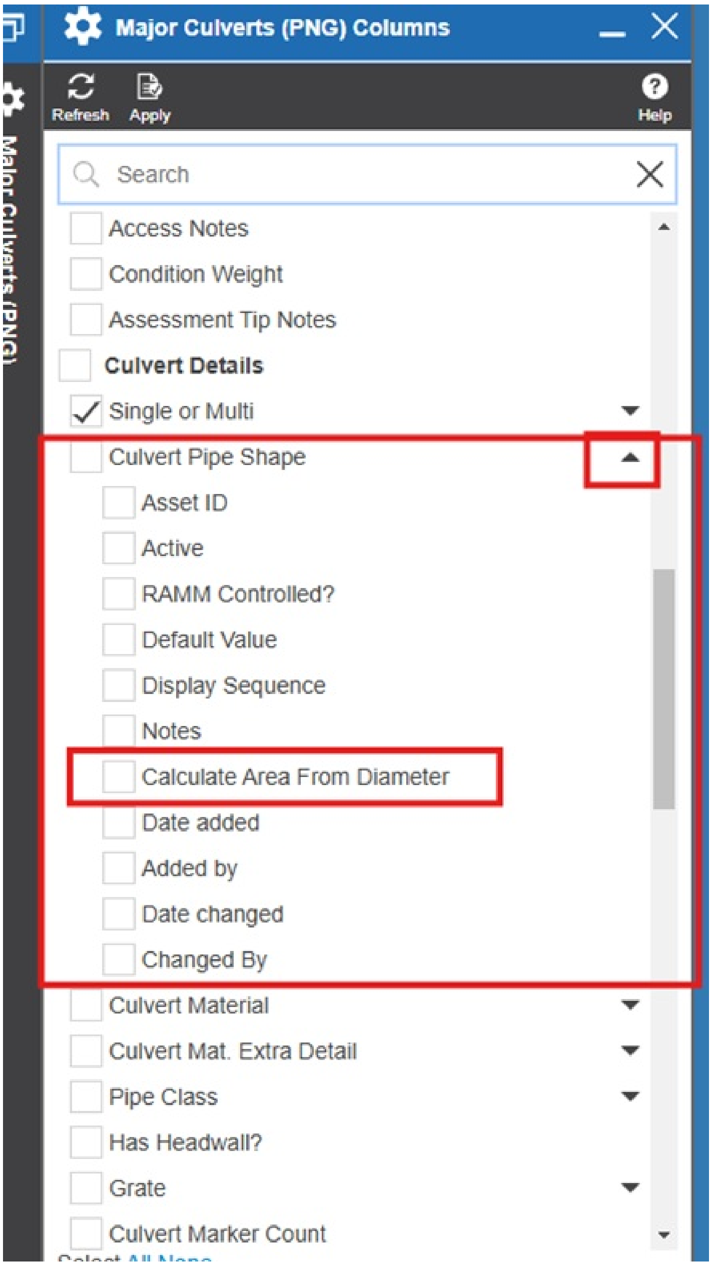


Clicking on a row in the grid will open the record for that row just if you had clicked the show details button on the map at which point you can work with the record as described earlier in this document.

Modifying the columns visible in the grid

Click on the Columns button in the action menu at the top – this will open up a tab which lists all the columns on the table you are looking at on the grid – those ticked will show up on the grid, while columns which are lookups to other tables have a black triangle that allows you to expand to see the fields on that table and include them in the grid as well.

In the example shown below, the column "Culvert Pipe Shape" is a lookup to another table – clicking on the black triangle then shows all the available fields from that table as well as those directly held in the Major Culverts table – in this case, you could choose to include the Calculate Area From Diameter from the lookup table to the grid:



Adding a record in the grid

To add a record via the grid you will need to gather location data to populate the record with – this information can either supplied by others with access to the system, or can get captured by using the **i Tool** as described in the AWM Navigation article.

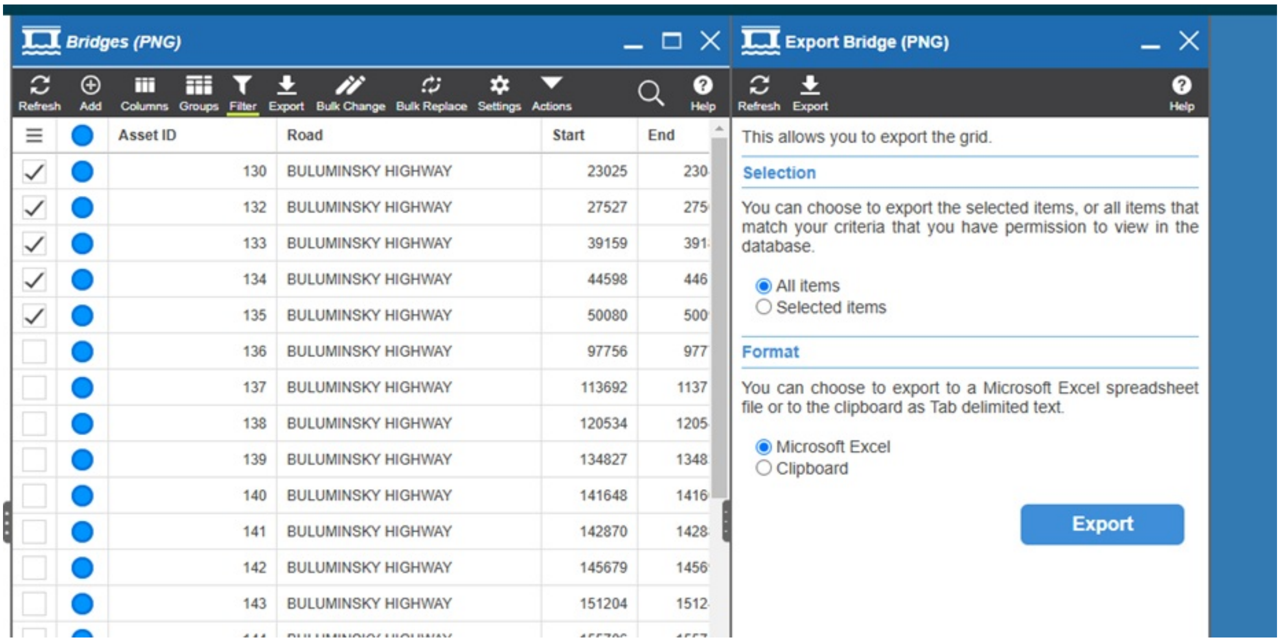
Depending on the record you are trying to add, this may be simply the road name, and a route position along that road (a point asset) or may require both a start and end location.

When adding the record, the location section of the record should be loaded with this information, otherwise the record will not save, or worse, may not show on the map at all as it has no location data to map to.

Aside from this requirement to populate the location information, the process for adding the record otherwise follows that described in the AWM Working with Records article, at least from the point the record itself opens.

Exporting from the grid

To export information from the database, click on the Export button at the top of the grid – you can either export "selected" or "all items" – choosing selected items only exports those items in the grid that are ticked (see screenshot below) while all items exports all the records in the grid (based on what filters you may have set).



You can either export directly to Excel (in which the file can be found in your downloads folder) or copy to the clipboard and paste into a file of your choice – Excel or otherwise. Just be careful when using the copy paste option as some large text fields which allow for line breaks (use of the Enter key in the field to form paragraphs) will cause the record to paste over multiple rows in Excel – in this case you're better off exporting directly to Excel.

AWM Support & Help

13/12/2024 10:35 am +10

Help Videos

Select the Help icon.

Each area provides a number of videos to help.

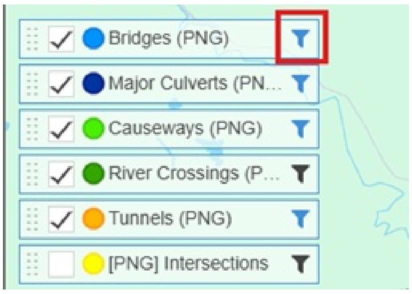
'Contact Us' to log an issue with Thinkproject (owners of AWM)

Applying a Carriageway Filter to an Asset

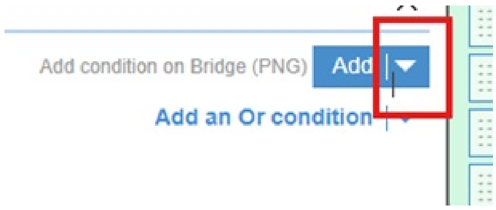
13/12/2024 11:44 am +10

To apply a filter to an asset table based on information in the carriageway table (such as province or sealed/unsealed network) the following steps should be followed (note that this article outlines how to apply a filter for province – if you want to filter for network type or other information, change “province” for the appropriate field.

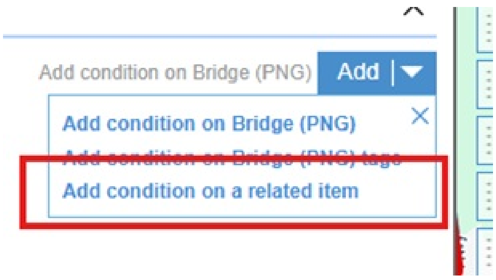
Open the filter for the layer you want to filter.



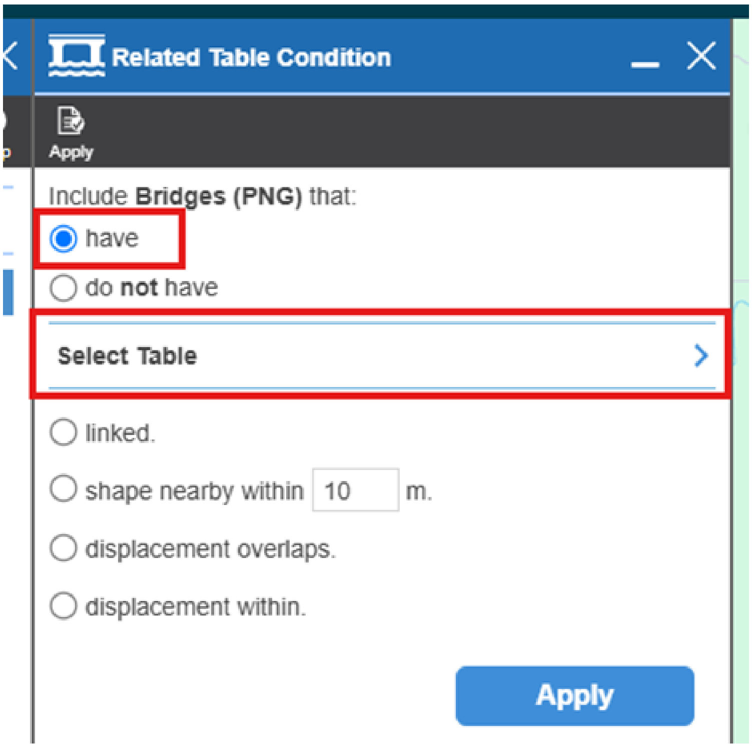
Use the drop down arrow beside the “Add” button.



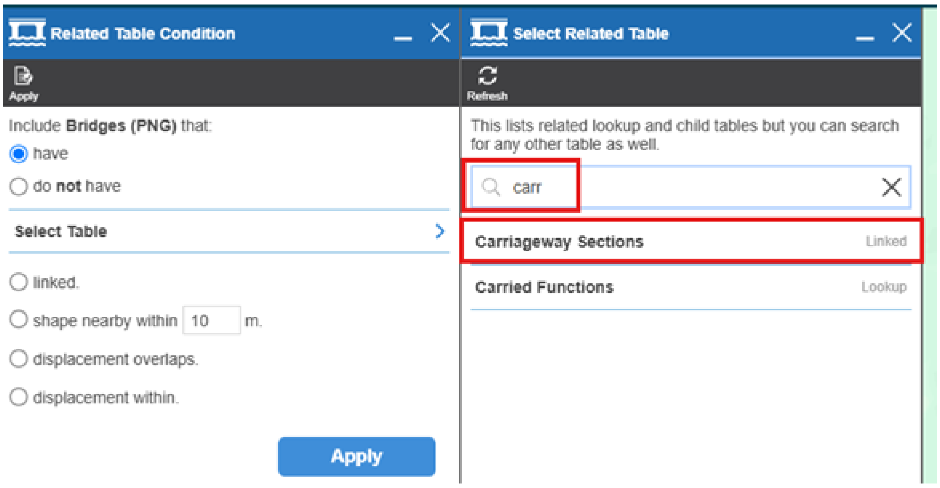
Select the third option “Add condition on a related item”.



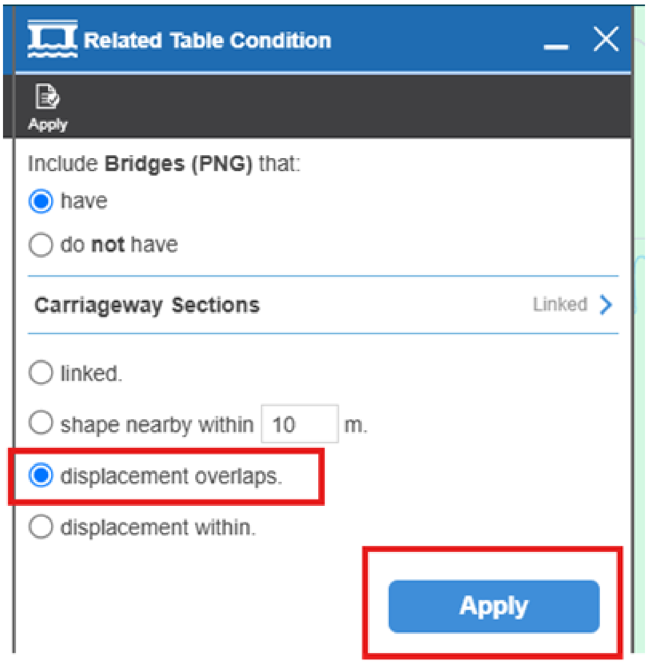
On the next tab that opens up once you select the option, make sure that the option “have” is selected, and then click on Select Table.



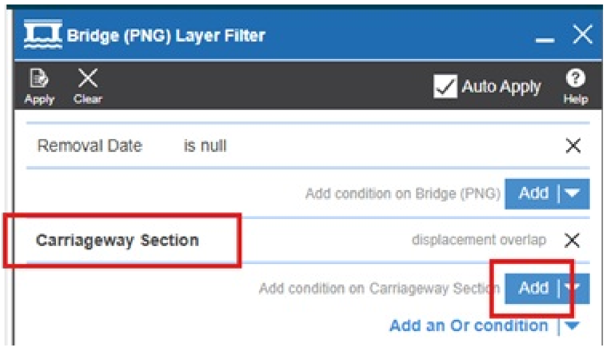
In the select table tab that pops up, type**carr** in the search box, and then select “carriageway sections” in the list that shows up.



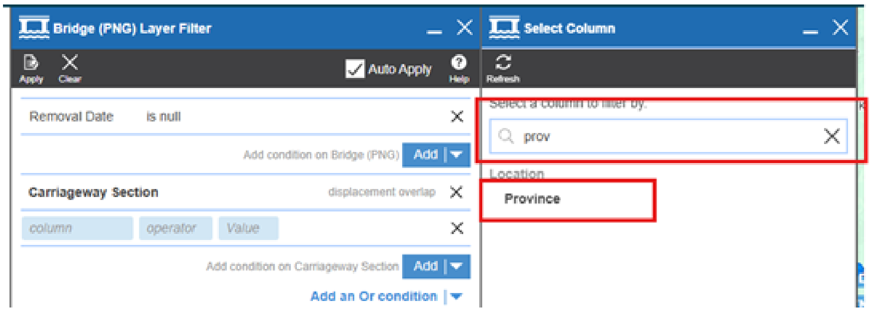
Once you’ve selected Carriageway Sections it will automatically return to the Linked Tab where you want to select **displacement overlaps** option and click apply:



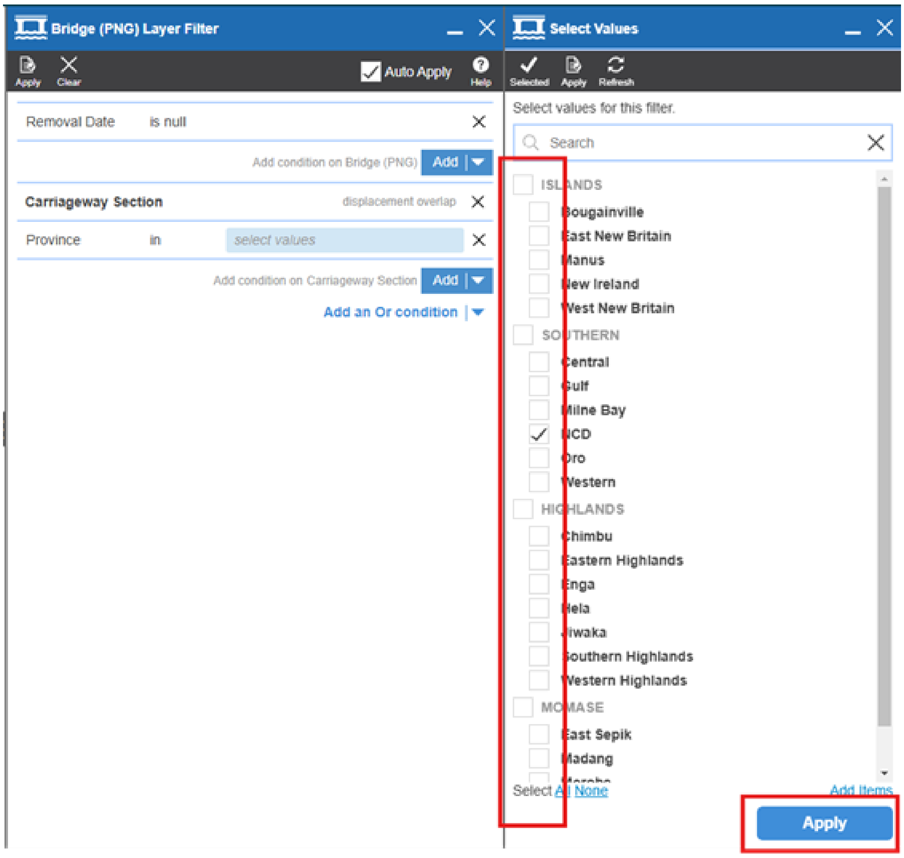
This is why we choose displacement overlaps – the asset has a start RP that overlaps with one of the carriageway sections – it then uses this carriageway section to filter for the data held on the carriageway section (note that the RPs given here are examples and may not match those in the actual database) – in this case, the example bridge would be assigned to the Morobe province based on its start position:



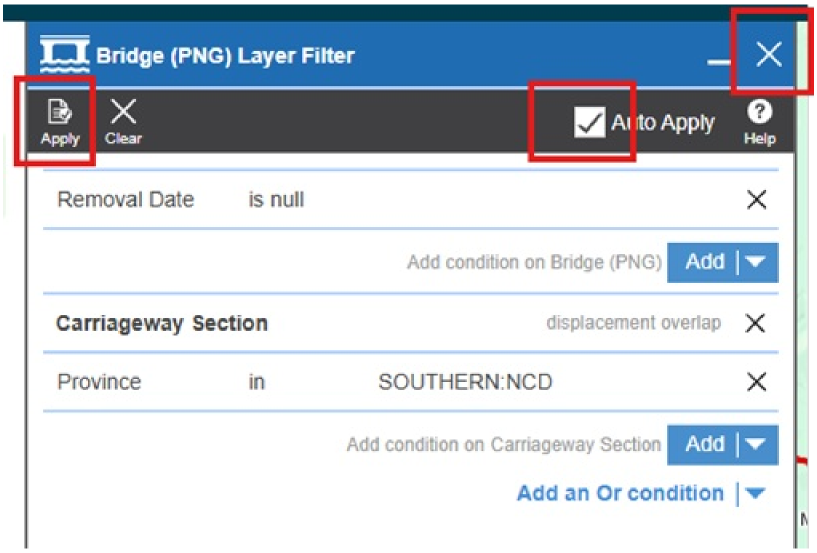
The select column tab will pop up as usual – here we want to select province (either start typing province in the search bar at the top or scroll through the list to find it):



This will cause the lookup for province to pop-up – select the province(s) or region(s) you want to filter by – you can tick as many as you want – if you're only after a single province, only select that single province, and then click apply:



This takes you back to the main filter tab – if the**auto apply** option at the top is ticked, this will have immediately applied your filter, and you can close the tab – otherwise you'll need to click **Apply** and then close the tab:



The filter is now applied, and this can be repeated for any table that holds both a road name, and either a location or start and end location against the record.

Exporting the Network to a Shapefile

13/12/2024 12:11 pm +10

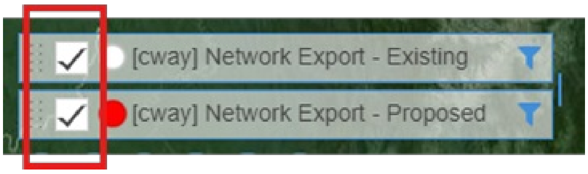
A map layer package has been set up to ensure that the key data held in the carriageway table (basis of the network) is exported without requiring you to modify the layers to do so. The map layer package is **[carrway] Network Export to file**.

This has two separate layers:

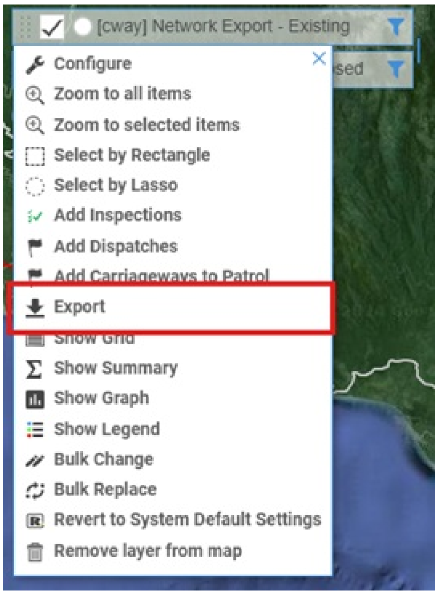
- [cway] Network Export – Existing: the current network including any provincial or district roads loaded into the database (these can be filtered out in the external system by using asset_owner).
- [cway] Network Export – Proposed: only those unconstructed sections of the missing links (those sections which are currently provincial roads will be included in the Existing layer) and proposed roads.

If the export only needs the existing network or the missing links, you can export from that layer alone to complete the task, however if the export needs both the existing network and the missing links, then the export must be done on each layer separately (this will create two separate export files).

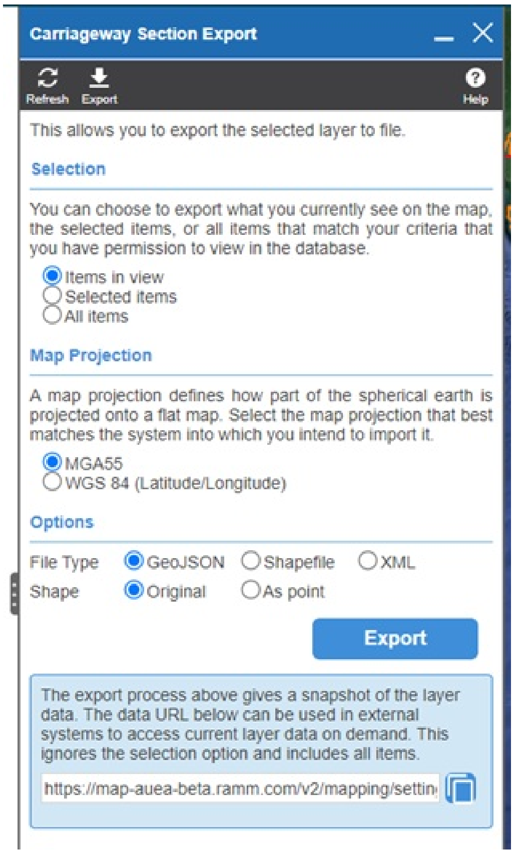
To do so, select the layer you want to use and make sure that it's active:



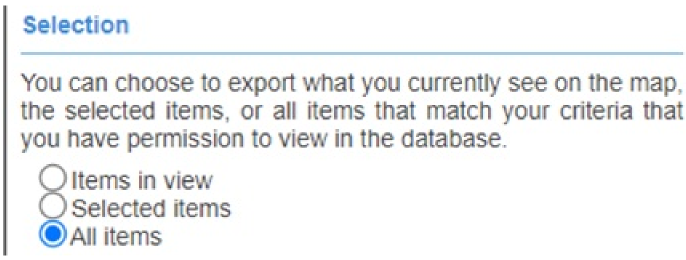
Left-click on the layer bar on the map (making sure to not click on the tick box or filter button), this brings up the layer menu, from which you want to select the option to Export:



This brings up the Export form which allows you to configure what you are exporting and to what type of file:



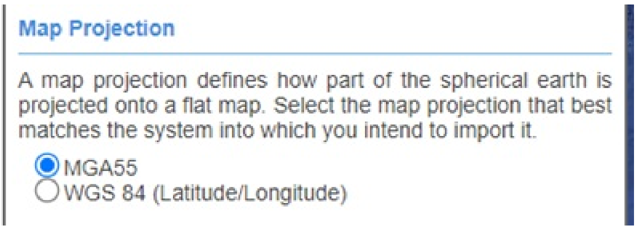
As we're exporting the full network, the selection should be set to All Items:



The other two options can be used when only a particular section of the network is needed to be exported:

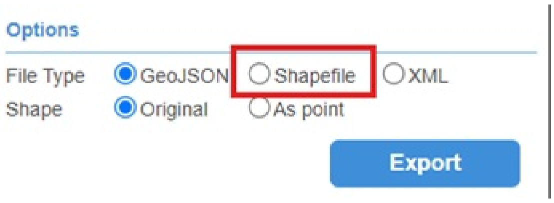
- Items in View exports only those items you can see on screen, so if you zoom into the Milne Bay Province, for example, you will only export those roads which are visible on the screen based on what you can see.
- Selected Items uses the Select by Rectangle or Select by Lasso options allows you to draw a shape on the map which in this case will select all the carriageway sections which are at least partially within the shape you draw (note that it selects the individual carriageway sections, not the full road – if you draw a shape that includes all of Morobe province, you will only get the carriageway sections on the Highlands Highway, as an example, where the carriageway sections are at least partially within the Morobe province).

The next set of options determines if the exported file is exported in northing/easting co-ordinates (MGA55) or latitude/longitude (WGA84) – unless the person you're providing the exported data to specifically requests latitude/longitude, leave the selection at the default MGA55.



The final set of options determine the file type that is exported and whether the network is exported as lines (Original) or points (this one defaults to Original – make sure that As Point is not selected, otherwise you'll end up exporting a bunch of random dots around the map rather than a network!).

Unless the person you're exporting the file for requests otherwise, select the Shapefile option:

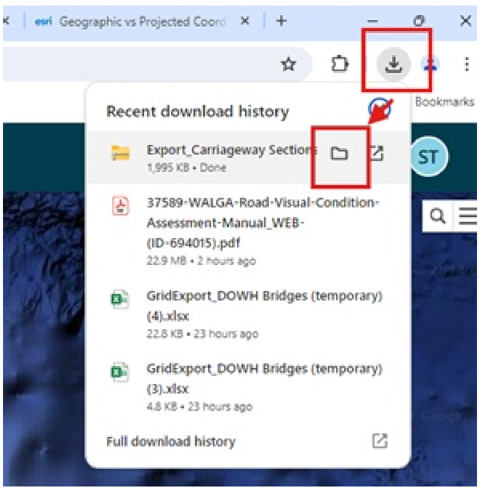


Clicking the Export button will then download the file into the default download directory for the browser you are using.

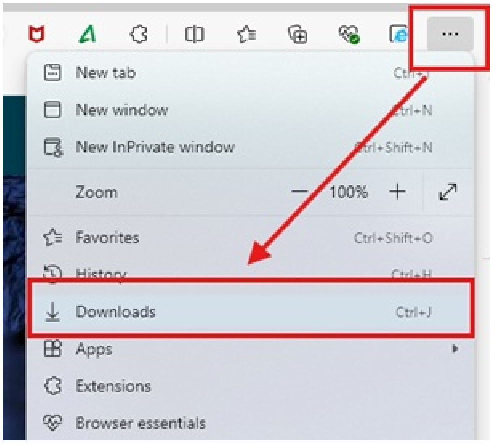
The file will be named something like "Export_Carriageway Sections" and may have a number (5) (example) behind it depending on how many times this has been exported previously (it adds the number behind the file to make the file name unique).

This can be accessed using the downloads button in the browser as follows (note that clicking on the folder beside the filename opens the folder with that specific file highlighted).

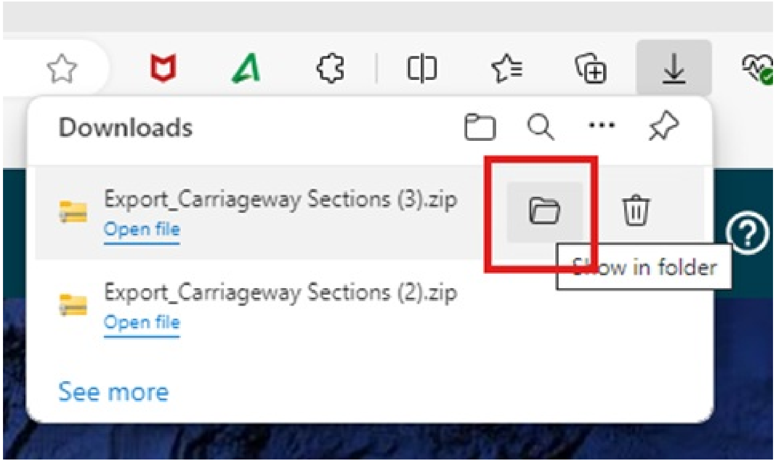
-
- Chrome – once the download starts the download icon will appear in the top right of the browser – once the download is completed, click on this, and then click on the folder icon that appears when you mouse over the file in the list.



- Edge – once the download is complete the download window will pop up and then disappear. To access the file after the download window disappears, click on the three dots icon in the top left and select downloads from the menu:



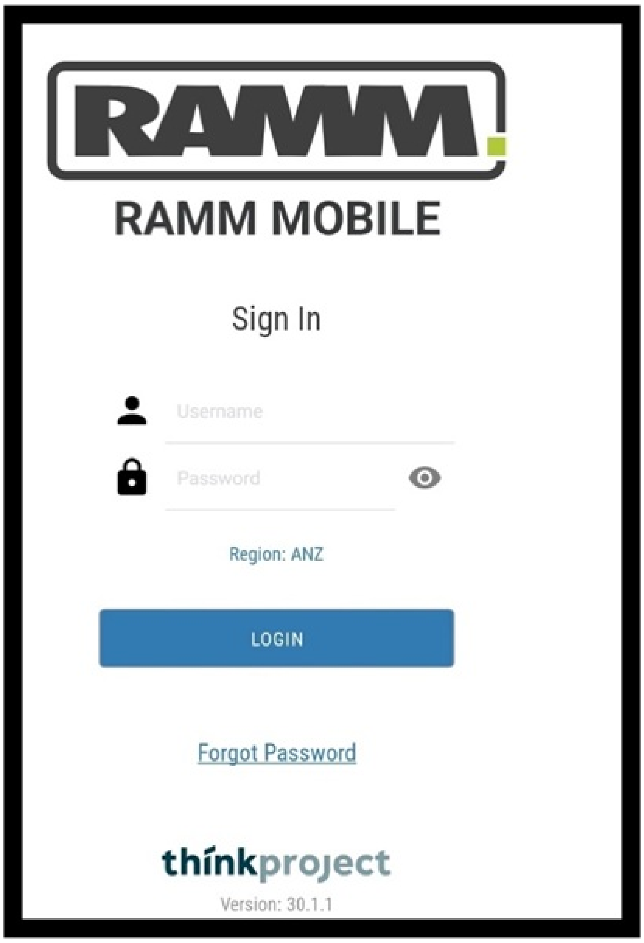
Then when the download window opens, click on the folder that appears as you mouse over the file you want:

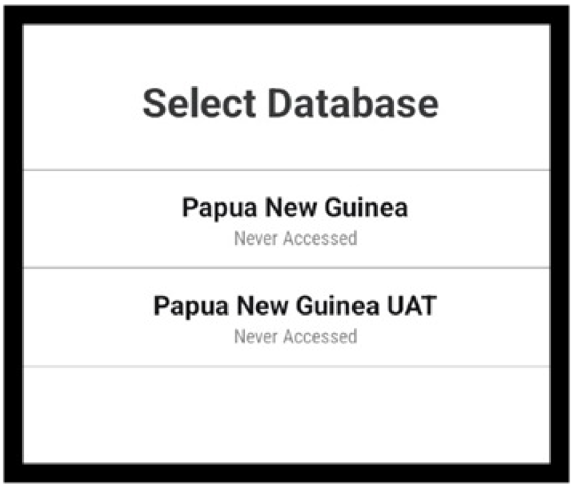


AWM Mobile Fundamentals

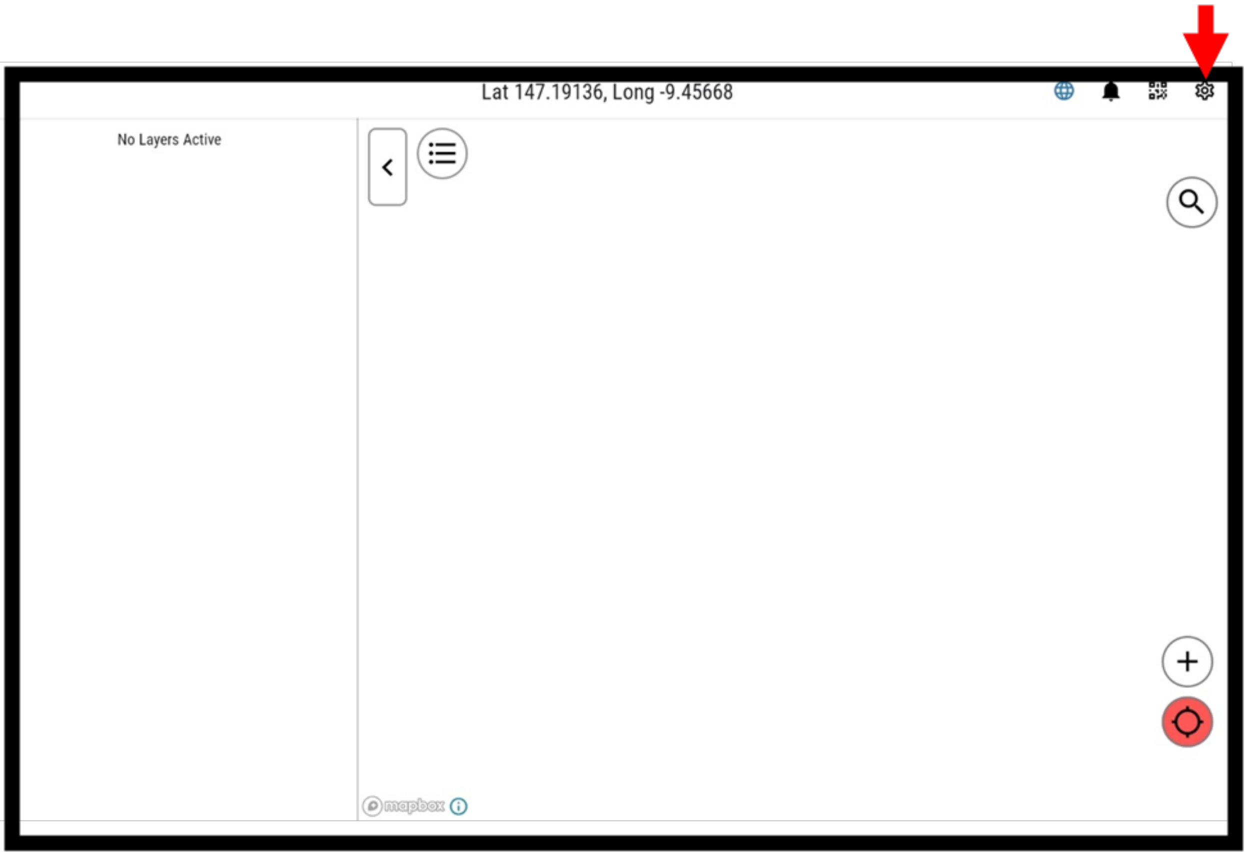
16/12/2024 2:02 pm +10

When you first open RAMM (AWM) mobile you will see this log-in screen. Use the same log-in details as you would use for go.ramm.com. Next, you'll be asked to select the database. Select Papua New Guinea.



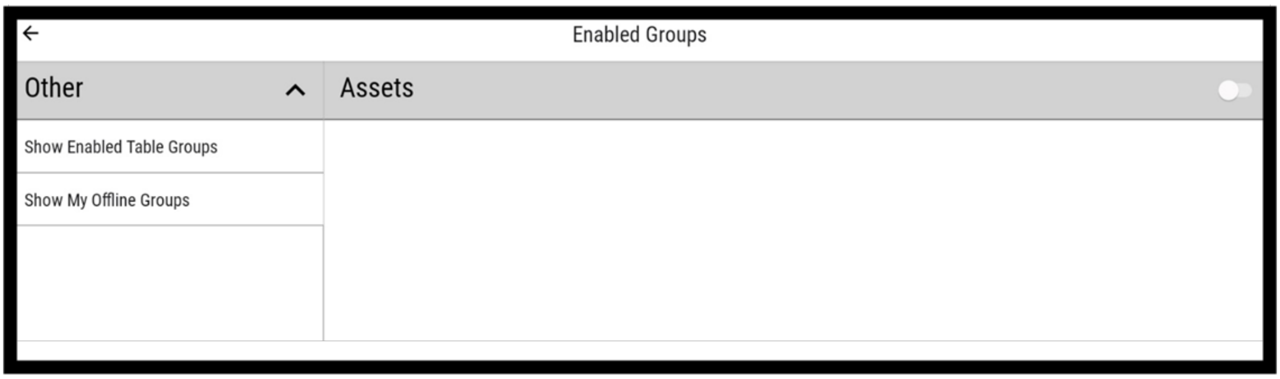


Next, you will see the screen below. There are no layers currently active on the map. Click on settings in the top right corner.

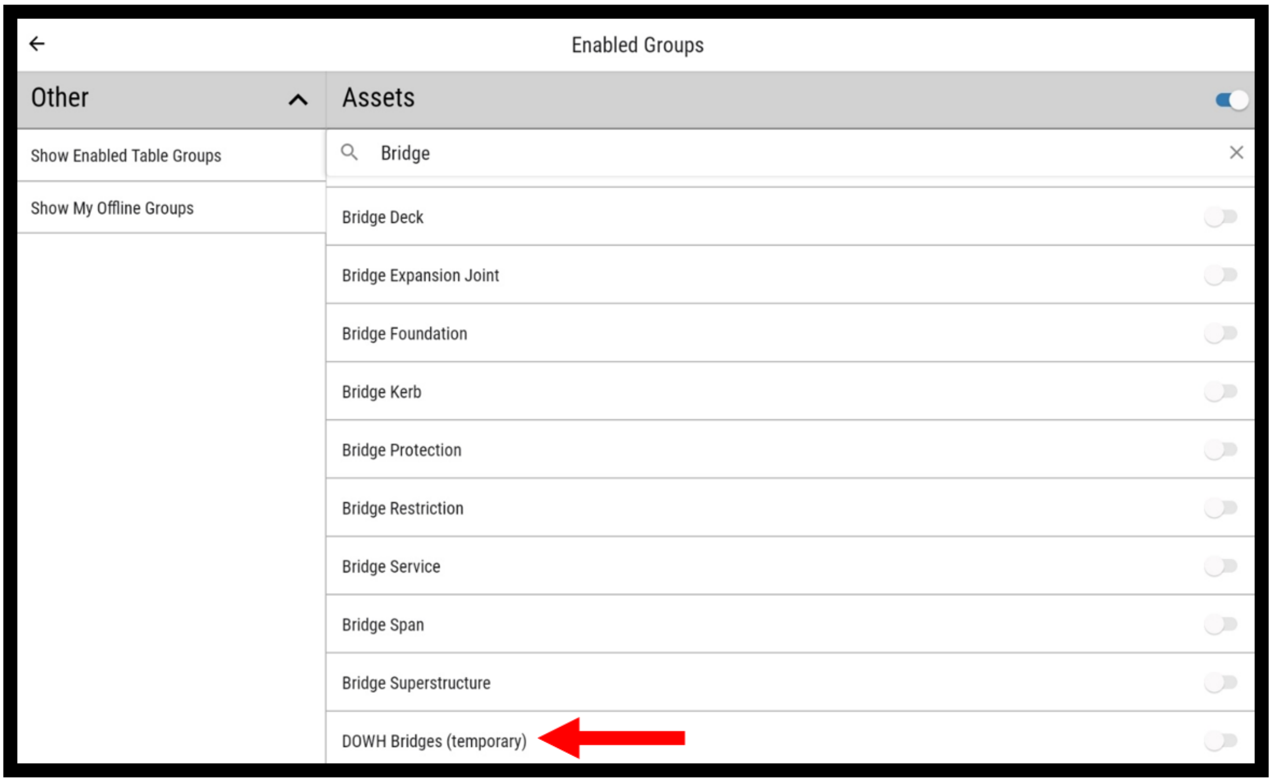


In the settings menu there are two key areas - Enabled Groups and App Settings. Enabled groups is where you turn on different asset layers so that they are visible on the main map. App settings is where you can change settings such as the base map layer, switch the test environment from alpha to beta or production mode (when production becomes available), change the theme colours to dark mode, turn on the secondary column for assets, update the map touch sensitivity and so forth. There will be more settings that become available as the beta environment gets updated and refined. Click on enabled groups.

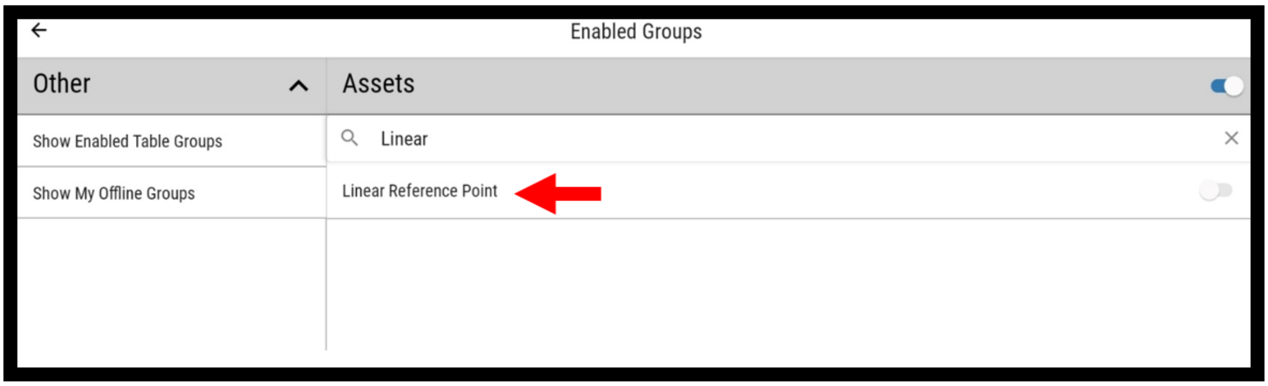
To turn things off and on in RAMM (AWM) mobile - you use the sliders shown on the far right next to assets. These sliders turn blue when a specific setting is activated and are greyed out when the setting is inactive. Click on the slider to activate the list of assets.



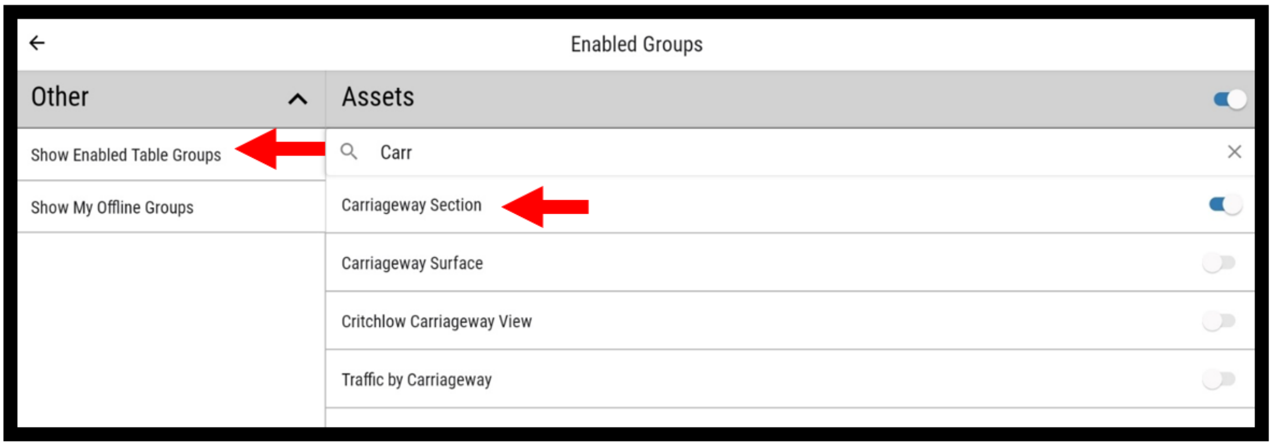
Once the asset list is activated, you can search as you normally would in AWM. Search for "Bridge" and Select DOWH bridges (temporary). Remember the slider colour on the right will change to blue once activated.



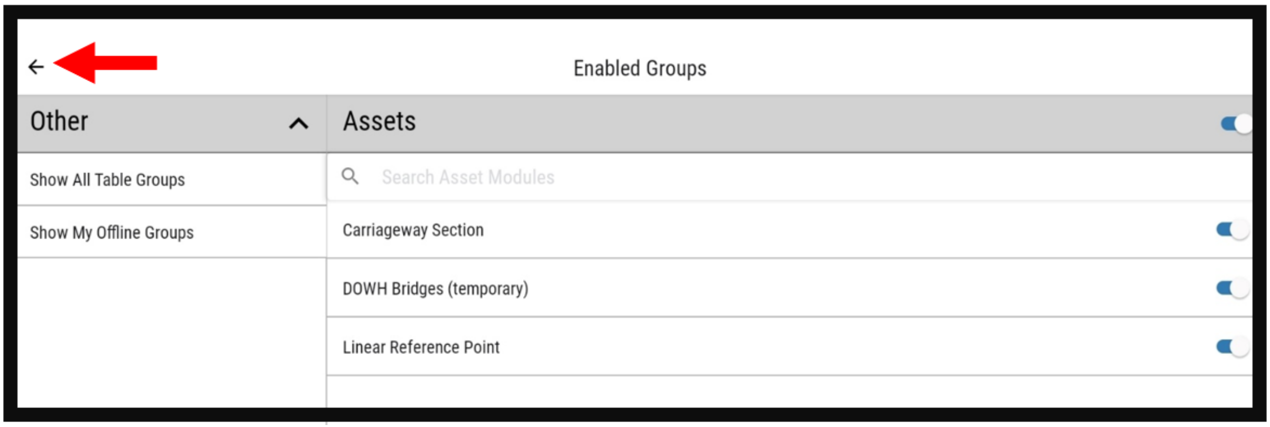
Once you have DOWH Bridges (temporary) loaded, search for linear reference point and then select Linear Reference Point.



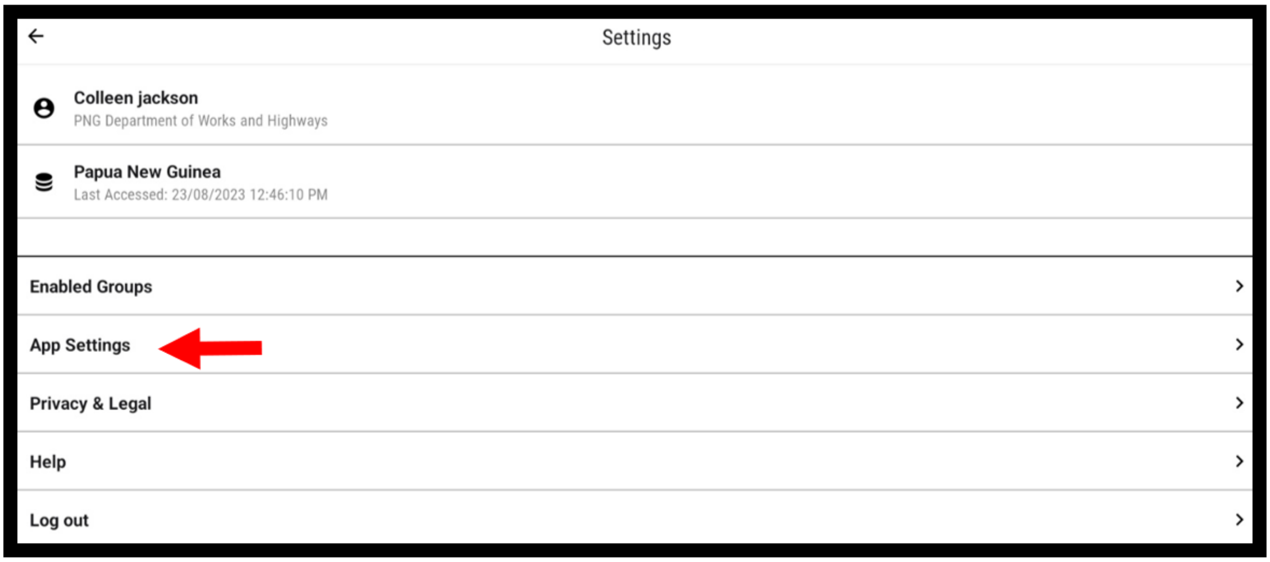
The next asset layer to load is Carriageway Section. Search for "Carriageway" and select Carriageway Section. Once carriageway section is loaded, click on **Show Enabled Table Groups** on the left.



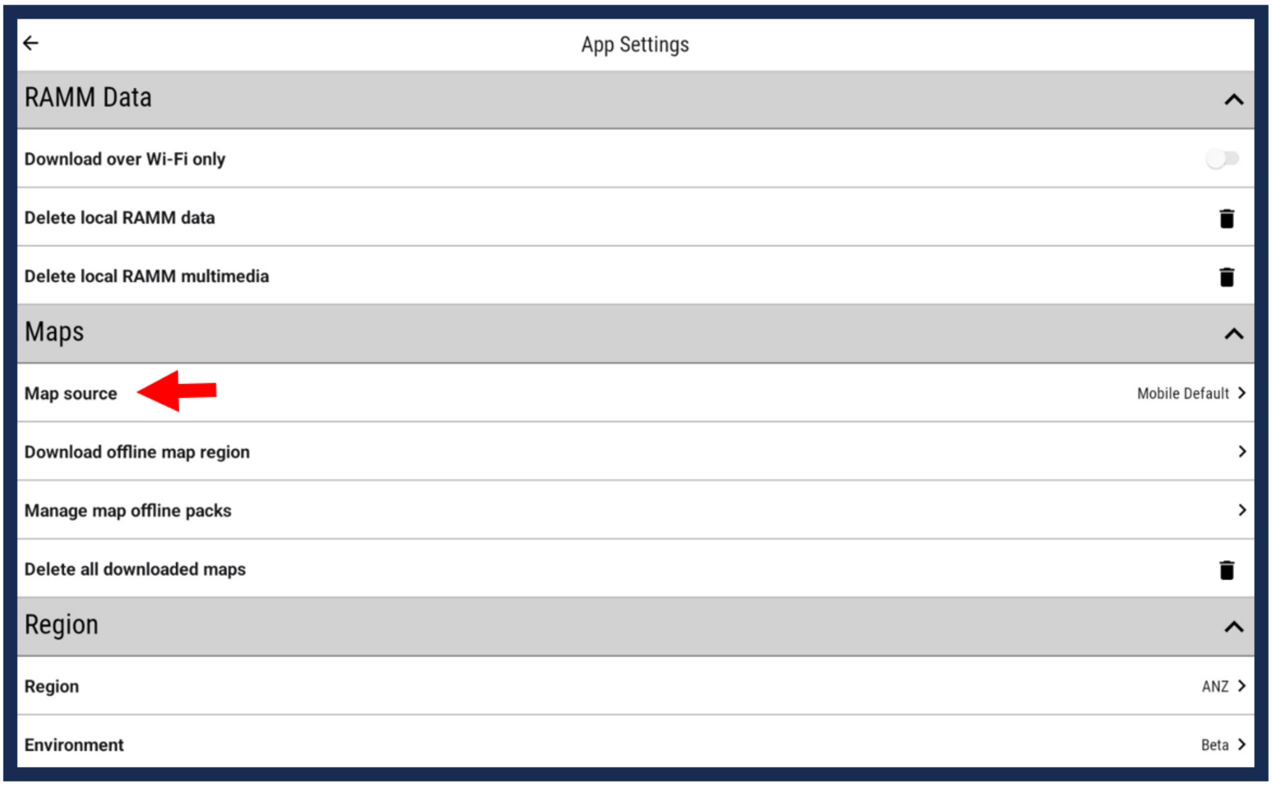
When you select Show Enabled Table Groups the list view will change to only show asset types you have selected. Click on the back arrow on the top left to go back to the main settings menu.



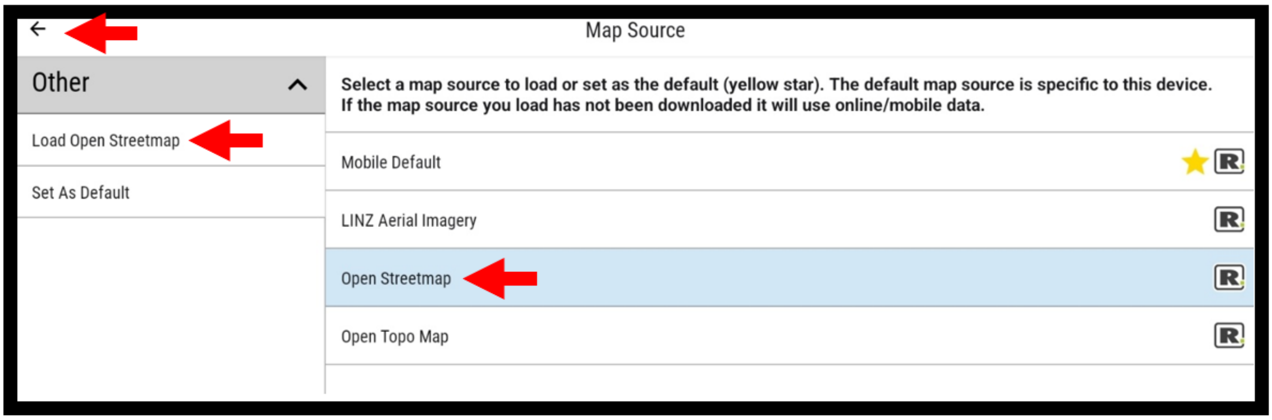
Now that we have the correct asset layers showing on the map, next we want to change the base map. Select App settings.



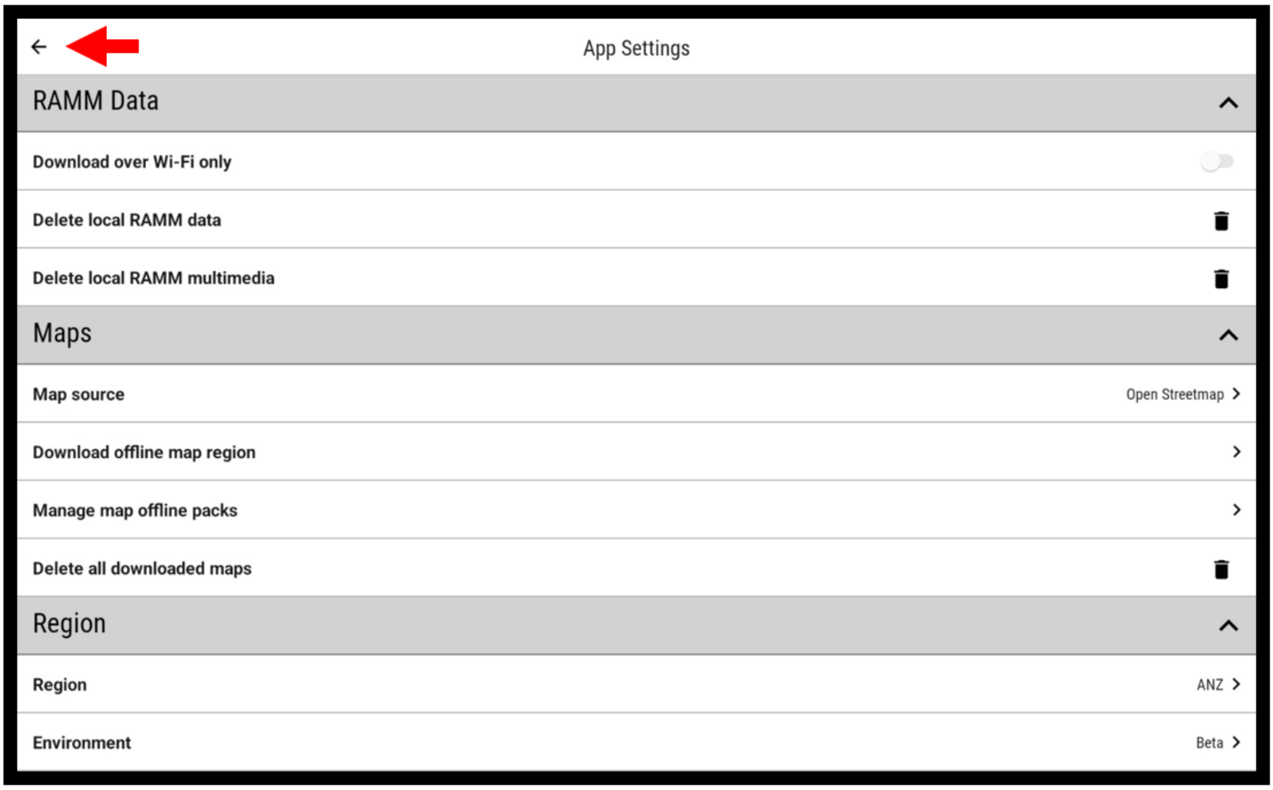
We want to change the map source from mobile default- so select Map source under maps.



Select Open Streetmap and then select Load Open Streetmap on the left. A pop up should appear saying settings loaded. Once Open Streetmap is loaded, click on the back arrow to go back to the settings menu.



Select the back arrow on the top left to go back to the main settings menu.



Select the back arrow on the top left to go back to the map view.

Working with Data Fix Records

17/12/2024 6:46 am +10

Purpose of the Data Fix table

The Data Fix table is used to record updates or fixes to asset or network data where the person identifying the issue does not have the access, experience or training to make the change(s) to the data themselves.

A user with the appropriate permissions, training and experience can then review the data fix request, make the necessary changes to the database, and then close out the data fix request.

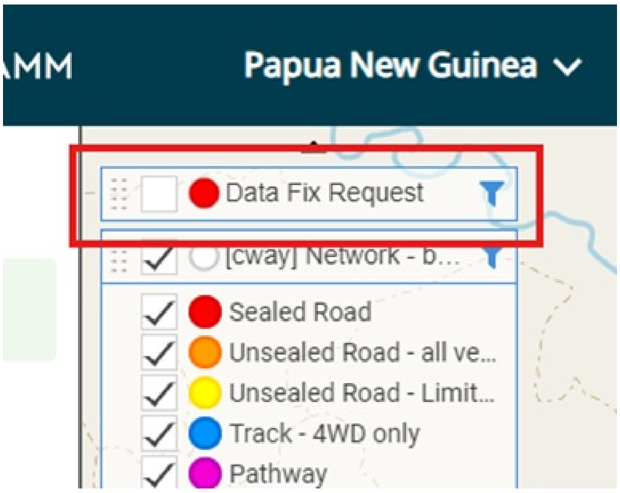
Examples of what can be recorded in this table include (not a complete list):

- The network centreline not following real alignment
- The network centreline starts/stops in wrong location
- Changes in the network definition not recorded in the right location (e.g. the change from sealed to unsealed network)
- An asset is missing from the database (standing onsite looking at a bridge for example where the database doesn't have an asset recorded)
- The asset recorded at the location no longer exists (a bridge may have been washed out in a storm event for example)
- Some part of the data for the asset is incorrect (a bridge may be recorded as a single lane beam and slab bridge, for example, but is in fact two lanes wide)

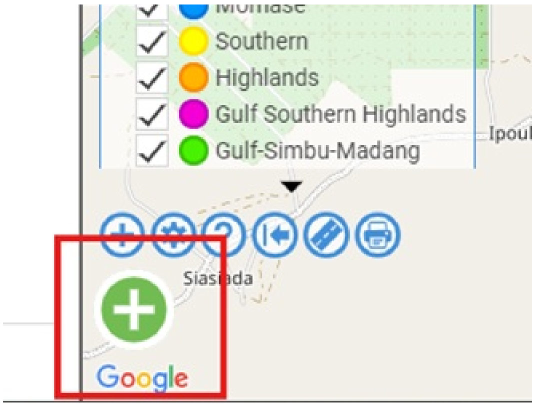
This How To covers adding and completing/removing a data fix record.

Adding a Data Fix record

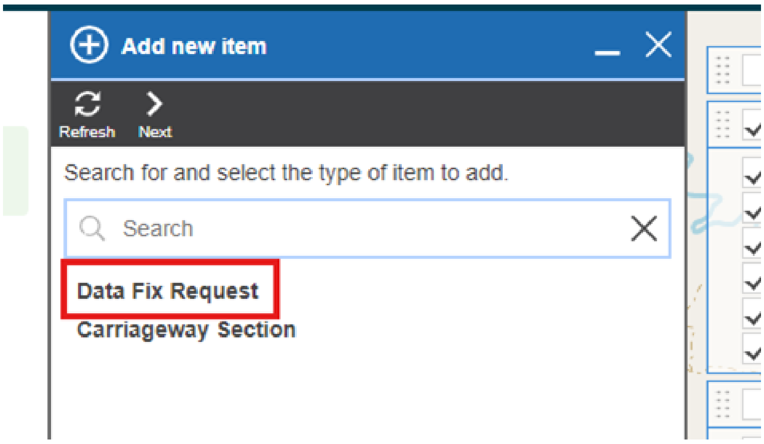
Make sure that the Data Fix Request layer is on map – it's been included in the map layer packages that have been shared for the various reviews.



Click the add new record button at the bottom left of the map view.



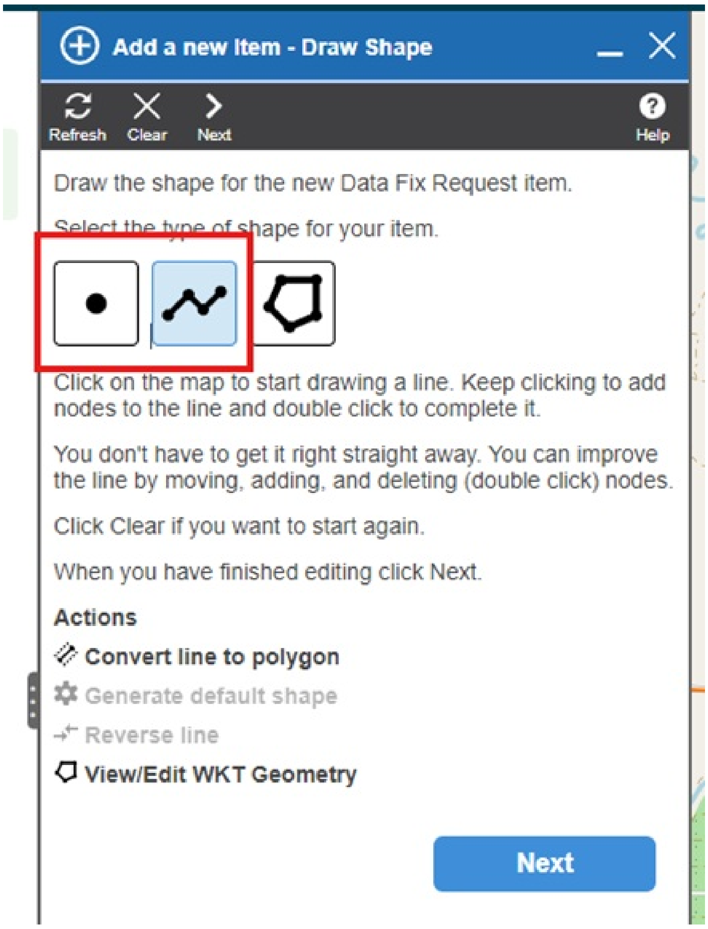
Select the Data Fix Request table to add the new item to.



Select point or line depending on which is appropriate (for example, a data fix request to split a carriageway at an intersection is fine as a point, while identifying a new road to add to the database needs to be loaded as a line).

Use **LINE** for the network for anything that requires an extension to an existing road, addition of a completely new road, or change in alignment of an existing road.

For anything else, use **POINT**, and record the changes in the brief description of the issue field.



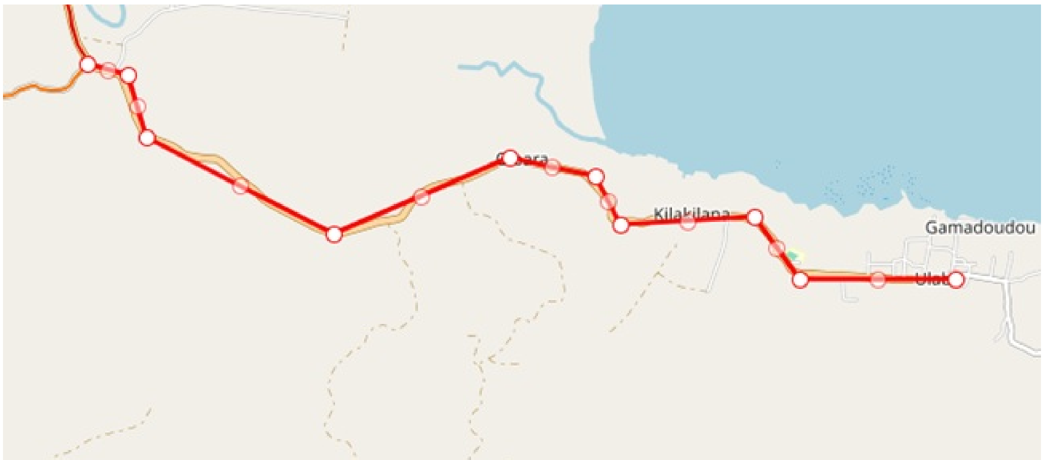
For line records, the accuracy of the line needs to be enough to understand what needs to be done – if there are other roads that may confuse matters, the line should be done with enough attention to detail to make sure that it's clear which road we need to map the fix to.

On the other hand, where it is clear what needs to be done (such as a missing road where the aerials are clear for example), the centreline can be loaded as a rough guide.

Example of "rough" capture for a linear data fix:

The screenshot shows a road for "rough" capture – for clarity's sake I'm using open street maps rather than aerial imagery but the idea remains the same – 12km long, it's too long to want to have to carefully map out the centreline for the full distance:

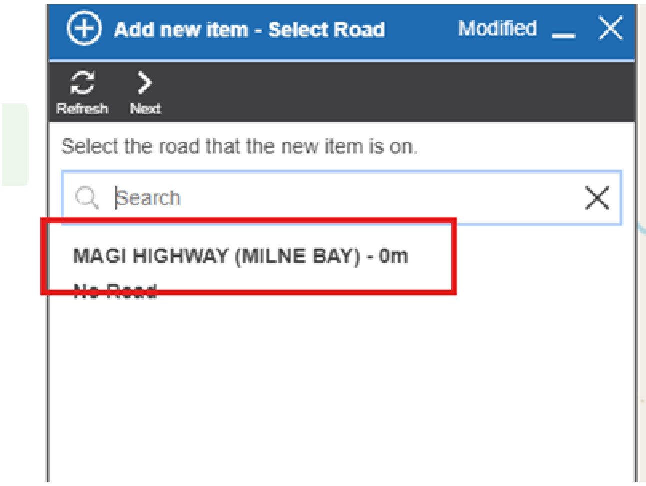
Instead, we speed it up a bit by only mapping out a few points (in this case the full 12km road with only 10 points in total) to give a rough guide as to where the road runs from and to:



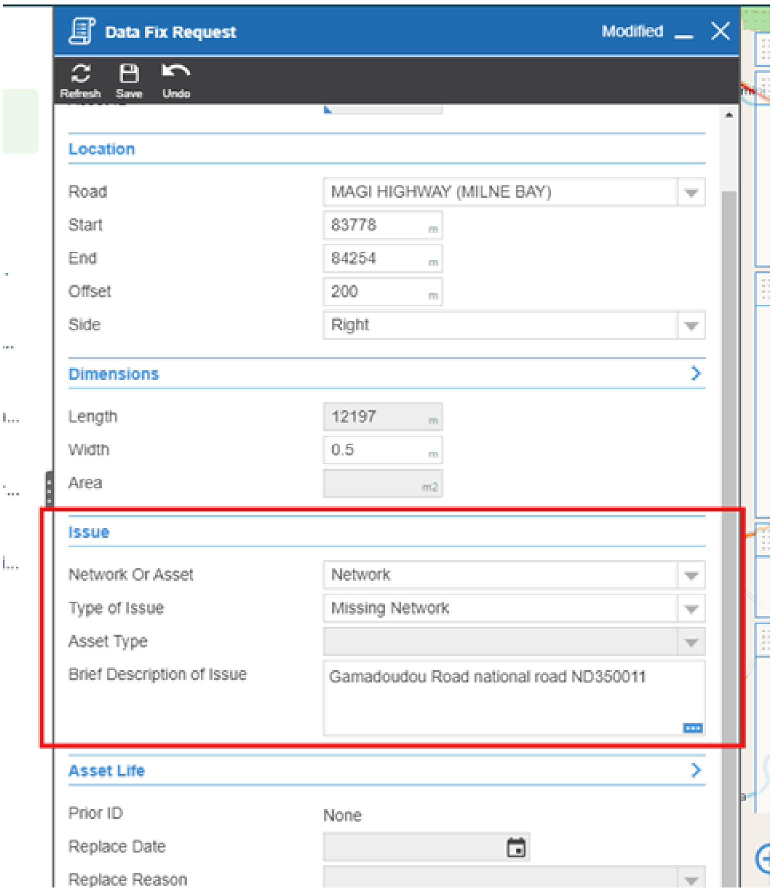
Assigning the data fix to a road and entering the necessary data:

Once the data fix point or line has been created (double click as the last point when doing a line to finish it),[BY1] click Next to move to the road select screen.

Select the road it should be attached to – the metre value behind the road name is the offset from the centreline of the road in question and is an indication of how close your starting point is to the road. Generally, the road to attach the record to should have the lowest offset (with one exception at intersections where you may actually be closer to the centreline of the other road – in this case you'd pick the road it should be on rather than the closest road).



Clicking on the road to use will automatically take you to the record, with the location data filled out based on your choice. Once the form loads, you only need to update the "Issue" section of the form:



Field	Option	What's required
Network or Asset	Lookup	Whether the issue is network or asset-based
	Network	*Use this for centreline or carriageway issues (such as a change from sealed to unsealed network in the wrong location)*
	Asset	*Use this for a specific type of asset such as a bridge or river crossing*

Type of Issue	Lookup	The first three options should be used if Asset is chosen, the last 3 for network issues only
	New Asset	*[**Asset**] There should be an asset at this point, but it currently does not exist in the database.*
	Remove Asset	*[**Asset**] There is an asset in the database that no longer exists – either the data was wrong to start with or the asset no longer exists.*
	Data Incorrect or Missing	*[**Asset**] Some piece of data on the asset record is incorrect (type of bridge for example or diameter of the culvert) or is missing completely.*
	Missing Network	*[**Network**] A road is missing from the database completely and should be added.*
	Modify Centreline	*[**Network**] The centreline should be extended (a road runs further than the current centreline shows) or modified (aerials show the road running straight while the centreline has it curving between the two points).*
	Network Data Incorrect	*[**Network**] Some piece of data on the road or carriageway is incorrect (a road is incorrectly labelled as a National District when it should be a National Main for example).*
Asset Type	Lookup	If you select Asset above, this field becomes available to record the specific asset type the issue relates to – some key asset types:
	Bridge (PNG)	*All types of bridges including bailey, concrete, timber, etc. as well as log bridges.*
	Causeway (PNG)	*All low-flow structures built to allow crossing of a waterway, whether they include pipes as part of the structure or not.*
	Major Culvert (PNG)	*All culverts of 2m^2 area or 1.8m in width/diameter or greater.*
	River Crossing (PNG)	*Sites where the road exists on both sides of the river where the river can be forded by vehicles to continue along the road (and there is no structure there to support this).*
	Tunnel (PNG)	*All bored or cut-and-cover tunnels, along with structures where major culverts have been utilised to allow traffic under another road (an example being the Waigani roundabout using Armco culverts under Poroporena Highway).*
Brief Description	Free text	Required, enter enough information that someone else could make the fix, e.g. for incorrect data “Culvert diameter – should be 600 dia”, or “Update centrelines to match aerial imagery”

Save the record, and you’re done.

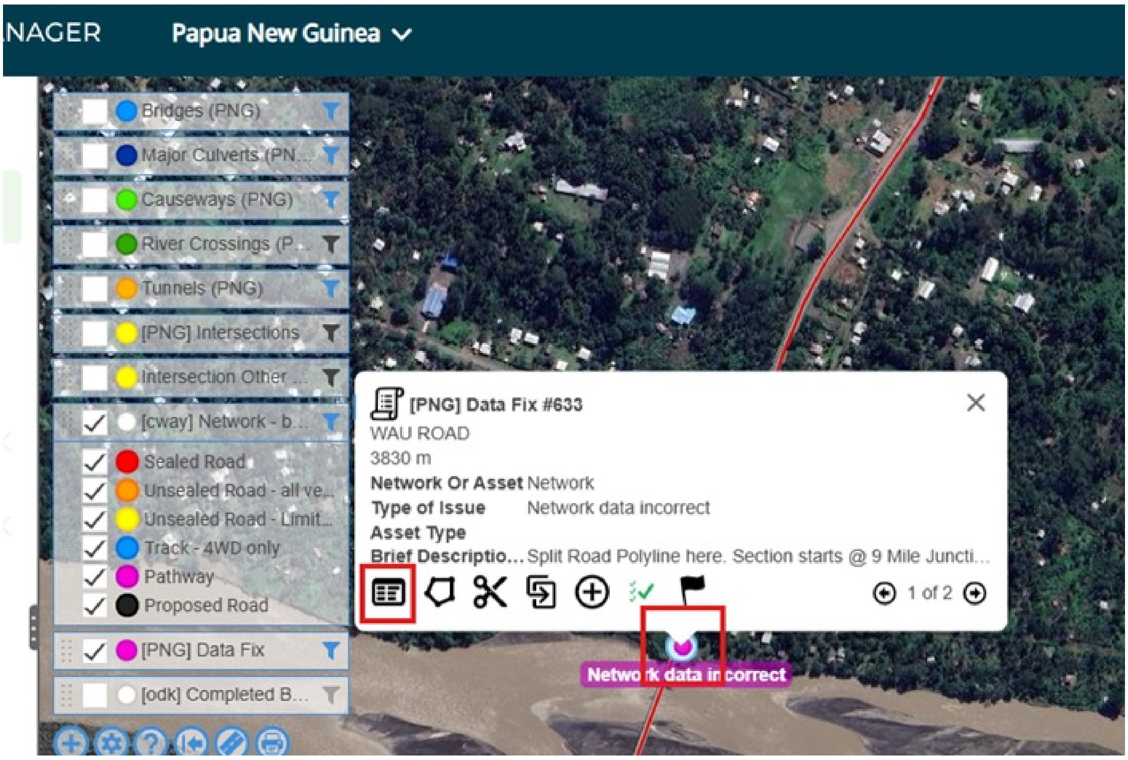
Completing or removing a Data Fix record

Data fix records are intended to only be temporary, existing in the database until the fix is made, or the request is determined to not be necessary.

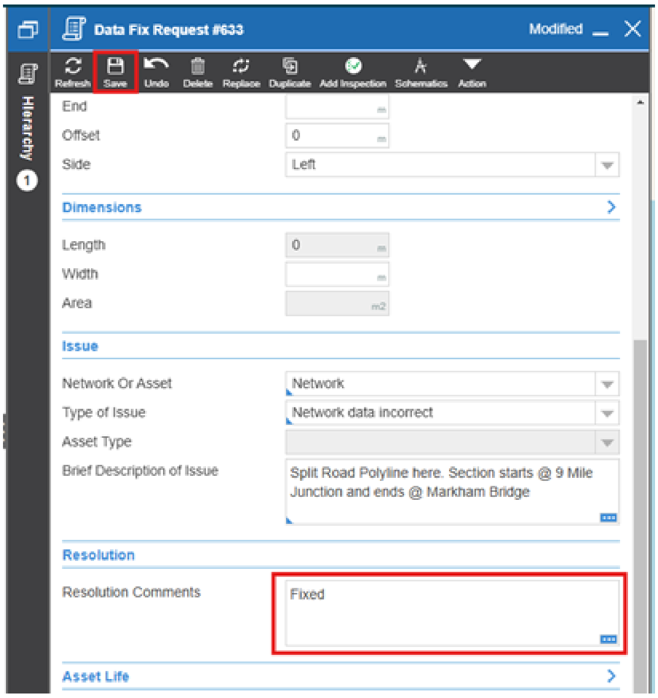
Removing the data fix may be done by both the original user who added it as well as the reviewer, while completing the data fix should only be done by the reviewer once they've made the necessary fixes requested.

The process to complete or remove a record is very similar with only two steps being different, so the following covers both as a single process.

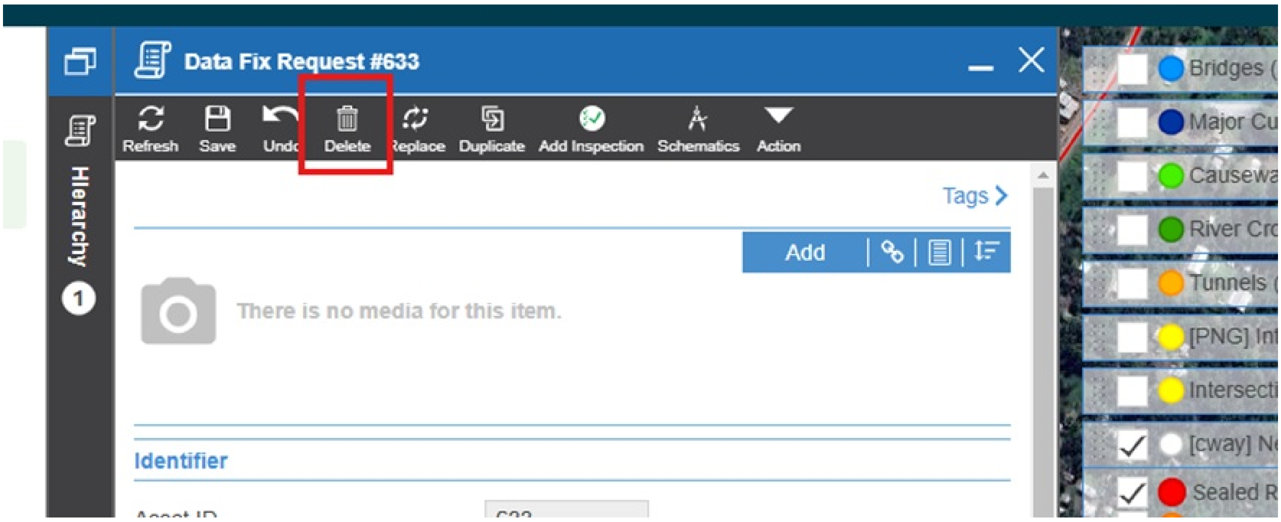
As with the adding a data fix, make sure that the Data Fix layer is visible on the map, and then select the data fix record you wish to complete/remove:



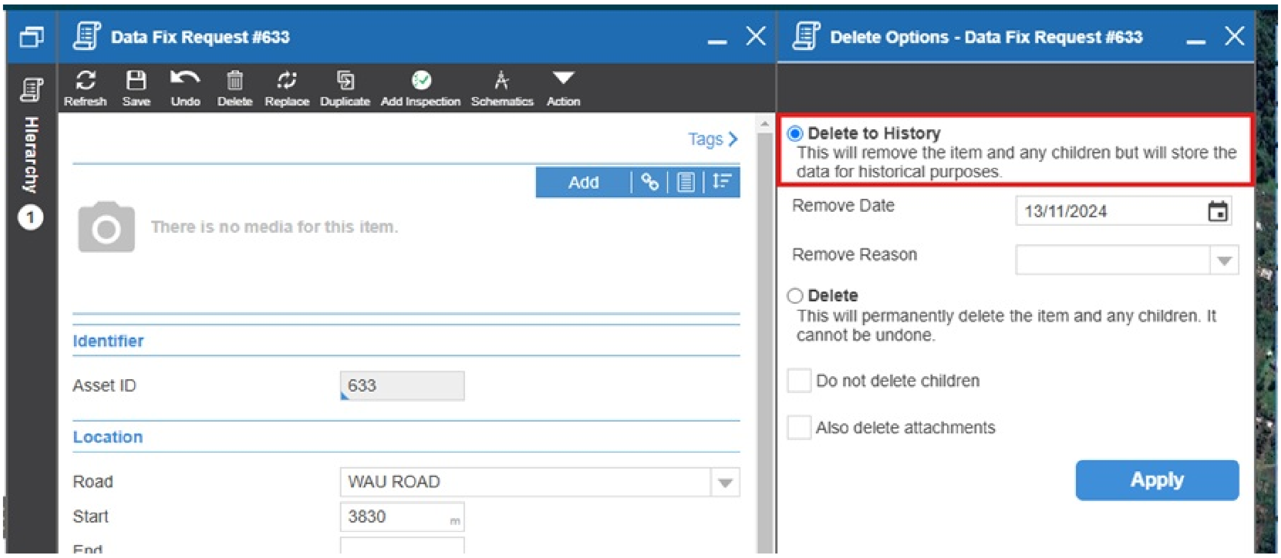
If the data fix is being completed or removed by the reviewer, the field "Resolution Comments" should be filled in to provide feedback to the user that raised the original data fix request. If the data fix is not necessary (a request for a provincial road to added as a national road for example), the notes should be sufficiently detailed to let the user know **why** the data fix was turned down ("Dysox Street is a provincial road, not national") to avoid the original user re-raising the same data fix request. On the other hand, if the data fix was done, the notes can be as simple as "Fixed", "Added" or the like. Once these notes have been added, save the record before moving to the next step.



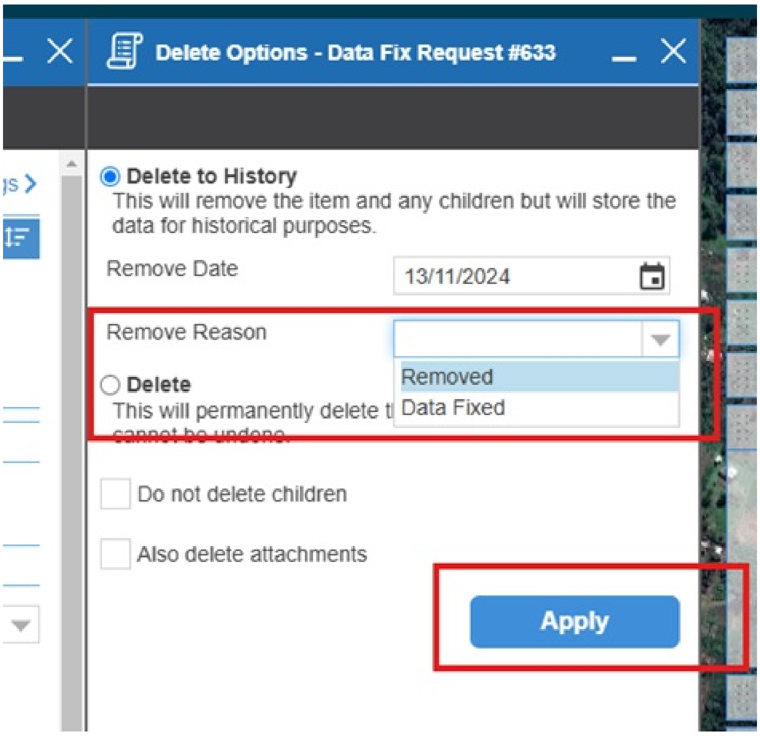
In the record itself, select the Delete option from the menu.



This then brings up a menu to select the delete option you want to use. The menu defaults to the first option, “Delete to History” – this is the option you **NEED** to use:

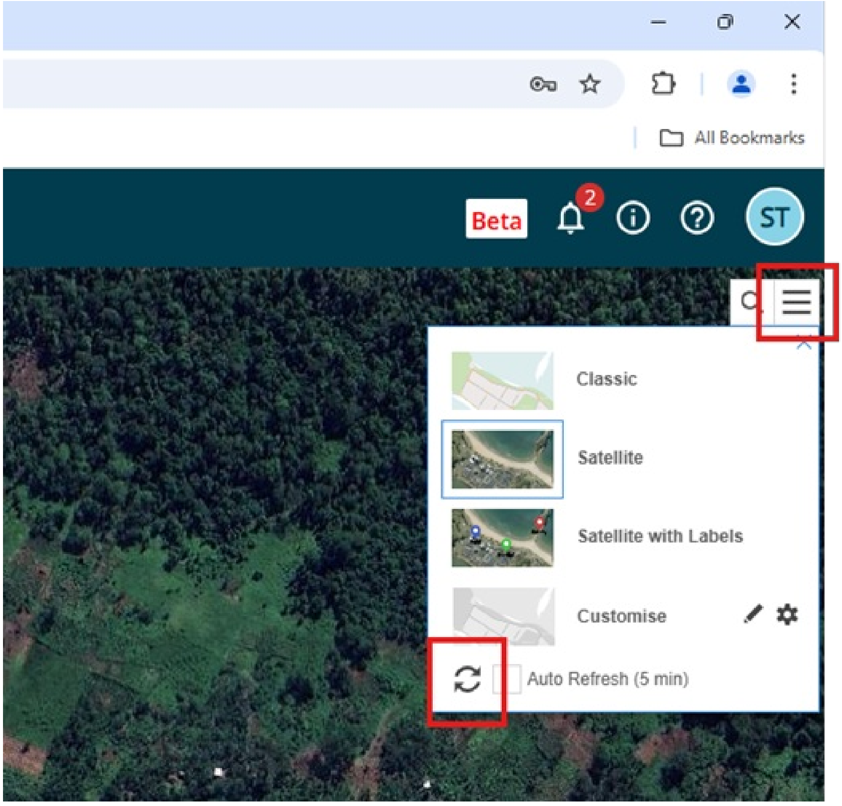


To complete this process, you will need to select a "Remove Reason" – this is the one place that the process differs between completing and removing – if you are completing the data fix request as the issue has been resolved, select "**Data Fixed**", otherwise if you are removing the request as it's either not valid or no longer necessary, select "**Removed**", and then click Apply.



The system will then end date the record with the remove date, and once finished, the record will be greyed out with no fields being editable – close the record and return to the map.

If the record doesn't disappear from the map you can click on the refresh map button in the menu in the top right of the map to refresh the map which will make the record disappear from the map – note only do this while zoomed in on the map, as it refreshes all visible data on the map which make take some time if you're zoomed out with a lot of data displayed on the map:



Notifications for removed or completed data fixes

As part of the process of resolving these data fixe requests, an email is automatically generated and sent out overnight for those records that have been end-dated that day.

The email is sent through to the email associated with the login of the user that raised the original data fix request(s) along with any other users assigned to the same province (as the AWM Mobile tablets are using a fixed user for each province, which may or may not be the same as the actual user making use of the tablet).

The email includes the status of the data fix (removed or data fixed) and the resolution comments for the fix(es).

Length Adjustments

02/04/2025 10:52 am +10

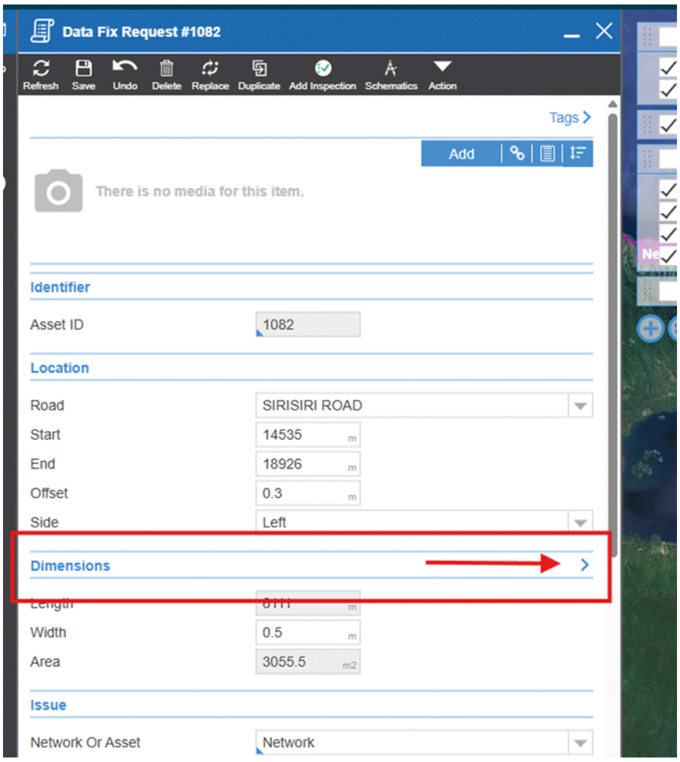
This article demonstrates how to adjust the dimensions for a record. This may be needed when the actual length drawn is different from the calculated length (end location - start location) for the record. This is expected for records that either are only loosely associated with a road or not associated with any road.

When Actual length is not equal to calculated length then a Length Adjustment and and Adjustment Reason need to be populated.

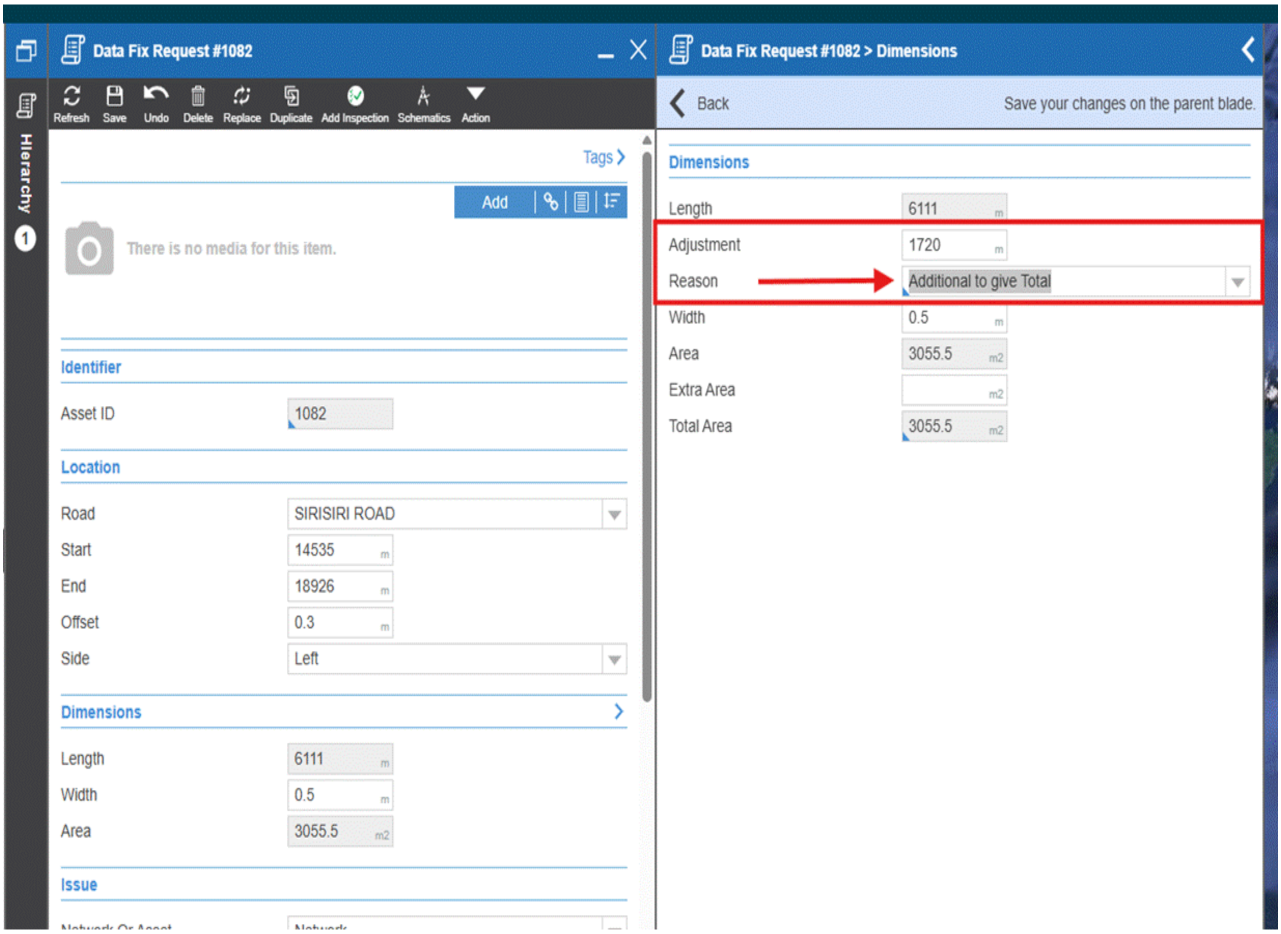
If you don't populate the Adjustment Reason then you will get an error message "Adjustment reason is required". The **Reason** field has to be populated before you can save the record.

The following provides you a guide on how you can find and populate the Adjustment fields.

These Adjustment fields can be found under **Dimensions**. This can be located by clicking on the blue arrow (>) to the right of the **Dimensions** heading to access the secondary tab where the **Length**, **Adjustment**, and **Reason** can be found.



Once the **Adjustment** field is no longer blank or 0, the **Reason** field becomes required.



The error message you're seeing "Adjustment reason is required" means that the highlighted **Reason** field hasn't been populated and needs to be to allow you to save the record – populate the **Reason** field with one of the following:

Adjustment Reason	Generally Adds or Subtracts	Use?	When to use
Additional to give Total	Adds to	Yes	Where the line starts on the centreline (or at a given offset to the C/L) and then moves away from the C/L/given offset (such as a footpath that may form an arc away from the road kerb before returning back to the kerb 100m down the road) before returning back to the C/L/given offset (+/- minor variations in the offset). Also use this one if you have no road (and therefore no start RP or end RP).
Ends away from the road	Adds to	Yes	Line starts at some point on the road but diverges from the centreline at some point along its length to start/end away from the road (while the road centreline continues)
Ends beyond Road End	Adds to	Yes	Line starts at some point on the road and follows the centreline either to the end of the road or back to the start of the road, and then continues for some distance past this point

Adjustment Reason	Generally Adds or Subtracts	Use?	When to use
Common Section	Subtracts from	Yes	When two separate lines merge for a distance but where there shouldn't be a duplication such as at a 4-way offset intersection where the second road centreline might effectively travel along the main road centreline for a short distance – while the start/end RPs on the secondary road absolutely need to account for the overlap to get the appropriate location, the overall network length shouldn't double count that section.
Cul de sac	Adds to	No	Unlikely to be used, used to add distance where a cul-de-sac head has a small island that increases the effective driven length for the road. Fairly minor adjustment and generally better to update the actual centreline to match the reality on the ground.
Dummy of No Length	Subtracts from	No	Most common use for this one is to remove road lengths from the system so that, for example, provincial road lengths aren't reported when summarising the network data – better to use ownership to remove so generally this one isn't likely to be used.
Starts or Ends at an Intersection	Subtracts from	Yes	Similar to "Common Section", this one is used to remove the overlap in length for the section of the centreline where it falls within the width of the major road – generally only used with the network rather than assets.
No adjustments made	Neither	Yes*	Only use if setting adjustment to 0 or deleting adjustment still requires you to enter a reason – this one indicates that there should not be any value other than 0 in the adjustment field.
Roundabout	Adds to	Yes*	Where minor roundabouts have not be set up as their own centreline/carriageway you may need to use length adjustment to add a few metres to the carriageway length or asset length where it tracks around the roundabout rather than following the straight centreline. Should be fairly rare as most roundabouts on the national network are large enough to be separated out into their own distinct centreline.
Unknown	Both	Yes*	Only use where it is unclear as to which option you should be using – wherever possible use one of the other options.
Widening	Adds to	No	Unlikely to be used – very minor adjustment to the overall length where the line crosses two carriageway sections with significantly different width where it's enough to mean the lateral shift is enough to add to the distance.

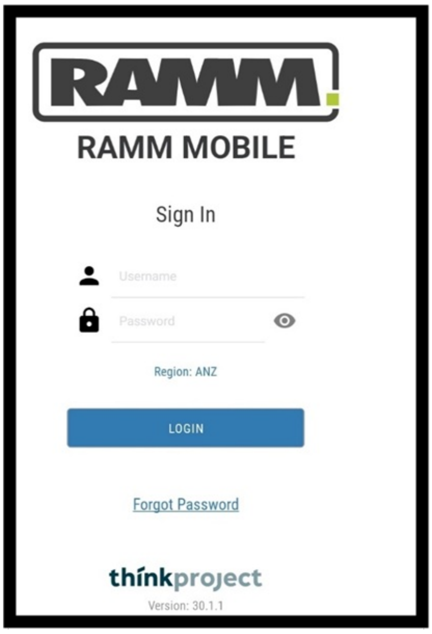
* = rare

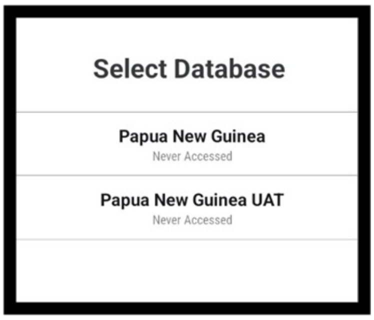
Generally, "**Additional to give total**", "**Ends away from road**", "**Ends beyond road end**" should cover most of your needs.

Using RAMM Mobile for the First Time

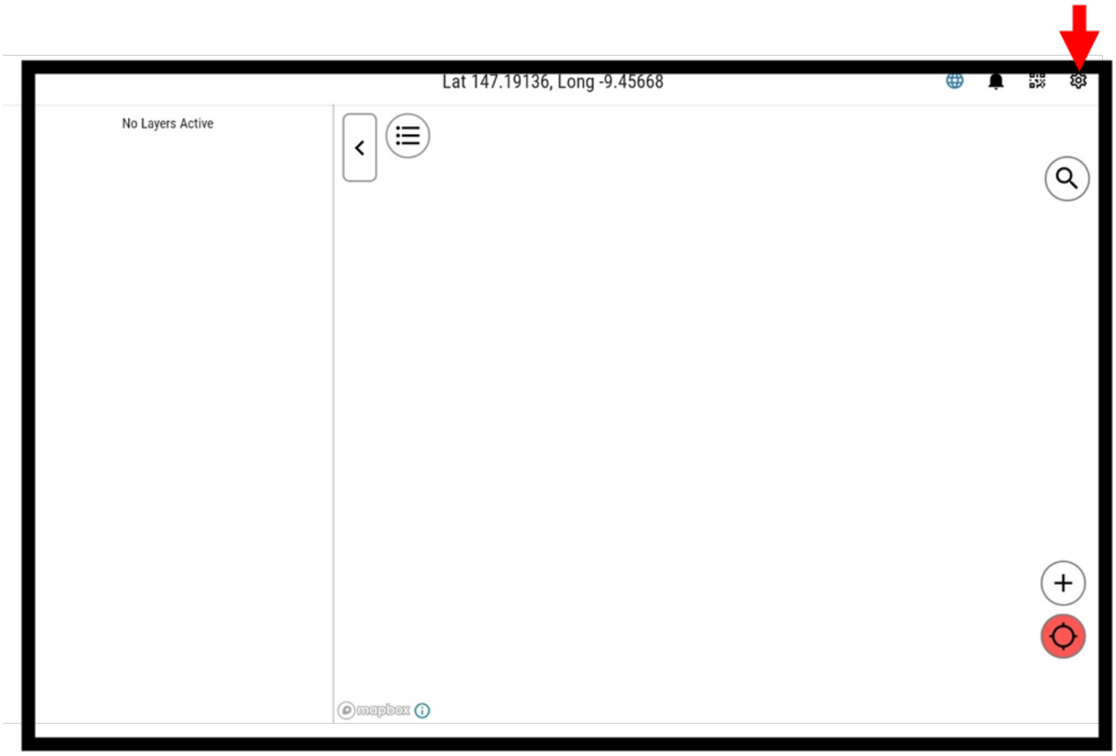
11/08/2024 11:16 pm +10

When you first open RAMM mobile you will see this log-in screen. Use the same log-in details as you would use for go.ramm.com. next you'll be asked to select the database. Select Papua New Guinea



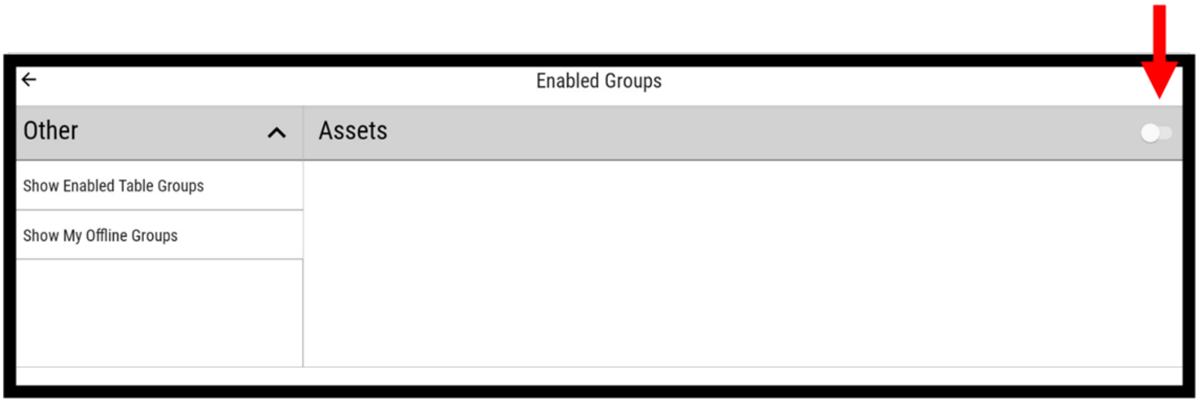


Next you will see the screen below. There are no layers currently active on the map. Click on settings in the top right corner.

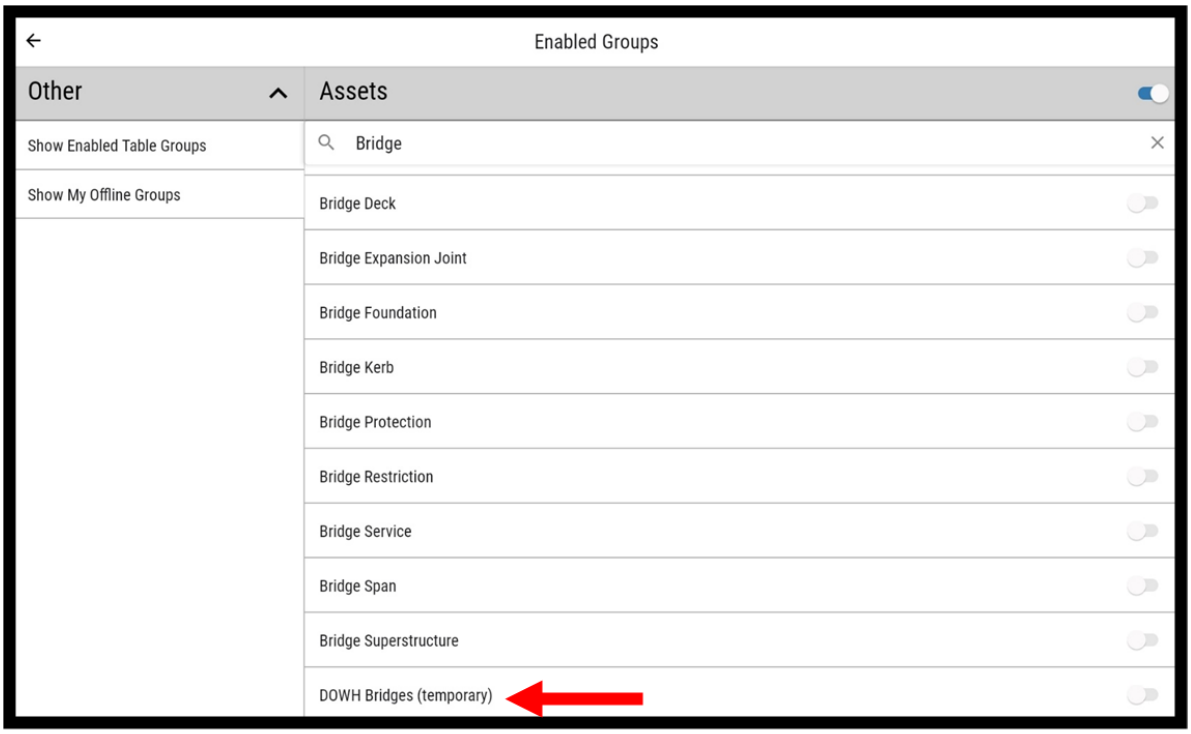


In the settings menu there are two key areas- enabled groups and app settings. Enabled groups is where you turn on different asset layers so that they are visible on the main map. App settings is where you can change settings such as the base map layer, switch the test environment from alpha to beta or production mode (when production becomes available), change the theme colours to dark mode, turn on the secondary column for assets, update the map touch sensitivity and so forth. There will be more settings that become available as the beta environment gets updated and refined. Click on enabled groups.

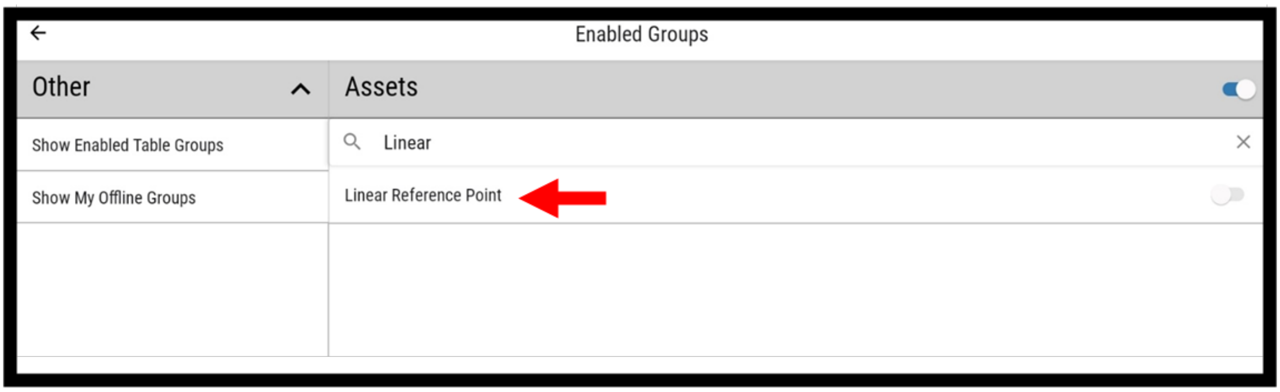
To turn things off and on in RAMM mobile- you use the sliders shown on the far right next to assets. These sliders turn blue when a specific setting is activated and are greyed out when the setting is inactive. Click on the slider to activate the list of assets.



Once the asset list is activated, you can search as you normally would in RAMM. To load an example dataset search for bridges and Select DOWH bridges (temporary). Remember the slider color on the right will change to blue once activated.

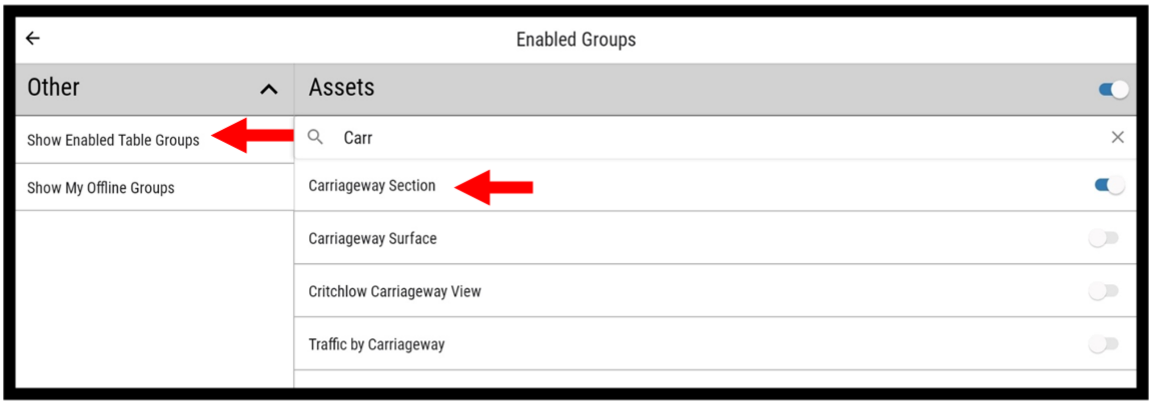


Once you have DOWH bridges (temporary) loaded, load another example dataset by searching for linear reference point and then select linear reference point.

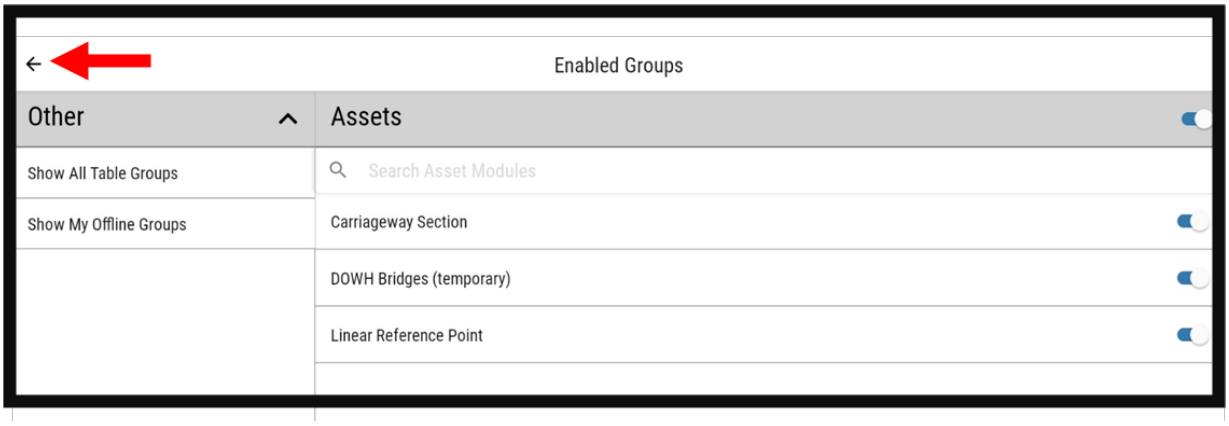


The next example data layer to load is carriageway section. Search for carriageway and select carriageway section.

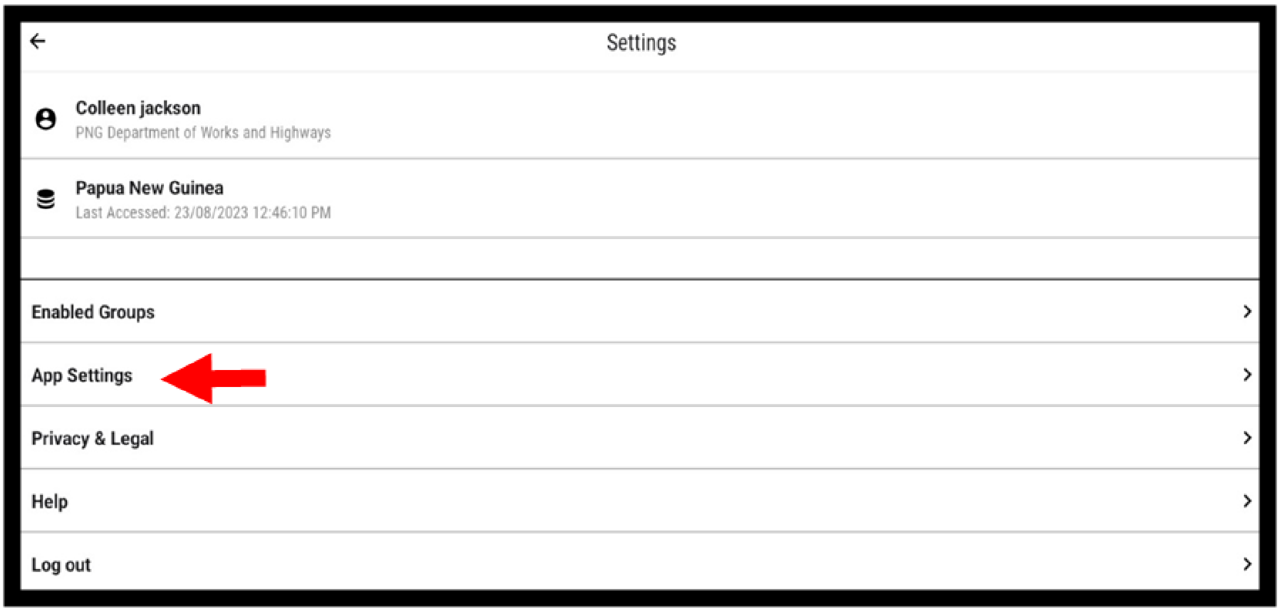
Once carriageway section is loaded, click on show enabled table groups on the left.



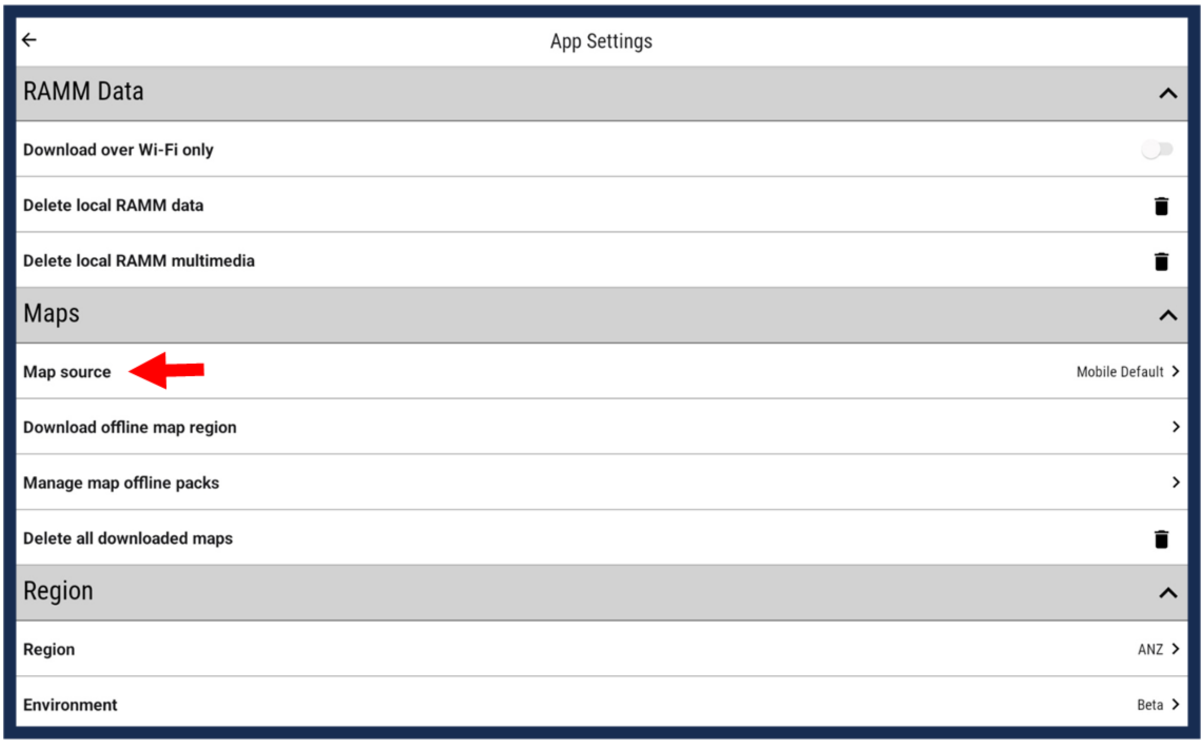
When you select show enabled table groups the list view will change to only show asset types you have selected. Click on the back arrow on the top left to go back to the main settings menu.



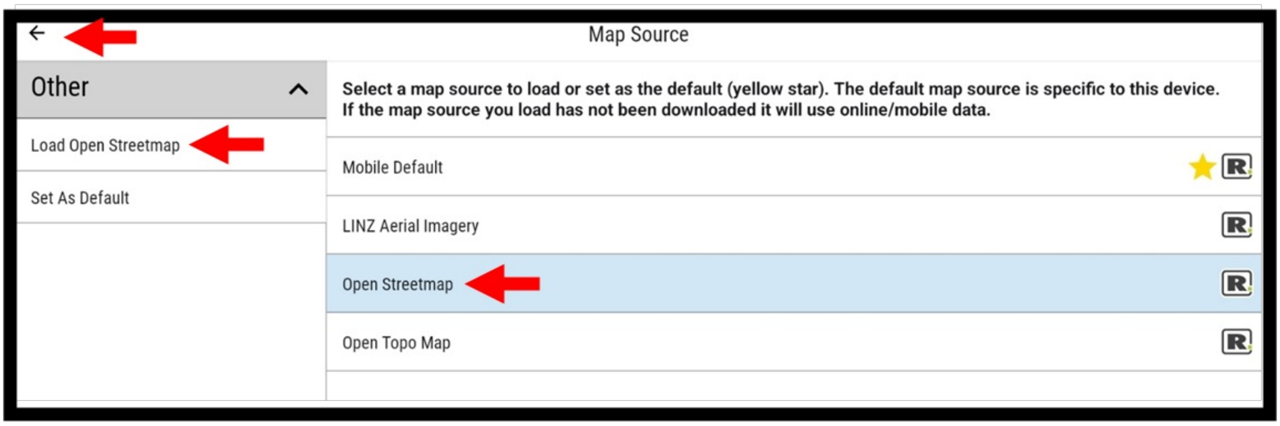
Now that we have the correct asset layers showing on the map, next we want to change the base map. Select App settings.



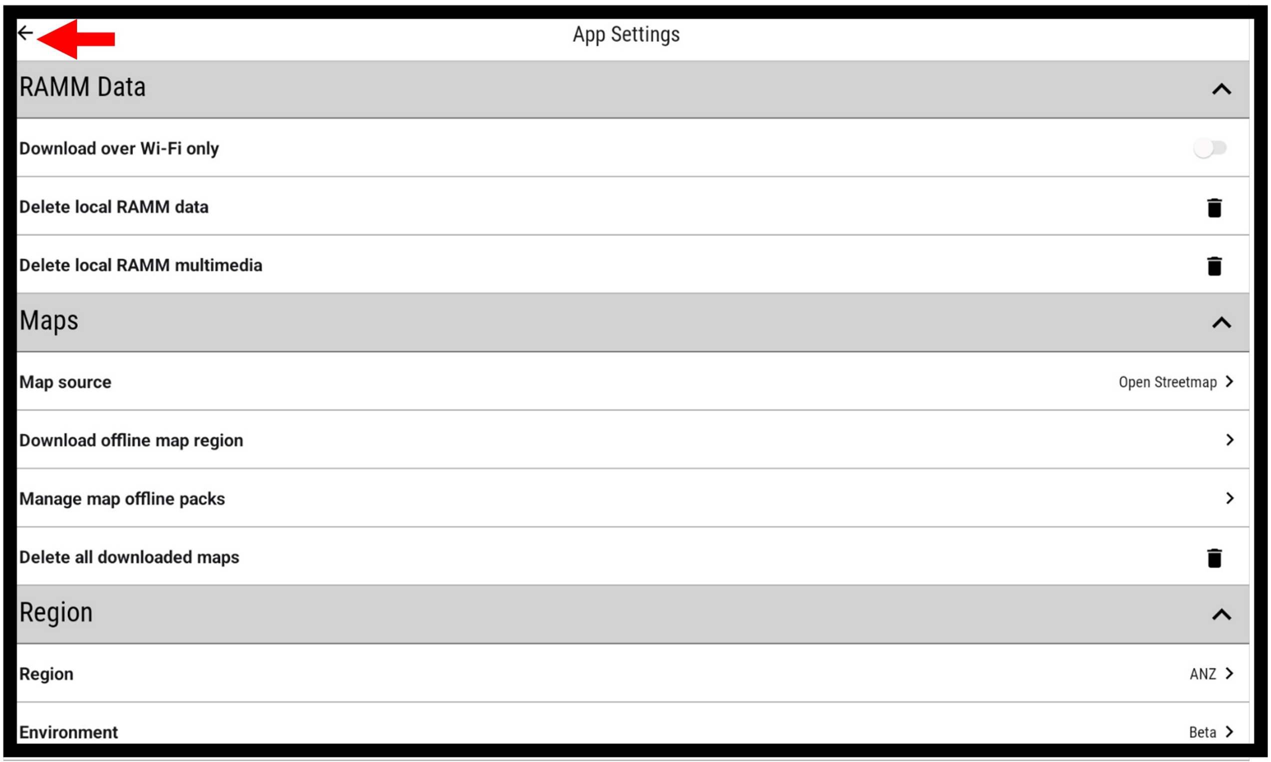
We want to change the map source from mobile default- so select map source under maps



Select open street map and then select load open street map on the left. A pop up should appear saying open street map loaded. Once open street map is loaded- click on the back arrow to go back to the settings menu



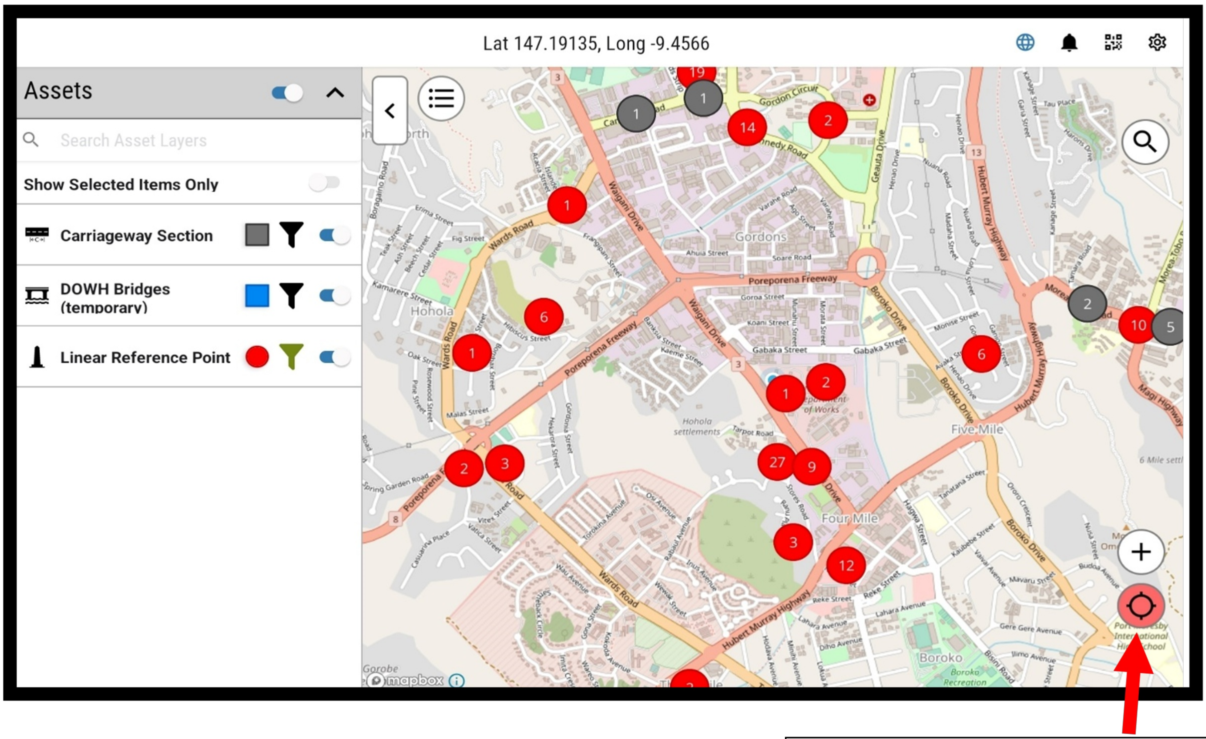
Select the back arrow on the top left to go back to the main settings menu.



Select the back arrow on the top left to go back to the map view.

You will now be able to see assets selected on the map, the default setting is to have the map centred around your current location (in this case the blue dot hidden slightly under a linear reference point on Waigani Drive). The default setting is also to show the assets on the left hand side with a colour legend so you know what is displaying on the map in your area- you can turn asset layers on and off by clicking on the asset name (the sliders will change color from blue to grey).Another default setting is to display clusters of assets on the map unless you're zoomed right in.

You can zoom in on the map using your fingers- have two fingers toughing the map and move your fingers apart to zoom in, and to zoom out move your two fingers apart anywhere on the map.



If you click on the red circle then it will refresh the map and take you to your current GPS location

Roads in RAMM a guide to pavement and surface tables

04/03/2025 6:54 am +10

ThinkProject have created a quick 10-page guide to the pavement and surfacing tables. This guide can be downloaded here Roads in RAMM.pdf. The guide covers the content listed below:

- road name
- carriageway sections
- centrelines
- pavement layers
- carriageway surface
- pavement structure view
- surface structure view
- surface structure major surface
- treatment length view

Filtering in RAMM a guide on how to filter data

04/03/2025 6:55 am +10

Think project have created an in-depth (40+ page) step-by-step guide on how to use RAMM filters. This guide can be downloaded here Filtering in RAMM.pdf . The guide covers the content listed below:

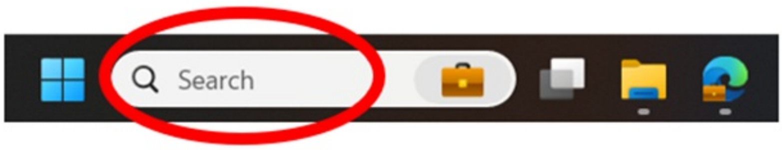
- creating a filter
- selecting an operator
- example filter conditions
- entering expressions
- expression functions
- example expressions
- filtering on a related item
- combining filters
- overlap examples
- dispatch filters
- global filters
- settings and saving filters

How to Join a Microsoft Teams Meeting

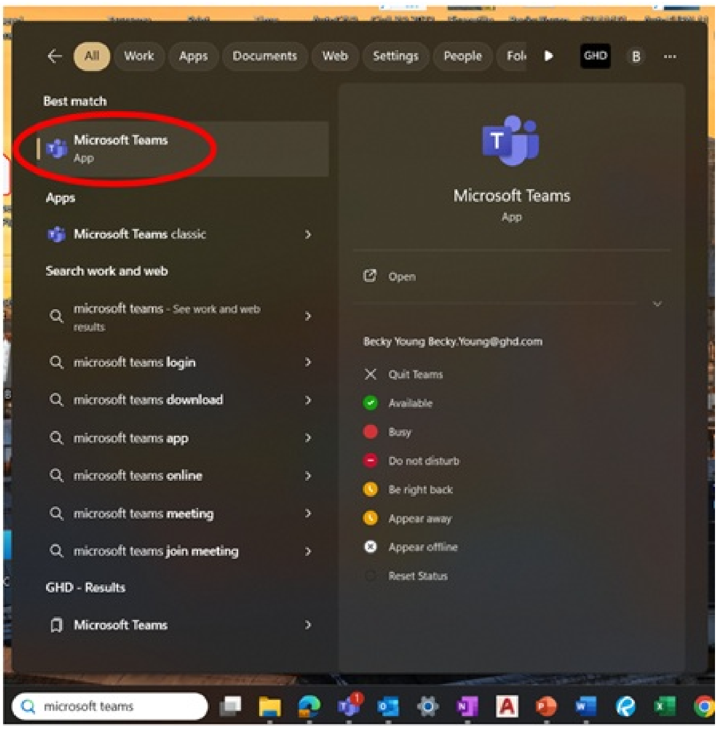
10/12/2024 9:21 pm +10

Open Mircosoft Teams

Search for ‘Microsoft Teams’ using the search function on the bottom left corner of the screen.

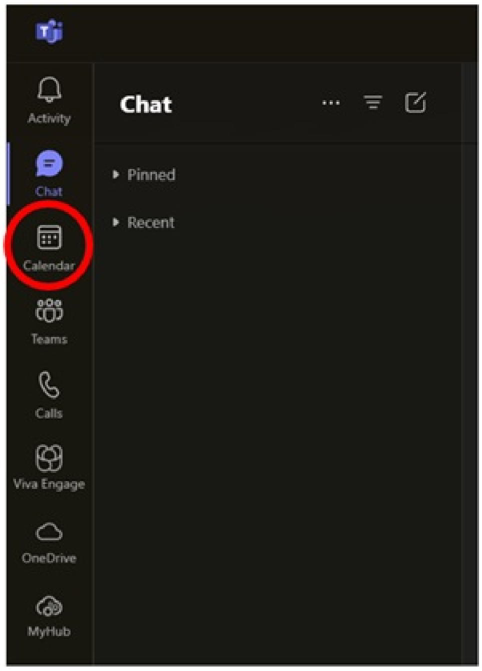


Click on the Microsoft Teams application.



Select the Calendar tab

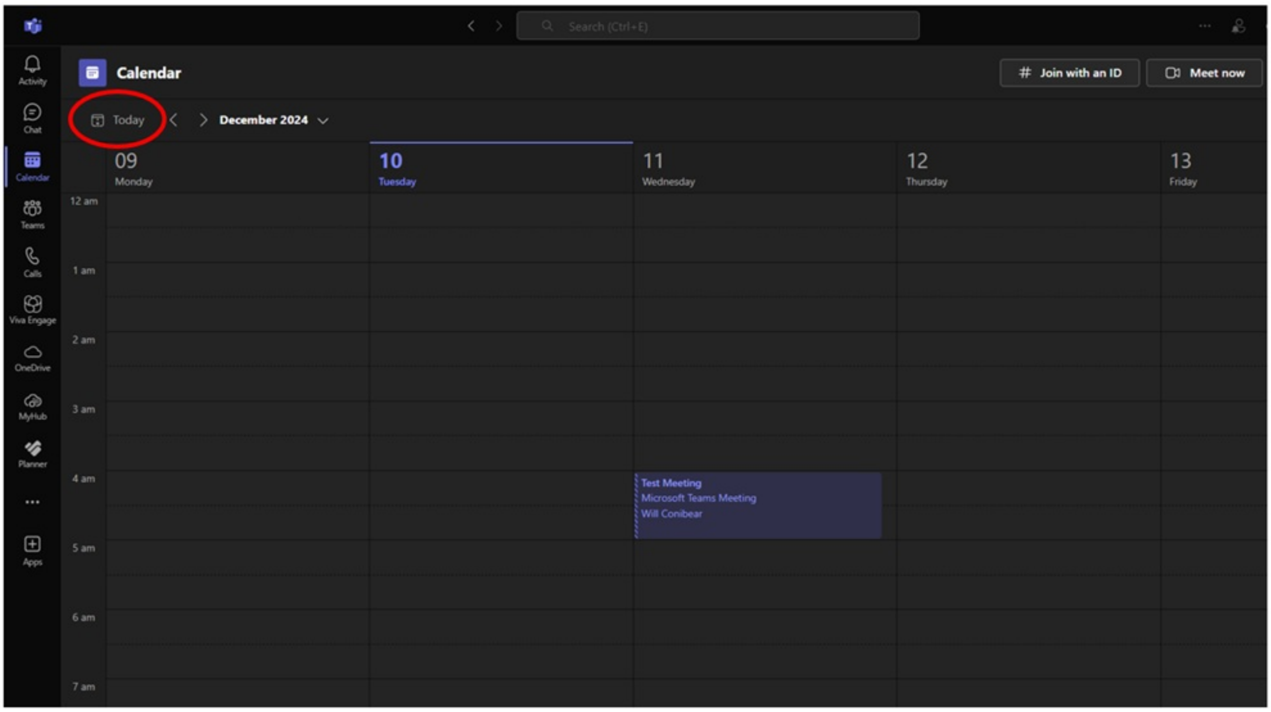
Click on the Calendar tab on the far left hand column.



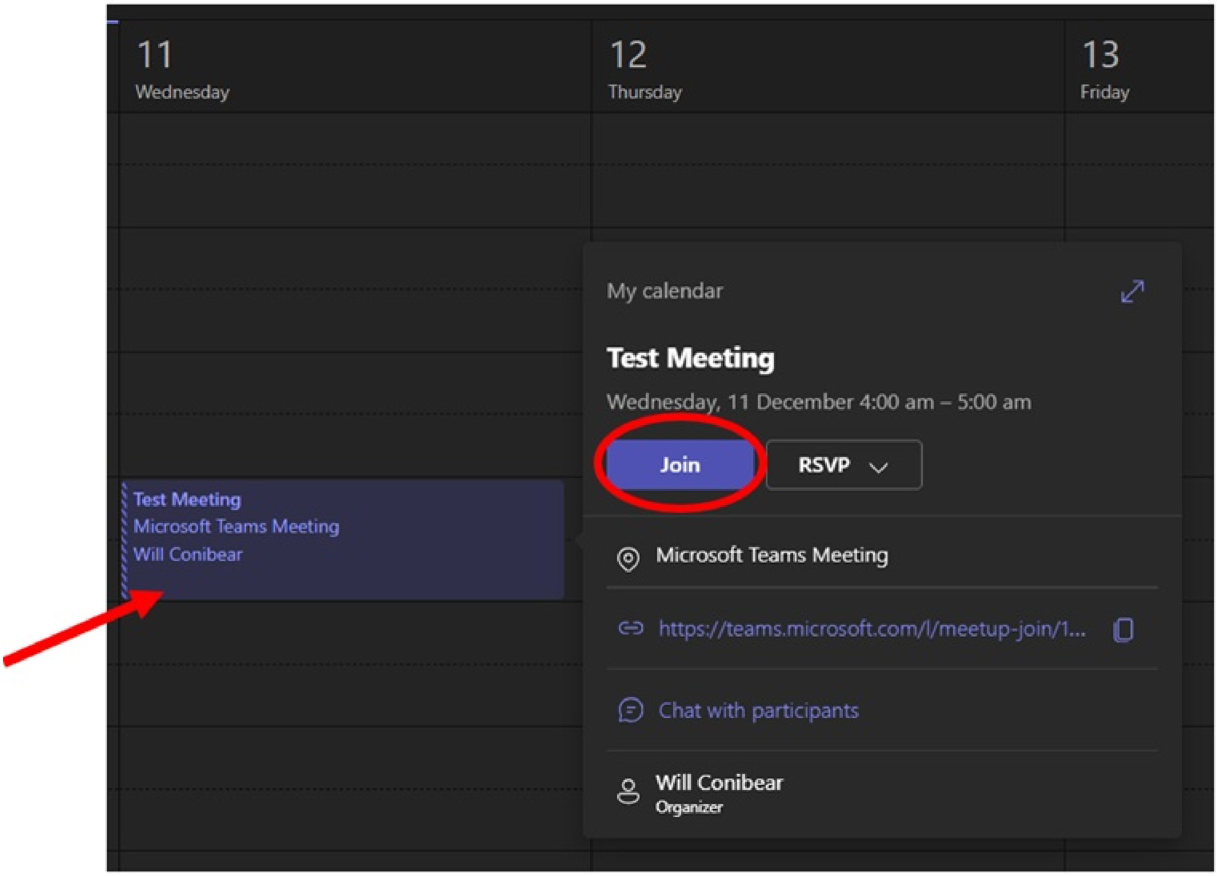
Find the meeting and select 'Join'

Make sure that your calendar view is on Today's view, by clicking 'Today' in the top left corner of the calendar tab. If someone has sent you an invite for a meeting, it will automatically appear in your Microsoft Teams Calendar.

NOTE: You should join the meeting at the time the meeting starts.



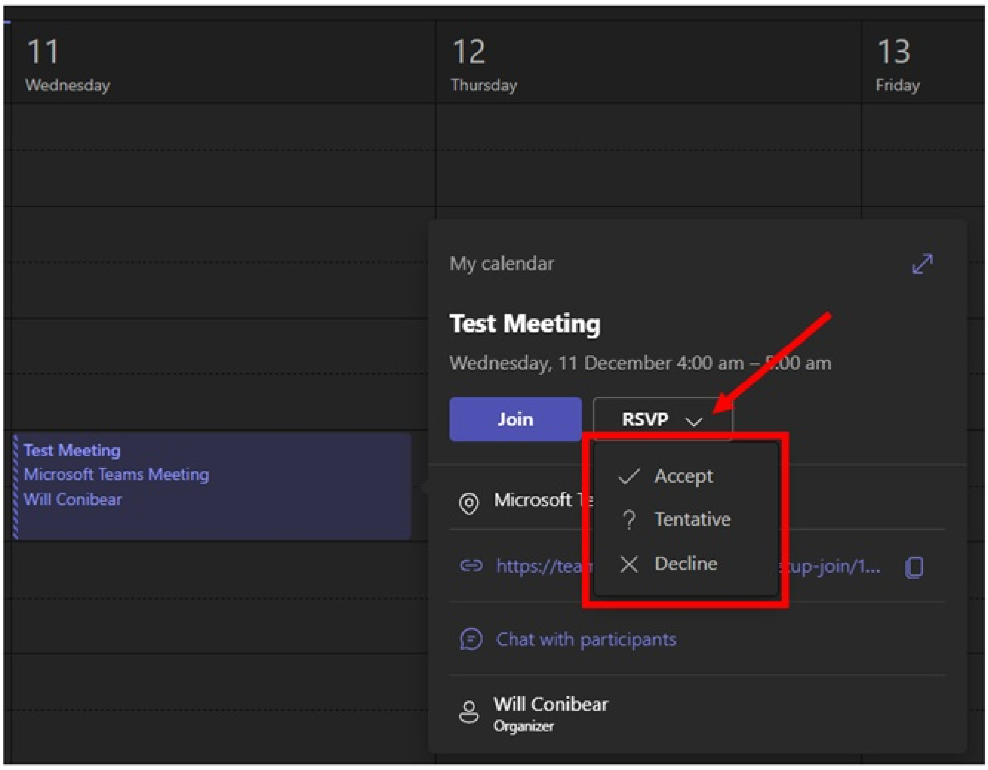
Click on the box that represents the meeting you want to join and select 'Join'.



A pop-up will appear that will allow you to select if you want your camera and microphone to be on. This is also where you can adjust where your sound will be coming out of (computer or headphones). When your settings are chosen, select 'Join now' to join the meeting.

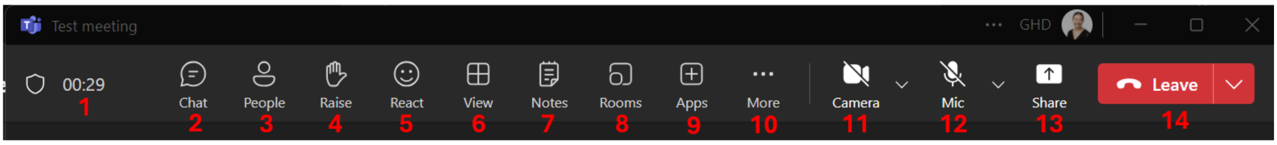
NOTE: If an external provider has sent the meeting invite, you may have to wait to be admitted into the meeting by the meeting organiser.

Prior to the meeting (anytime from when you got sent the meeting invite, up until when the meeting will start), you can 'RSVP' to the meeting organiser to let them know if you will be at the meeting or not. You can do this by clicking the dropdown arrow next to 'RSVP'.



Meeting controls

After successfully joining the call, at the top of the screen, there will be the following controls.



1. **Timer** – Check how long the meeting has been running
2. **Chat** – Show or hide the meeting chat
3. **People** – Show or hide all participants
4. **Raise** – Raise your hand during a meeting to let others know you have something to share without interrupting the speaker.
5. **React** – Express a reaction. Choose an emoji reaction to something someone is saying
6. **View** – Choose and change how you see other participants.
7. **Notes** – Take meeting notes
8. **Rooms** – If you're the meeting organiser, you can create a breakout room
9. **Apps** – If you're the meeting organiser, you can add and app to the meeting
10. **More** – Other actions that can be taken in the meeitng is to start recording or apply background effects.
11. **Camera** – Turn your camera on or off. Clicking the dropdown arrow will allow you to change your camera settings.

12. **Mic –** Mute or unmute your microphone. Clicking the dropdown arrow will allow you to change your microphone settings.
13. **Share** – Present your screen to the other people on the call
14. **Leave** – Leave the meeting

How to share your screen on a Microsoft Teams Meeting

04/03/2025 11:43 am +10

Your browser does not support HTML5 video.

Please note that at the end of the video, the "stop sharing" buttons and the red outline are not clearly visible, however they will be on your screens in the same locations as directed when you are sharing your screen.

Support - Technical Systems

04/09/2025 9:54 am +10

The following provides contacts for each of the main technical systems used by the DoWH AMB.

System		
ThinkProject Asset & Works Manager	The core system of the DoWH Road Management System	edmond.li@ghd.com
Mapillary	For uploading and accessing network video	remson.maea@pngroads.com
GoPro MAX	For the recording of network video	remson.maea@pngroads.com
TotalPave	For the recording of pavement (network) roughness	rexie.rei@pngroads.com
MetroCount	MetroCount counters and software for the recording of traffic counts	remson.maea@pngroads.com
KnowledgeOwl	Knowledgebase for the DoWH asset management and other related activities and requirements	elliot.mcbride@ghd.com

Road Management System Newsletter Mid-Year Update - September 2025

04/09/2025 9:49 am +10

Road Management System News

Mid-Year Update - September 2025

Link to downloadable PDF: Road Management System Newsletter Mid-Year Update - September 2025.pdf

The Road Management System (RMS) is a collection of modern systems to support DoWH asset management objectives and processes. The primary system is called Asset & Work Manager (AWM) (formerly RAMM).

As Phase 1 of the implementation project draws to a close, we can celebrate the significant progress achieved together. It also provides an opportunity for a call to action, building on our shared success to drive even greater results in Phase 2.

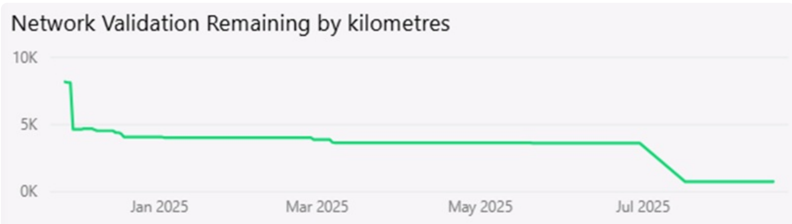
In 2024, there was a high level of activity for the implementation of the RMS including the rollout training in November. This newsletter provides an update of the activities that have been taking place in the first half of 2025, and determines some of the lessons learned from the pilot studies and implementation more generally.

Capacity Development

- Rollout training and IT equipment has been provided to provincial and regional staff, supported by the Works Kuru knowledge base (access here: **help.pngroads.com**)
- Both one-on-one and weekly office hour sessions have been provided to support provincial teams with refresher training, and answer any questions they have with using the AWM system. There are now many provincial officers who have a good understanding of how to validate data, raise data fix requests (over 190 requests added in 2025) and use the monthly project monitoring module.
- Some officers are yet to fully engage with the system since the rollout training. The final stages of Phase 1 provide the opportunity for everyone to get involved and contribute to the progress already being made.
- There have been weekly data fix request sessions with the Asset Management Branch (AMB) team, who have resolved over 220 data fix requests in 2025.
- The Network Monitoring and Evaluation (NM&E) team are now well versed in using the AWM system to keep a projects and contracts register, and to support the monthly project monitoring process.
- AMB staff are preparing to take on more ownership of network and structures validation tasks. Updated Knowledge base (Works Kuru) articles are now available to support this work.
- DoWH AMB are taking ownership of some training activities by organising the meetings with provincial engineers and conduct the drop-in sessions themselves.

Network

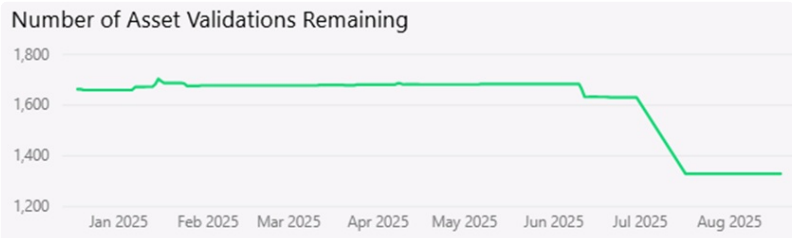
- Over 8,300km of the national road network now managed in AWM. Thanks to the dedication of provincial teams, eleven provinces have now fully completed their network validation review, with most of the remaining provinces having completed over 80%.
- Centreline improvements and updates following the April 2025 Gazette changes are ongoing, with a focus on national routes



Insights into the dashboard: status of remaining network validation review

Road Structures

- There are now a total of 946 bridges, 519 major culverts and 79 causeways recorded in the System.
- 340 bridge condition survey results have been imported into AWM, with another 100 under review before importing.
- Provincial teams are progressing with structures validation, though most provinces have 60-70% of their structures still needing validation.
- A notification system now alerts the structure assets administrator when new structure records are added



Insights into the dashboard: status of remaining asset validation review. A ssets include bridges, causeways, major culverts and river crossings.

Projects

- The monthly project monitoring process in AWM has been finalised and is available for use, including automated PDF reporting for draft and final versions. Unfortunately, there has still been lack of engagement from some provinces in using this process.
- Over 380 project records and 320 contract records have been loaded into the system, including all TSSP Proforma contracts.
- Updating project monitoring records has been tested and configured in the ThinkProject 'Assets' app, which is set to replace RAMM Mobile.
- A notification system has been set up to alert NM&E advisors when new project records are added.

Selection of photos from project monitoring reports:

Type 5 Open drain on both sides of the road on New Britain Highway, East New Britain

Excavation and widening along the New Britain Highway, East New Britain

Culvert Cleaning and drainage works on Momote Road, Manus

Upgrading and sealing of 2.5km from Chabbai Junction on Buka Road, Bougainville

Data Collection

Network Video

- Training sessions were held with the AMB team to build capability in capturing network video, and additional footage was collected during fieldwork.
- Network video has now been captured from Bougainville and Vanimo, and has been uploaded to **www.mapillary.com**, improving data accessibility and supporting infrastructure assessments.

Traffic Counting

- The national traffic count programme has been set, including site frequency and schedule, and has been approved by AMB leadership.
- Remson Maea has been collecting traffic count data in East New Britain and Gulf with results pending upload to AWM.
- A contractor has been engaged to deliver the traffic count programme, with processes for data flow back into AWM to be finalised.
- Options for Metro RoadPods and additional pneumatic tube counters are still under consideration, particularly for Port Moresby urban roads.

Network Conditions

- The AWM network has been loaded into TotalPave, streamlining transfer of condition data into AWM.
- Bougainville roughness data (460 km) collected via TotalPave is now available in AWM.
- Rough-o-Meter 4 data has been collected, with data for Lealea Road now uploaded into the system.
- Uploading condition data still requires manual checks to match locations, due to ongoing network updates in the system: this will reduce once network alignment is finalised.

RMS Systems

- Power BI dashboards are now fully functional to help to track the quantity of data in the System, track the progress and status of projects, and the extent to which the provincial staff are carrying out their assigned tasks. These dashboards are available to management and executive staff.
- Step-by-step guides on joining Microsoft Teams calls and sharing screens have been provided through the Works Kuru, supporting more effective use of the platform during online meetings.

Asset Management Maturity Assessment

- The Asset Management Maturity Assessment was conducted to review and improve AM practices, previous reviews conducted in 2023 and in 2018.
- Interviews were held in February 2025 with over 15 key people, including DoWH Secretary Mr. Gibson Holemba and other executives.
- The review used a tool with 268 questions and resulted in an overall score of 2.37 out of 5. The assessment provided detailed results and included recommendations for improvement, accompanied by a visual heatmap to show the gaps identified. The results were presented to executive directors on 25th June 2025.

Lessons Learned

Continually improvement depends on learning from both our successes and challenges. Every lesson helps contribute towards a smarter, more resilient road network. Here we will reflect on lessons learned from the pilot studies that were conducted in two provinces and during Phase 1 Implementation more generally.

Two pilot rollout and training activities were carried out to test how provincial staff could take on RMS data validation and collection:

- Kavieng, New Ireland: 10–15 August 2024
- Buka, Bougainville: 7–10 April 2025

New Ireland was selected as a pre-rollout trial site to refine training content, test tools, and assess how data collection could be managed at the provincial level. Bougainville was chosen for its strong engagement during the national rollout, with the visit focused on refresher training and understanding challenges with using the system independently. Lessons learnt are set out as follows:

- **Technology literacy varies**: Training needs to be paced carefully, allowing less confident users time to learn while encouraging more capable staff to support their colleagues.
- **Building confidence takes time**: Staff gained basic competence during training but often lacked confidence using the live system. More supervised, in-person training by AMB team is recommended until provincial teams feel ready to work independently.
- **Task repetition is valuable**: Both trainers and trainees may resist repetitive exercises, but repeated practice builds necessary confidence.
- **Traffic counting and video collection responsibilities**: In most cases, having AMB staff or contractors handle these tasks is more efficient, except in harder-to-reach locations such as Bougainville, where investing in provincial capacity may be worthwhile.
- **Maintaining communication**: Regular, scheduled follow-up meetings after training are essential. Communication channels such as Teams should be tested before trainers leave.
- **Connectivity and funding challenges**: Limited internet access and tight budgets for data collection activities remain barriers. Exploring alternative funding models or incorporating data collection into major works contracts may help.
- **Clear data responsibility**: Identifying a designated person responsible for data entry and validation in each province helps streamline communication and support ongoing data management.
- **Ownership and motivation from management:** Regular communication from management and the executive team is essential to reinforce the value of engineer support and the benefits of using the AWM system. When the engineers feel confidents and acknowledged by the executive team, they are more likely to invest time in learning and using the system effectively. As managers and executives deepen their understanding of the insights and efficiencies the AWM system provides, they can actively encourage and motivate their teams to adopt it more consistently. This top-down endorsement not only drives usage but also fosters a culture of ownership and continuous improvement.

Next Steps

- **AWM Training**: In October 2025, the RMS Implementation team will be bringing an accredited trainer from ThinkProject (Software provider for AWM) to conduct refresher training sessions and provide the opportunity for officers to become certified AWM users. Remote support sessions will continue as per usual.
- **Asset Handover Management**: Over the coming months there will be a focus on how we collect asset data at the end of projects and transfer this efficiently and accurately into the AWM System.
- **AMB Ownership**: The AMB team will continue to take more ownership of supporting provincial staff activity using the AWM system and its administration. GHD team will create more opportunities to increase the ownership of the AMB team during the transition period.

Call to Action

Together, we can maintain momentum and take RMS to the next level in Phase 2. Strong engagement and accountability from provincial staff and executive leadership will be the key to unlocking even greater impact for our road network. To move forward effectively, we ask for focussed attention on the following:

- **Promote training participation**: Executive-level staff should actively encourage their officers' attendance at refresher trainings and office hours, addressing both technical and engagement barriers.
- **Complete network and structures validation:** Provincial staff must finalise network validation by the end of Phase 1 to support alignment and future updates.
- **Complete monthly project monitoring records:** Monthly reporting by provincial staff remains inconsistent. Escalation to executive level is recommended. The system has been designed to easily complete project updates, and the benefits are great. For example:
    - Project monitoring not only highlights challenges being faced in the field, but also gives Headquarters the insights needed to respond quickly and provide stronger support.
    - Good project work should be celebrated! Photo evidence in particular demonstrates the great work that is being done in the provinces. Public rewarding and recognition should be conducted to promote and encourage people to do the great work.
    - Up to date project data allows for headquarters to have a better understanding of the status of the network and helps them to allocate Government and Donor funding.
    - Often funding is provided on the condition that reporting is regularly provided and is accurate. The system generated project reports offer an efficient means to provide this type of reporting.
- **Become familiar with the system and its capabilities:** If there is an expectation that officers are using the system, then there should be a good level of understanding from managers about the system's capabilities and how they can use it to work more efficiently.
- **Familiarise yourself with the Circular Instructions:** The circular instructions 112025, 122025, 132025 and 142025 were distributed early in 2025, these set out the requirements relating to the use of AWM.

Contact

We welcome your feedback and questions about this newsletter or the RMS implementation. By sharing your ideas and experiences, you help us improve and strengthen our collective effort to build a smarter, more resilient road network for Papua New Guinea.

Colleen Jackson
Assistant Secretary AMB
Colleen.Jackson@pngroads.com

Eduardo Sangrador
Road Asset Management System Adviser, TSSP3
Eduardo.Sangrador@pngtssp.com

Elliot McBride
Project Manager, RMS Implementation
Elliot.Mcbride@ghd.com

Tabitha Makas
RMS Support
Tabitha.Makas@ghd.com

Network Validation - Work Instruction

05/02/2025 1:23 pm +10

Task

As part of the roll-out of the AWM system, the network within the system must be reviewed and validated to ensure that:

1. It provides an accurate spatial representation of the national road network
2. That the details of the network such as road hierarchy are accurate

Provincial staff will review the roads within their province to confirm their accuracy.

The task has three separate parts to it, and in general should be undertaken in the order listed:

1. Roads missing/incorrectly included/naming
2. Road alignment
3. Carriageway details

Any issues identified in the process of working through this task should be logged in AWM using the "**Data Fix Request**" table - see the How To guide "**Working with Data Fixes**" the specifics of adding and working with these records.

As part of the task each staff member will update the table "Network Validation Tracker" with their progress (see *Tracking the Task* below for the process).

To assist in the task, a map layer package "Network Review" has been created.

Roads missing/incorrectly included/naming

The first step is to review the road network in the province and confirm that all the national roads in the province are represented on the map – for any roads that are missing, a data fix should be raised using a rough line to trace the extents of the missing road:

The second step is to make sure that there are no roads included in the system which should not be in the system – at this stage only National Route, National Main and National District roads should be in AWM, with National Institute and Provincial roads excluded (with a rare exception for Provincial roads that form part of the missing link projects where they will be taken over as national roads at the end of the project.

For roads that shouldn't be in the system, raise a data fix (point) on the road that should be removed with the brief description outlining why the road should be removed (e.g. "Provincial Road", "National Institute").

Finally, the road names themselves should be reviewed to make sure that there are no misspelt or incorrect names in the database.

In this case, raise a data fix (point) on the road and include the corrected name of the road in the data fix request.

Road alignment

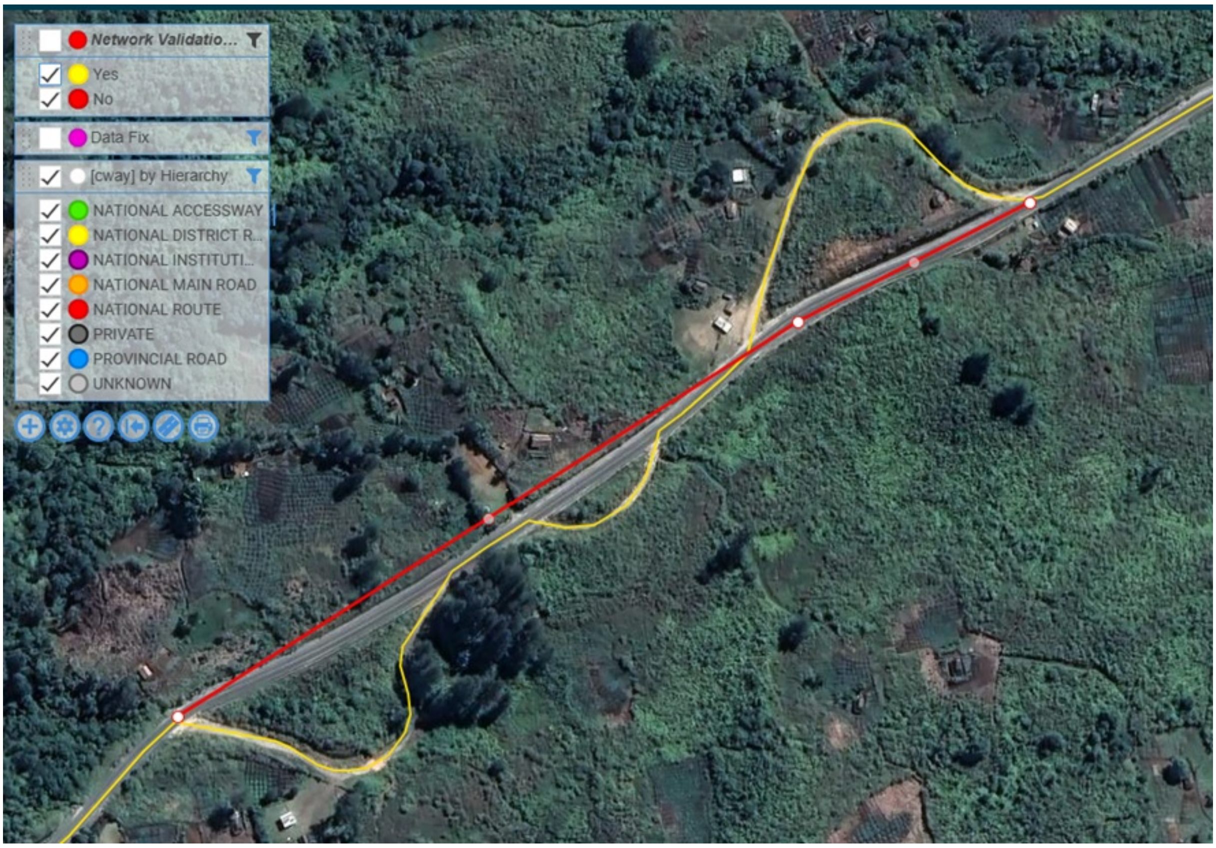
After checking for missing or incorrect roads, the next step is to look at each road and confirm the following:

1. The **road start/end locations** are correct – for most this should be obvious, but some roads end in locations such as small villages where it can be uncertain as to the exact location the road should terminate:

Where the start or end is incorrect, raise a data fix to identify the issue:

- If it is a shortening of the existing centreline, use a point data fix at the location the centreline should be trimmed to.
- If it requires the extension of the centreline, use a rough line data fix (as shown for adding a new road above) to indicate where the additional centreline should go.

2. That the road **centreline alignment** is correct – either confirming against the aerial imagery, or where you are aware of project changes to the alignment that the aerials are too old to show.



In both cases, a data fix (line) should be raised. If the aerial is clear (as in the image above), a rough line can be used just to indicate the fix required – if the change is based on local knowledge of a project that is not shown in the aerial, the line must be much more detailed and accurate as it will be the only guide available to make the change.

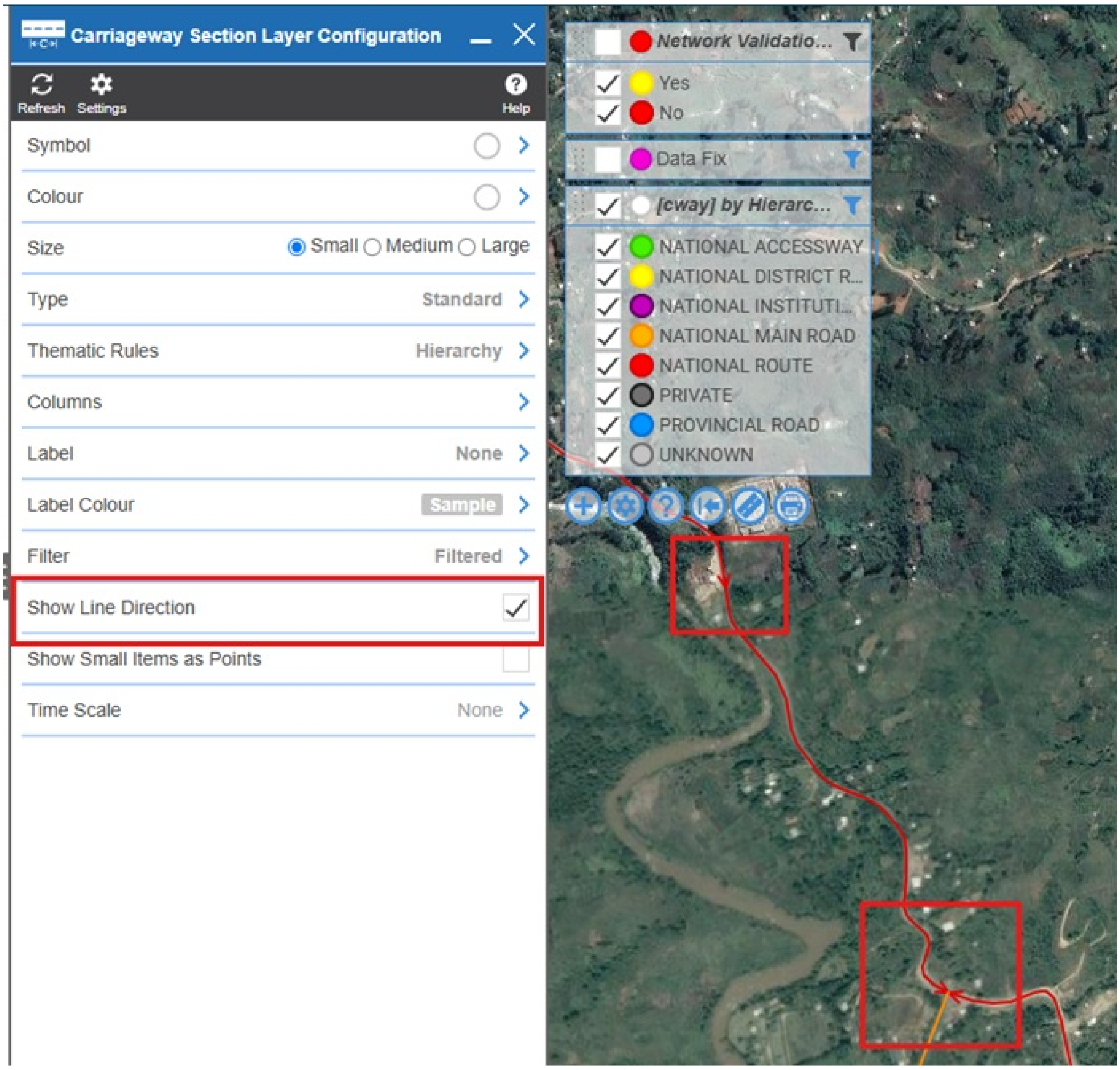
Carriageway details

Once the overall road alignment has been checked and any fixes required logged, the final stage is to check the details of the individual carriageway sections, focusing on the following fields:

- **Network Type** - is this section of road sealed, unsealed or a 4-wheel drive track?

The quickest way to work through this information is to setup thematic layers on the map to display the data values.

The carriageway splits can be made easier by turning on the "Show Line Direction" in the configuration menu as this will cause a little arrow to display at the end of each carriageway section, making it easier to identify where each section starts and ends:



If the data is incorrect, a data fix should be raised at the location, either a line or point as follows:

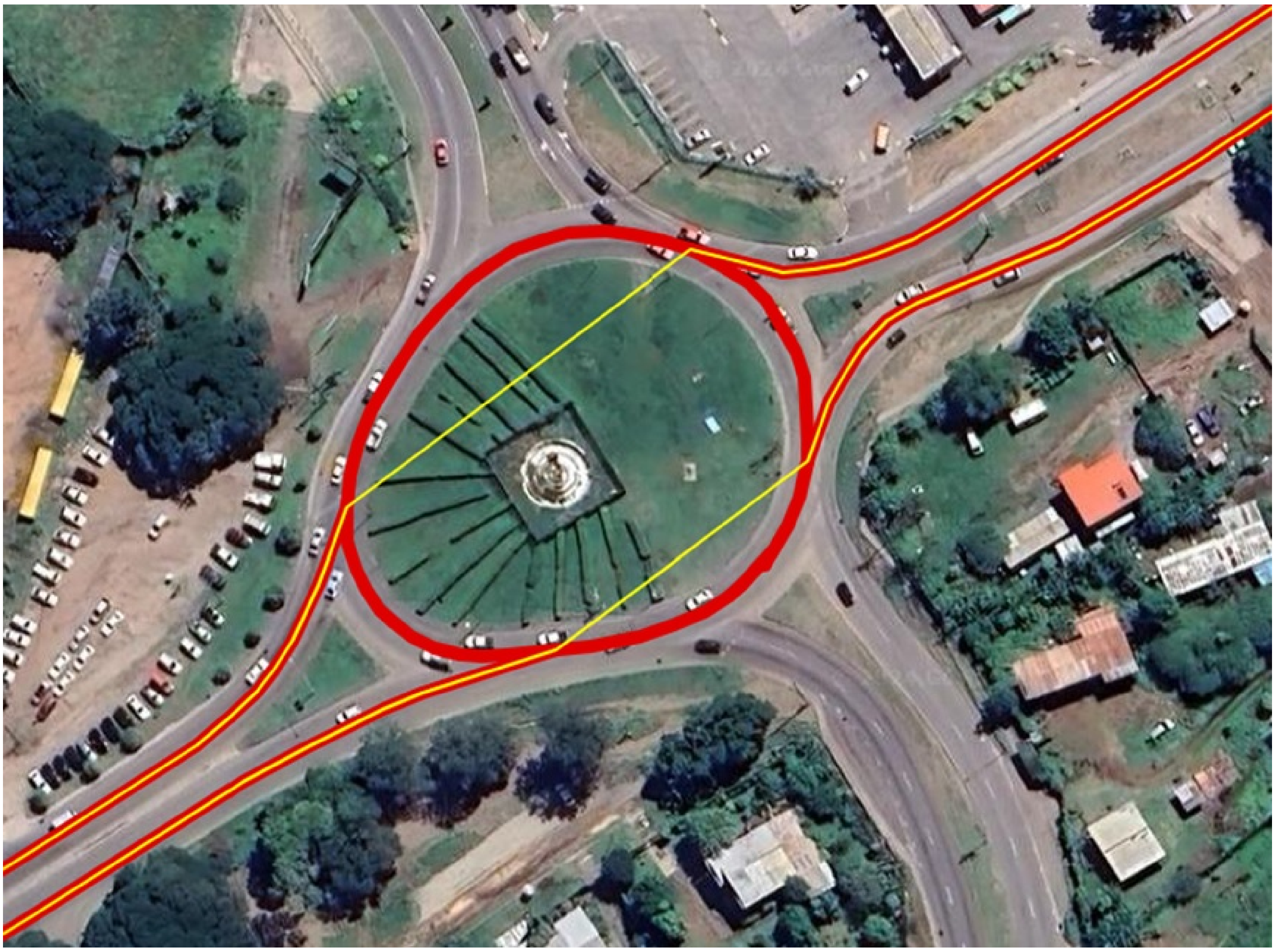
- If the issue applies to the entire carriageway section (wrong hierarchy for example), a point data fix within the

start/end location of the carriageway section is sufficient.
- If the issue applies to only part of the carriageway section, either:
  - A line (start and end points **need** to be accurate, the rest of the line can be rough) showing the extent of the issue, or
  - A point data fix with sufficient detail in the notes to understand what is required (such as if the second half of a carriageway section is unsealed, but the overall record is currently sealed – place the point at the location it changes from sealed to unsealed, and include in the notes something like "Unsealed from here to end of section" to indicate which direction the change applies in).

Tracking the task

Progress of this task will be tracked using the "Network Validation Tracker" table – as part of the process of checking each road in a province, the associated record in the tracker table should be updated.

Note that short sections such as ramps or roundabouts have not had records created in the tracker table, and that the tracker records may look a bit odd around these locations as they draw a straight line across the roundabout – this is not something to worry about but is a consequence of the roundabout being its own "road" – the carriageway/centreline network is accurate in any case (centrelines in red, tracker record in yellow):



Each record holds Yes/No flags for each of the tasks outlined above – when all of the flags are set to Yes, the overall record will be set to complete, and if using the Map Layer Package provided, the record will change to green to indicate that it has been completed:

Road Alignment Checked

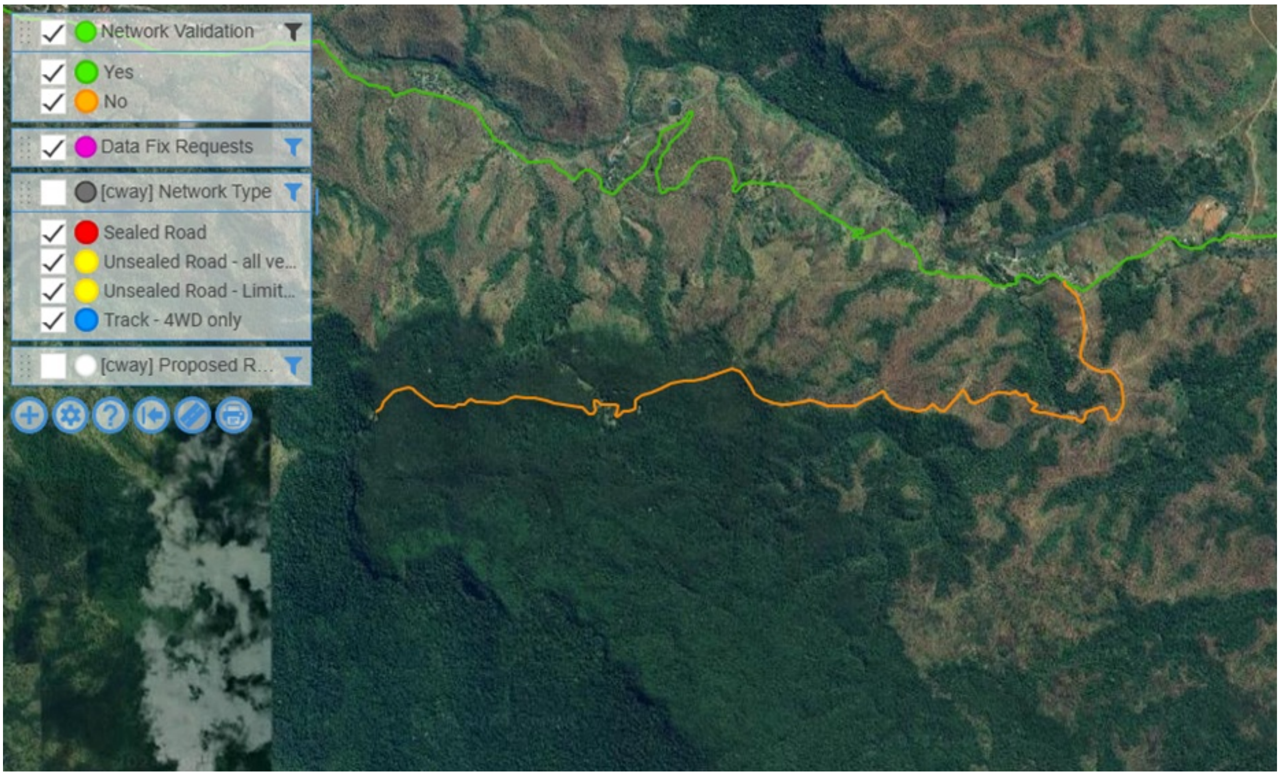
Checked is this a National Rd?	Yes
Checked the Road Name?	Yes
Checked Start/End Location?	Yes
Checked Alignment?	Yes
Alignment Checked As At	29/11/2024

Carriageway Details Checked

Checked Network Type?	Yes
Details Checked As At	29/11/2024

Road Checked Overall

Road Checked	Yes
Road Checked As At	29/11/2024



Road Structures Validation - Work Instruction

05/02/2025 1:23 pm +10

Task

As part of the roll-out of the AWM system, the structures within the system must be reviewed and validated to ensure that:

1. An accurate picture of the total structure asset base on the network and their locations
2. That the basic details of the structures are correct

Provincial staff will review the structures within their province to confirm the overall inventory and quality of the data.

The task has the following parts to it:

- Picking up any missing assets that should be in AWM.
- Identifying any assets which have been loaded in AWM as the wrong class of asset (bridge loaded as a causeway for example).
- Confirming the location of the individual assets based on aerials/local knowledge.
- Reviewing the basic information for the asset and ensuring that it is correct.

To complete this task, you will be required to do a mix of the following:

- Add new assets – any missing assets.
- Move an asset on the map – assets in the wrong place should be shifted to the correct place.
- Update the shape of the asset on the map – if the shape displayed on the map doesn't match the visible asset on the aerial, it should be updated to match.
- Update an asset record's data – structures with incorrect or unknown data should have this data corrected.
- Raise a Data Fix Request for assets that are in the database as the wrong class (Bridge when they should be causeway for example)

For those assets that have been field inspected in ODK only a minimum number of asset record fields should be reviewed.

For other assets as much information as can be remembered should be loaded against the record – bearing in mind that this desktop review is only the first stage and there will be an opportunity to get better data in the field using AWM Mobile later.

To assist in the task, a map layer package "Structures Review" has been created.

Missing assets

If there is a creek, river, or other site that should have a structure where it is missing in AWM, you will need to add a new record of the appropriate structure type.

There is a minimum amount of data that must be loaded against the asset that varies by the class of the asset – see **Minimum Data Requirements**.

Wrong class of asset

If an asset has been loaded into AWM as the wrong class (a bridge loaded in as a causeway for example), you will need to raise a data fix request to get the AMB team to update the system with a new record of the appropriate class and delete to history the old record (this way it allows the AMB team to manage the changes in links to the ODK data that is in the process of being imported).

Confirming the location of the asset

The location of the asset should be against the satellite aerials (or alternative base-map layer if the quality of the imagery in the default satellite imagery is poor). This should allow you in most cases to both:

1. Move the asset to the appropriate place based on the aerials

2. Adjust the shape of the asset to match dimensions that can be seen in the aerials – note that for river crossings, major culverts and tunnels this will be an estimated shape given their nature.

Confirm basic data for the asset

The following basic (and generally common across all structure assets) fields should be checked and the data validated:

- Name
- Local Name
- Carried Function
- Crossed Function
- Road Lanes (if Carried = Road)
- Obstacle Name (if Crossed is a waterway) – if not in the drop down list use the next field
- Name Not In List – use this field for river/creek name if it doesn't appear in the drop down list for Obstacle Name
- [**Bridges**] Spans – the number of spans, enter -1 if not known

While you are required to validate the data listed above, see **Minimum Data Requirements** for the different asset types, as some records may require more information to be entered to allow you to save it (follow the guide for what to do for different field types listed in **Minimum Data Requirements**).

Assets that have been validated in the field using ODK follow a slightly different process – see the **ODK Data** section below.

ODK Data

Note that the ODK data for the structures that have been inspected to date is in the process of being loaded into the database over the next week (as at 26/11/2024) – this data will be available through the Hierarchy blade on the record.

For these assets, the Confirm basic data step can be ignored as the ODK data will be transferred from the import table to the main record. The other steps of ensuring their location and class should be undertaken, however.

Minimum data requirements

At a minimum the following data will need to be populated when creating new or updating an existing structure to be able to save the record.

In all cases, if you are unsure, follow the following process:

Drop-down/lookup lists – Unknown if you're not sure, otherwise populate

Number fields – If they should always be positive numbers (such as number of spans) enter -1 if you are unsure, otherwise populate – entering -1 means it's immediately obvious that this isn't a real value.

Date fields – construction dates for major structures – if unknown, enter 1/1/1800, if the year is known, then enter 1/1/year, otherwise the known date

Text fields – if required and not known (a culvert's name for example), simply enter Unknown

Bridges

- Bridge Type
- Name
- Local name – if it has one
- Carried Function
- Crossed Function
- Road Lanes (if Carried = Road)
- Waterway Name (if Crossed is a waterway) – if not in the drop down list use the next field
- Name Not In List – use this field for river/creek name if it doesn't appear in the drop down list for Waterway Name
- Span Count = -1 if you don't know, otherwise enter the number of spans
- Span Arrangement = Unknown, unless you have good data in which case load the spans in the format span number/length in m; span number/length in metres – e.g. 3 span bridge might be 1/8.3m; 2/7.1m; 3/6.4m
- Superstructure Cross Section
- Superstructure Long Section
- Beam Type
- Deck Type
- Parapet Type
- Surface Thickness (if Carried = Road) = suggest entering -1 here unless you really know what thickness of asphalt is sitting on top of the deck
- Abutment Type
- Abutment Material
- Abutment Cap
- Abutment Bearing
- Pier Type
- Install Date – see note on dates above, use 1/1/1800 if unknown.

Major Culverts

- Name (if it has one)
- Local Name (again if it has one)
- Carried Function
- Crossed Function
- Road Lanes (if Carried = Road)
- Waterway Name (if Crossed is a waterway) – if not in the drop down list use the next field
- Name Not In List – use this field for river/creek name if it doesn't appear in the drop down list for Waterway Name

- Single or Multi
- Culvert Pipe Shape
- Culvert Material
- Has Headwall (Yes/No)
- Grate
- Construction Date – see note on dates above, use 1/1/1800 if unknown
- Horizontal Pipe Length – if unknown use -1

Causeways

- Name (if it has one)
- Local Name (again if it has one)
- Carried Function
- Crossed Function
- Road Lanes (if Carried = Road)
- Waterway Name (if Crossed is a waterway) – if not in the drop down list use the next field
- Name Not In List – use this field for river/creek name if it doesn't appear in the drop down list for Waterway Name
- Single or Multi
- Culvert Pipe Shape
- Culvert Material
- Has Headwall (Yes/No)
- Grate
- Construction Date – see note on dates above, use 1/1/1800 if unknown
- Horizontal Pipe Length – if unknown use -1
- Construction Date – see note on dates above, use 1/1/1800 if unknown
- Causeway Material
- Number of pipes – enter -1 here if uncertain as to actual number, 0 if there are no pipes in the causeway
    - If Number of Pipes is 1 or more, the following will be required
        - Culvert Pipe Shape
        - Culvert Material
        - Grate

River Crossings

- Name (if it has one)
- Local Name (again if it has one)
- Crossed Function
- Obstacle Name (if Crossed is a waterway) – if not in the drop down list use the next field
- Name Not In List – use this field for river/creek name if it doesn't appear in the drop down list for Obstacle Name
- Unsafe to cross – if uncertain leave blank otherwise populate

Tunnels

- Tunnel Type
- Tunnel Name
- Local Name (if it has one)
- Road Lanes – if Allows Vehicles = Yes
- Number of walkways – if Allows Pedestrians = Yes
- Tunnel Construction
- Type of Structural Lining
- Tunnel Shape
- Tunnel Diameter if Shape = Round (enter -1 if not known)

- Tunnel Height – if shape not round (enter -1 if not known)
- Tunnel Width = if shape not round (enter -1 if not known)
- If Allows vehicle = Yes then the following will be required (again, enter -1 if not known):
    - Ceiling Height
    - Maximum Trafficable Height
    - Kerb to Kerb
- Viable Detour

Tracking the task

Progress of this task will be tracked using some automated reporting based on the field “Data Status” that can be found on all structure records.

As part of the process of reviewing each structure, once reviewed, the data status field should be set from “Requires Validation” to “Desktop Validated”.

The layers provided in the Structures Review map package are set up to change colour to black when they are completed – you can use this to track where you are up to in the process of validating the data.

Collection of Inventory Information - Work Instruction

28/01/2025 11:14 am +10

Collection of Inventory Information

Bridge inventory information can be collected at office or during inspections, which are commonly carried out after construction or reconstruction of a bridge but can also be done directly before condition assessment. The main idea of the collection of the inventory information is to prepare the background database for the maintenance and rehabilitation planning. **Without correct inventory information it is not possible to carry out condition assessment**.

The main purpose of is to obtain inventory data required for network level planning and informed decision making. The inventory information will be collected with standardized series of data items that enables geometry, construction, and function of a bridge to be identified and described.

Inventory Information Collection

The main activity to collect the relevant information without on-site visit is locating, finding, and reviewing the bridge structure files and plans. The success of this type of inventory inspection is largely dependent on the effort put in documenting of previous design and building process. The data collection activities include reviewing the bridge structure files, plans and documents to identify the main measurements, possible components, and elements. If the data is collected by personnel without proper preparation, in Annex A of this document the basic components and parameters with terminology is presented to increase the basic knowledge level.

Possible sources of information about the bridge can be:

- **The "Design" and "As-built" bridge plans**. The bridge plans contain information about the bridge type, the number of spans, the use of simple or continuous spans, and the materials used to construct the bridge. They also contain information about the presence of composite action between the deck and girders, the use of framing action at the substructure members, and the kind of connection details used. The year of construction and the design loading are also usually contained in the bridge plans.
- **Previous inspection reports** that are done prior to the development of the system. Previous inspection reports provide valuable information about the history of the bridge, documenting its condition in previous years. This information can be used to determine which components and elements of the bridge warrant special attention. It also allows to some extent to compare the current levels of deterioration with those noted during the previous inspections to help determine the rate of deterioration.
- **Maintenance and repair records** that are done prior to the development of the system. Maintenance and repair records allow the inspector to report all subsequent repairs during the inspection phase, noting the types, extent, and dates of the repairs.
- **Rehabilitation/Retrofit plans.** Rehabilitation plans show modifications and replacements performed on the structure. Just as with the design plans, "As-Built (or record) drawings are preferable.
- **Geotechnical data** if available. Geotechnical data provides information about the foundation material below the structure. Sand, silt, or clay is more susceptible to settlement and scour problems than is rock. Therefore, structures founded on these materials should generally be given special attention with respect to foundation and scour issues than those founded on a rock.

- **Hydrologic data** if available. Hydrologic data provides information about the shape and location of the channel, the presence of protection devices, flood frequencies, and water elevations for various flood intervals. This information is necessary for scour evaluation, expected flood flows, and water velocity.
- **Roadway plans.** Roadway plans may provide some information if the structure plans are not available.

Although the information collection without inspections is a possibility, it is still suggested to check and enter the information during the inventory inspection. Without on-site visits, it is possible to collect inventory information more than ten structures in a day at an average.

The main activity to collect the relevant information only with inspections defining, counting, measuring, and recording the bridge structure information. The success of this type of inventory inspection is largely dependent on the effort put in the inspections and taking correct photos for post processing in office. During inventory information collection inspection, the main objective is to measure main dimensions (length, width, span length etc.) and define all bridge elements and typologies. Inventory information is most important part of the database, because without the correct information the system is useless. Based on the collected information, it is possible to distinguish the different types of bridges, present the quantifiable values of structures, and do the initial analysis of bridge network. Inventory information is collected only for bridges and bigger culverts (overall length of over 1.8m).

The data collection can be divided into two separate parts: (1) Dates, location, and measurements, (2) features and elements. The sequence for collecting inventory information is as follows:

1. Search for the bridge in the database (if one exists) or name the bridge after the location (village, road etc.)
2. Define the location or save the bridge GPS location.
3. Measure the main dimensions (Figure 3b. Main transverse dimensions of a bridge. Examples of a few cases of different bridge types)
4. Define the elements (Chapter 4.1.1)

Overall Bridge Identification Information

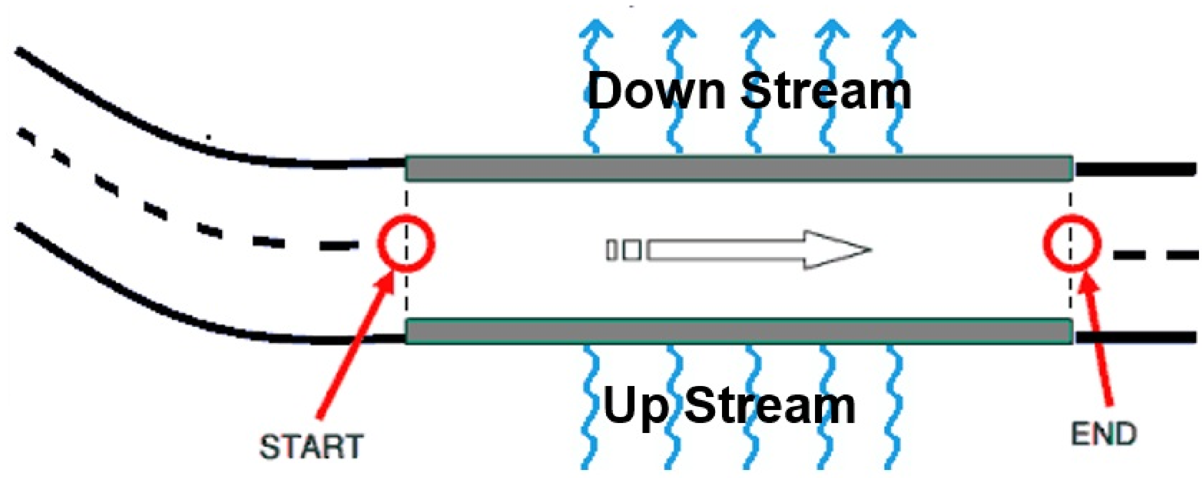
Region	According to bridge location
Province (Drop down list for Region)	
District (Drop down list for Province)	
Bridge ID code/Number	According to numbering system
Bridge Name	Name of bridge
Inspector's Name	
Date of Inspection	dd/mm/yyyy
Source of information	Field measurements
	Design Drawings/Map/Plan
	As built drawings
	3d Model/Point cloud
	Other - add comment

Bridge Location

The location data (Table 4.2. Bridge location details to be collected) is collected in same format for all the bridges.

The road section data available in the database should be considered as primary location reference data to be used during the data collection. The referencing data should be verified.

The chainage data should be collected according to Figure 2. If available, GPS coordinates should be added.

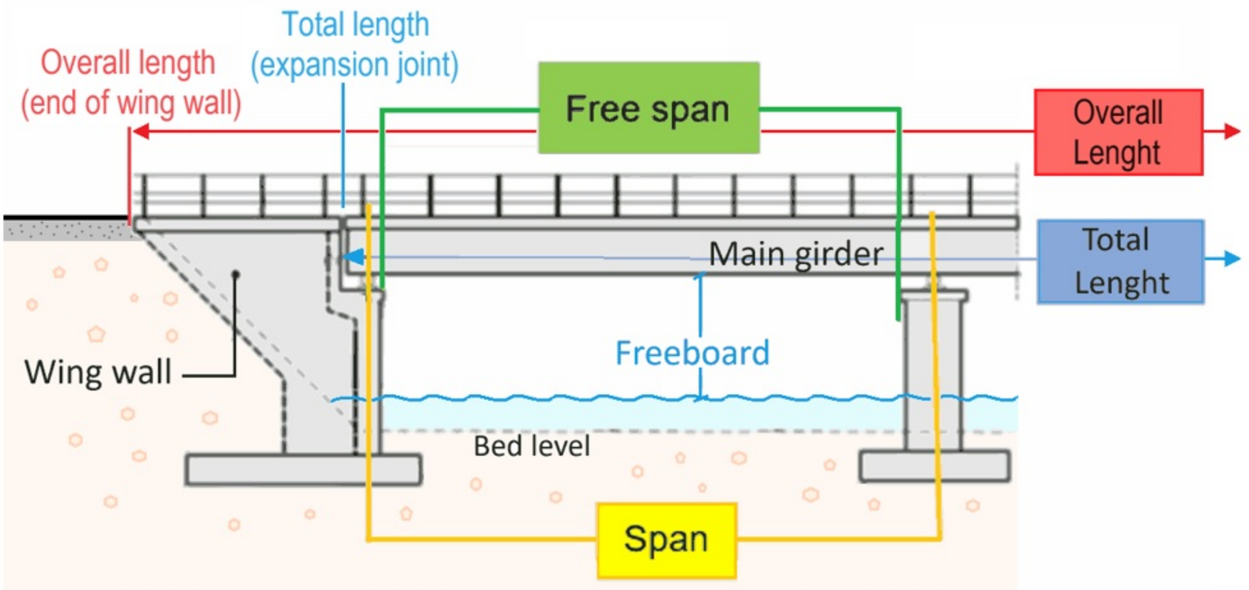


Measurement points of the Chainage (Flow Direction: Upstream to downstream)

BRIDGE LOCATION DETAILS	
Road ID code	The ID of the road on which the bridge is located
Road Name	The name of the road on which the bridge is located
Road address (distance from the road beginning in km)	Distance from the start of road in kilometres
Carriageway (1 or 2)	
GPS coordinates start chainage	
GPS coordinates end chainage	
Feature Crossed	River Name
	Road Number
	Creek
	Minor Creek/stream
	Swamp
	Sea (exposed)
	Estuary (salt water)
	Other (specify)
Detour length for the bridge [km]	Approximate alternative distance of getting to other side of the bridge
Detour time for the bridge [h]	Approximate detour time in hours
Alternative route	Description of the alternative route to other side of the bridge
Construction year	
Rehabilitation year, last	
Rehabilitation type, last	Repair
	Strengthening
	Reconstruction
	Other - add comment

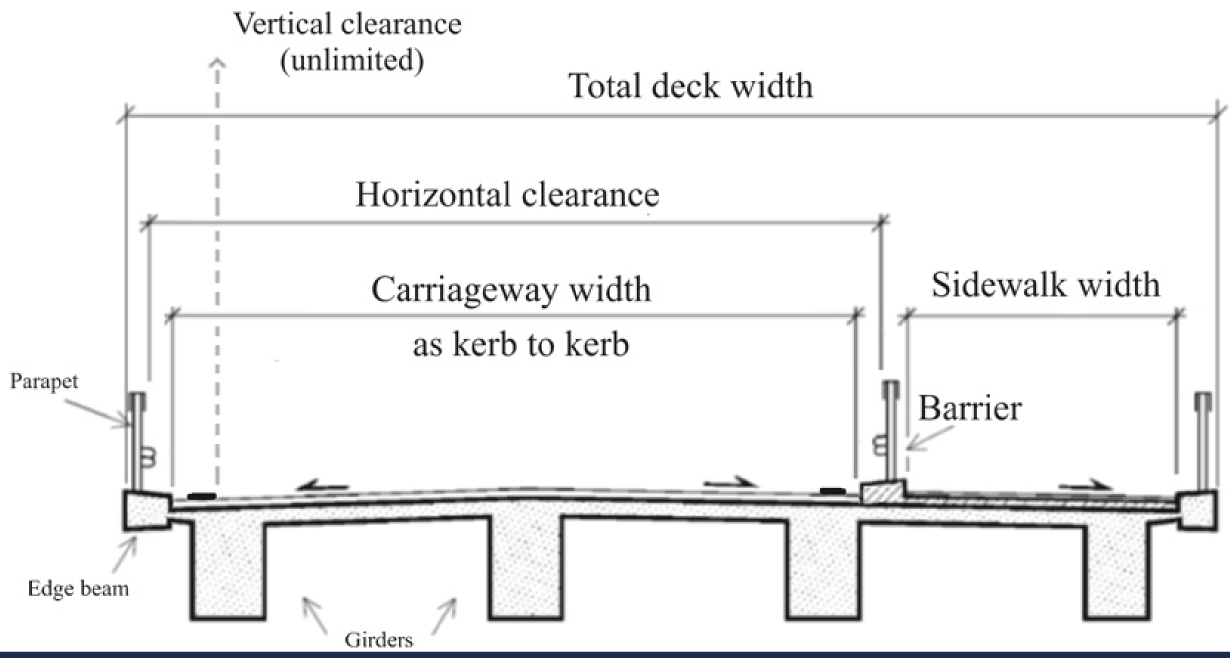
Bridge Geometry

The bridge measurements should be recorded with the resolution of 0.1 m. Preferably on site, but design information can also be a good input. The following Figure 3a and 3b illustrate the main longitudinal and transverse dimensions of a bridge with a few case examples.

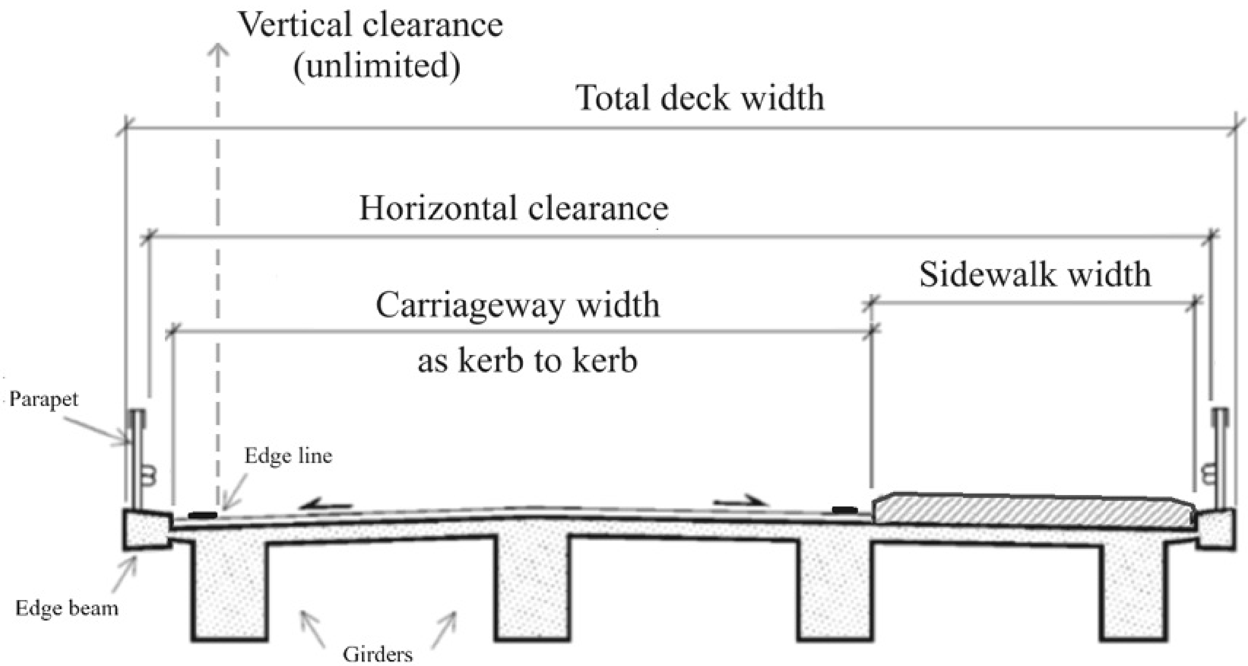


Main longitudinal dimensions of a bridge. The **overall length** is measured from the end of a wingwall to the other side's wingwall's end, while the **total length** is measured without the wingwalls, the distance between the last expansion joints, the expansion joints themselves counted out.

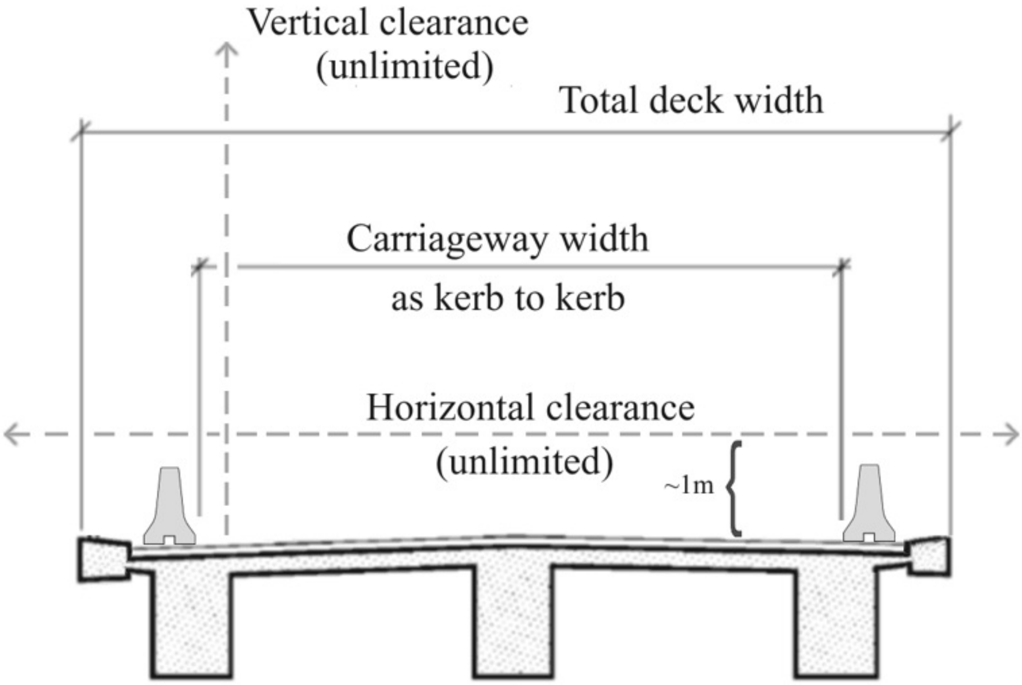
Below are the main transverse dimensions of a bridge, with some examples of a few cases of different bridge types.



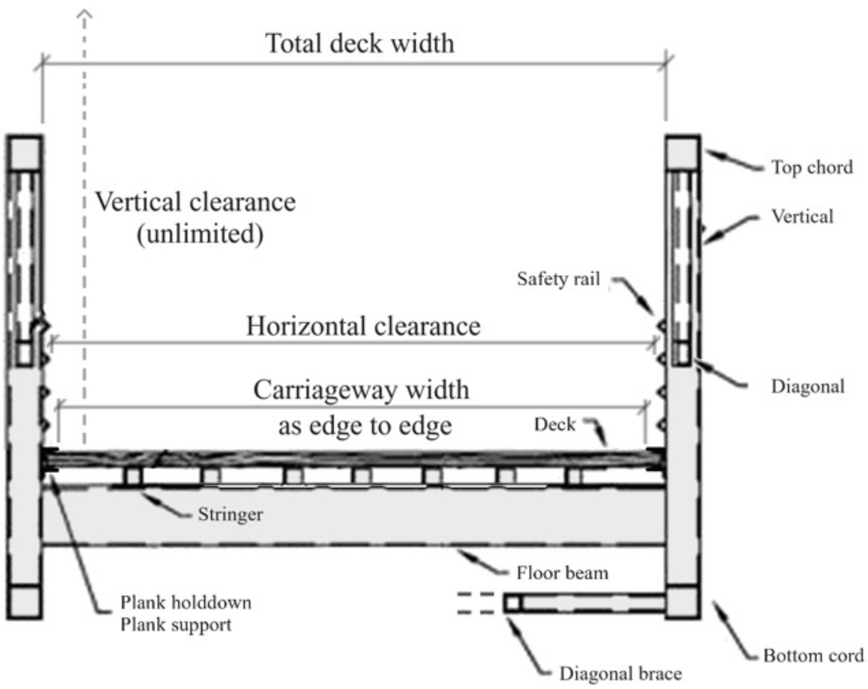
The carriageway width can be considered as kerb to kerb measure, even though sometimes there may be white edge lines marked on the bridge. Sidewalk width is the width of the foot path unless narrowed further by parapets or barriers. Horizontal clearance is the maximum oversize width that can pass the carriageway, in this case from parapet to parapet. Vertical clearance is unlimited.



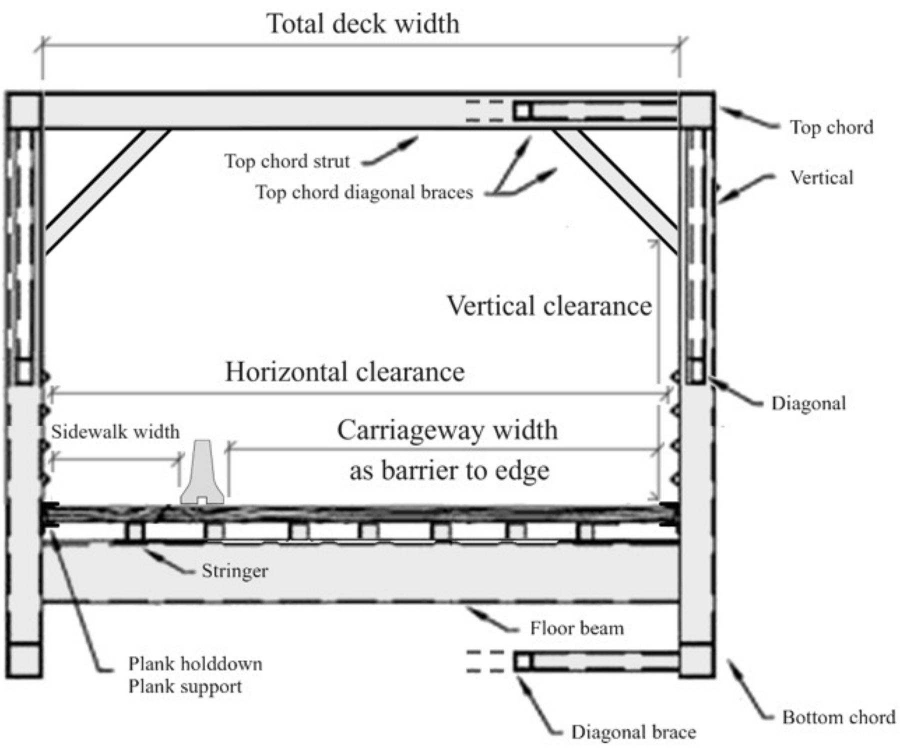
In this case the carriageway width is from the kerb until the kerb or clearly elevated and thus separated sidewalk. In this case the horizontal clearance for oversize transport is from parapet to parapet, spanning over the sidewalk.



In this case the carriageway is bordered with concrete barriers. However, in addition to unlimited vertical clearance, also the horizontal clearance is considered unlimited for oversize transport as these barriers stay low and there is nothing to block the clearance at over 1m height. Therefore, the bridge does not pose a width limit for an oversize cargo loaded on a trailer or other special equipment transport.



In this example of a half through H-section truss bridge there is no kerbs or dividing parapets, so the carriageway width is measured from the edge of the deck to the other edge.



In this example of a full box truss bridge the carriageway width is measured from the kerb/barrier to the edge of the deck. Vertical clearance is not anymore unlimited in this type of a bridge, as it's usually limited by the top chord struts, or even lower because of the diagonal top chord braces as in this example. Note that the clearance is measured at the lowest point over the carriageway. If carriageway is marked then at the lowest point between the edge lines, but if not marked, at the lowest point within the whole carriageway. Horizontal clearance is between the parapets, spanning over the divider, as the concrete barrier is less than 1m high.

Bridge Inventory - General Data

Type of crossing	Bridge
	Viaduct
	Light traffic bridge
	Underpass
	Culvert
	Ford
	Special - add comment
	Other - add comment
	Other - add comment
Principal feature (traffic above)	Car traffic
	Pedestrian/light traffic
	Wildlife
	Other – add comment
	Box culvert cell
	Brick (Arch)
	Cantilever and suspended span
	Concrete pipe culvert
	Continuous
	Corrugated steel culvert

Structural (Span) Form of the Bridge	Integral
	Partially continuous
	Rigid-frame/Fixed end
	Simply supported
	Tubular
	Other – add comment
Skew angle	
Number of car lanes on bridge	
Clearances on road carried (Principal Feature) [m]	1. Vertical Clearance – height between the top of the deck to the underside of any transverse element. No limits leave blank.
	2. Horizontal Clearance – distance between the inside faces of the outer elements (truss or parapet). No limits leave blank.
Overall Length [m]	Distance between the furthermost elements of a bridge
Total Deck Length [m]	Along the direction of the road, the distance between the outer edges of the abutment expansion joints.
Total deck width [m]	Distance between outermost edges of deck
Sidewalk width Left [m]	Total sidewalk/walkway width on the left
Sidewalk width Right [m]	Total sidewalk/walkway width on the right
Carriageway width [m]	Kerb to kerb width

*Skew angle can be determined using the Compass feature on the Tripltek tablet (Outdoors folder): Angle (acute or obtuse) subtended by Route Direction & Normal to the Flow Direction.

Bridge Elements - Surface - Before Bridge

Approach way (cover) material	Asphalt concrete
	Surface dressing
	Concrete
	Earth
	Gravel
Approach way (Side)	Kerbs
	Safety barrier
	Drainage gully
Approach way Material - Kerbs	Concrete (on site)
	Concrete (Precast)
	Masonry
	Aluminium fixed
	Aluminium flexible
	Concrete
	Concrete & steel
	Steel

Approach way Material – Safety barrier	Timber (Normal)
Approach way Material – Drainage gully	Concrete (on site)
	Concrete (Precast)
	Masonry
	Steel
	Plastic
Approach way width [m]	Width of the road structure or kerb to kerb
Overlay/Deck wearing surface (Road)	Asphalt concrete
	Surface dressing
	Concrete
	Steel plates/Grating
	Timber planks
	Bitumen
Overlay/Deck wearing surface (Sidewalk)	Asphalt concrete
	Surface dressing
	Concrete
	Steel plates/Grating
	Timber planks
	Bitumen
Signs (Bridge Sign)	Yes/No
Signs (Reflectors)	Yes/No
Parapet	Yes/No

Span Information

(Note that information inserted for Span 1 continues throughout the spans unless it is unique for a span and is changed during the inspection – span length normally on multi-span bridges)

Span 1 - Contains Near Abutment Data

Number of Spans	
Span Length (m)	The span length should be defined for every span
	Buried
	Steel – prefabricated
	Nosing
	Compression seal
	Rubber Extrusion

Expansion Joints	Steel finger
	Sliding plate
	Reinforced elastomeric
	Elastomeric in metal runners
	Elastomeric strip seal
	Elastomeric box seal/Modular
	Cantilever Comb and Tooth
	Steel angle
	Other – add comment
	None
Abutment height	
Exposed height of the abutment [m]	
Longitudinal width of the abutment [m]	
Abutments	Gravity
	Pile (stub abutment)
	Bank-seated (stub abutment)
	Wall and counterfort
	Spill through abutment
	Full height integral
	Integral with pile foundation
	Integral with spread footing
	Gabions
	Reinforced earth abutment
Abutment cap	Concrete (on site)
	Concrete (Precast)
	Timber (Normal)
	Steel
Bearings	Lubricated steel plates
	Neoprene rubber sheet
	Pot-cum-PTFE slided-guided/free
	Pot-cum-PTFE fixed
	Single roller
	Roller nest
	Segmental rocker
	Segmental rocker nest
	Rocker
	Pinned rocker
	Plain neoprene pads
	Laminated neoprene pads
	Isolation
	Friction pendulum
	High dampening rubber
	Spherical pot
	Disc bearing
	Pin and link
	Unknown
	None
Wing walls are part of abutment	Yes/No

Wing walls	Free standing
	Strengthened/Reinforced
	Splayed
Wing walls material (Free Standing & Splayed)	Concrete (on site)
	Concrete (Precast)
	Timber (Normal)
	Masonry
Wing walls material (Strengthened/Reinforced)	Soil
	Gabions
	Masonry
Reinforced earth wall	With relief culvert
	Without relief culvert
Reinforced earth wall materials	Concrete (Precast)
	Geostrap
Barriers	Vehicle restraint system
	Hand rails
	Structural element
Barriers material	Steel
	Concrete
	Concrete and steel
	Timber
Deck	Solid slab
	Voided slab
	Truss
	Log
	Unknown
Deck material – Solid slab & Voided slab & Deck edge beam	Concrete (on site)
	Concrete (Precast)
	Concrete (Pre-tensioned)
	Concrete (Post-tensioned)
	Timber (Normal)
	Timber (Tensioned)
Deck material - Truss	Steel
	Timber (Normal)
Deck material - Log	Timber (Normal)
Deck (edge beam)	Concrete (on site)
	Concrete (Precast)
	Concrete (Pre-tensioned)
	Concrete (Post-tensioned)
	Timber (Normal)
	Timber (Tensioned)
	Bailey
	Box Girder
	Girder
	Deck truss
	Through truss

Main Girder	Log
	Slab
	Arch
	Culvert
	Frame
Main Girder Material - Bailey	Standard
	Super
	Compact 100
	Compact 200
	Universal
	Other
Main Girder Material – Box Girder & Girder	Concrete (on site)
	Concrete (Precast)
	Concrete (Segmental)
	Concrete (Post-tensioned)
	Steel
	Timber (Tensioned)
Main Girder Material – Deck truss & Through truss	Steel
	Timber (Normal)
Main Girder Material - Log	Timber (Normal)
Main Girder Material - Slab	Concrete (on site)
	Concrete (Precast)
	Concrete (Pre-tensioned)
	Concrete (Post-tensioned)
	Timber (Normal)
	Timber (Tensioned)
	Steel
Main Girder Material - Arch	Masonry
	Concrete (on site)
	Concrete (Precast)
	Concrete (Pre-tensioned)
	Concrete (Post-tensioned)
	Steel
	Composite (steel + soil)
Main Girder Material - Culvert	Concrete (on site)
	Concrete (Precast)
	Steel
	Composite (steel + soil)
	Plastic
Main Girder Material - Frame	Concrete (on site)
	Concrete (Precast)
	Concrete (Pre-tensioned)
	Concrete (Post-tensioned)
	Steel
Secondary member	Girder
	Beam (diaphragm)
	Bracing

	Cable
	Log
Secondary member Material – Girder & Beam (Diaphragm)	Concrete (on site)
	Concrete (Precast)
	Steel
Secondary member Material - Bracing	Steel
	Timber (Normal)
Secondary member Material - Cable	Steel
Secondary member Material - Log	Timber (Normal)
	Timber (tensioned)
Other member	Vertical restraint system
	Seismic dampers
Drainage	Outlet pipes
	Downspout pipes
	Deck drains
	Pipe
Drainage Material - Outlet pipes & Downspout pipes	Steel
	Stainless Steel
	Plastic
Drainage Material – Deck drains & Pipe	Concrete (on site)
	Concrete (Precast)
	Steel
	Plastic
Construction joints/Hinges	Steel
	None

For Multi-span bridges with 'N' spans - Spans 2 to Span (N-1)

As per previous table but with Abutment data removed and the following Pier data added:

Piers	Solid wall
	Multiple column
	Single column
	Gravity
	Trestle column with bracing
	Pile
	Cantilever
	Integral
Piers material – Solid wall, Multiple column, Single column	Concrete (on site)
	Concrete (Precast)
	Composite (steel & Concrete)
	Composite (masonry & concrete)
	Timber (Normal)
	Steel
	Masonry
Piers material - Gravity	Concrete (on site)
Piers material - Trestle column with bracing	Steel
	Masonry

	Composite (masonry & concrete)
Piers material - Pile	Concrete (on site)
	Concrete (Precast)
	Composite (steel & Concrete)
	Composite (masonry & concrete)
	Timber (Normal)
	Steel
Piers material – Cantilever, Integral	Concrete (on site)
	Steel
	Composite (steel & Concrete)
Pier Cap	Concrete (on site)
	Concrete (Precast)
	Timber (Normal)
	Steel
Clearances underneath [m] Vertical Clearance /Measured freeboard	
Clearances underneath [m] Horizontal Clearance (free span)	
Bearings 1 & 2 (each pier can have 2 sets of bearings which may be different types) For continuous decks over the pier with only 1 bearing, Bearing 2 shall be “None”	Lubricated steel plates
	Neoprene rubber sheet
	Pot-cum-PTFE slided-guided/free
	Pot-cum-PTFE fixed
	Single roller
	Roller nest
	Segmental roller
	Segmental rocker
	Segmental rocker nest
	Rocker
	Pinner rocker
	Plain neoprene pads
	Laminated neoprene pads
	Isolation
	Friction pendulum
	High dampening rubber
	Spherical pot
	Disc bearing
	Pin and link
	Unknown
	None
Bearing movement indicator	Yes/No

End Span 'N'

As per **Span 1** table (with far Abutment data) with the Pier Elements from previous table added.

Bridge Elements - Surface - After Bridge

As per **Bridge Elements - Surface - Before Bridge** table

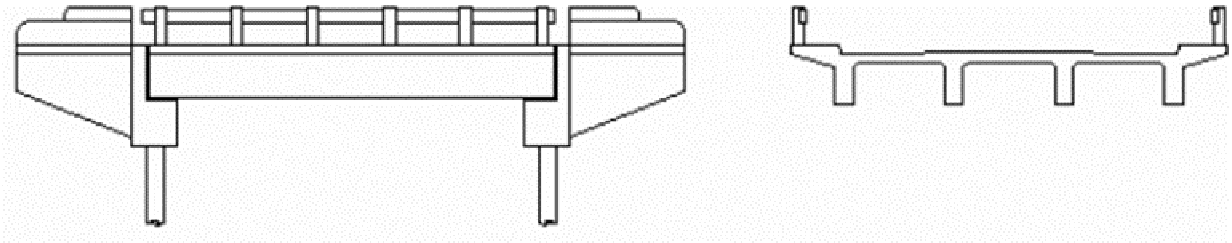
Bridge Elements - Outer

Riverbed protection	None
	Riprap
	Gabions/Reno mattress
	Concrete
	Filter point mattress
	Articulated block mattress
	Not known
Training	None
	Sheet piled wall
	Gabion groins
	Timber groins
	Filter point mattress
	Articulated block mattress
	Embankment and gabions
	Embankment and riprap
Scour protection	None
	Sheet piled wall
	Gabion groins
	Timber groins
	Filter point mattress
	Articulated block mattress
	Riprap
	Gabions/Reno mattress
	Not known
Spread footings	Concrete
Piles	Concrete
	Steel/Concrete (Circular)
Caissons	Steel (Circular)
	Steel (H section)
	Concrete (bored cast in situ under rugged)
	Concrete (driven precast)

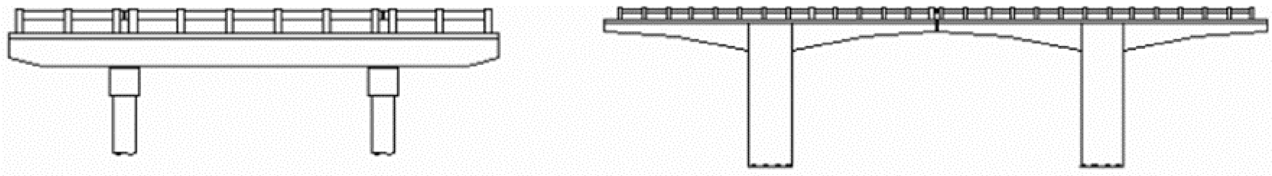
	Concrete (precast and prestressed)

General Features and Elements

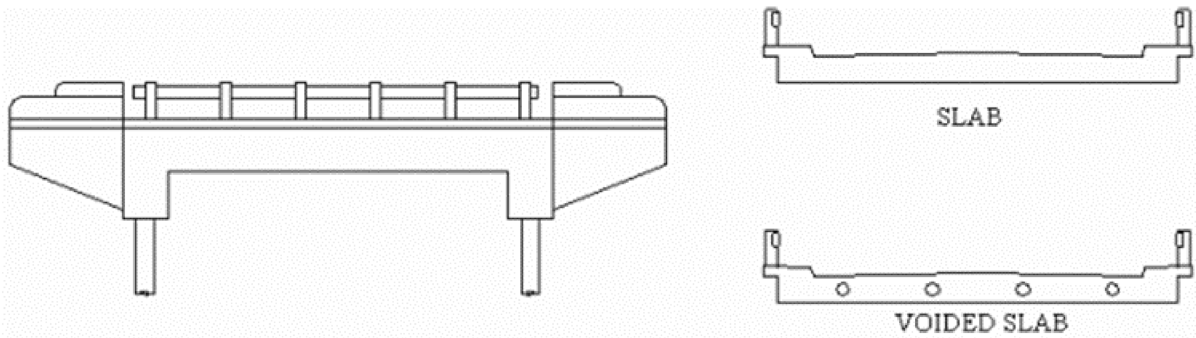
The Bridge Inspector ought to be familiar with the components and elements of the bridge to be inspected ahead of arriving at the site. To provide a reasonable level of confidence in the safety of the bridge, knowledge of the structure and good engineering judgment by the inspector is necessary. The relevant Templates for element information input is presented in Annexes C, D and E. Examples of most common Bridge Construction Types are presented next.



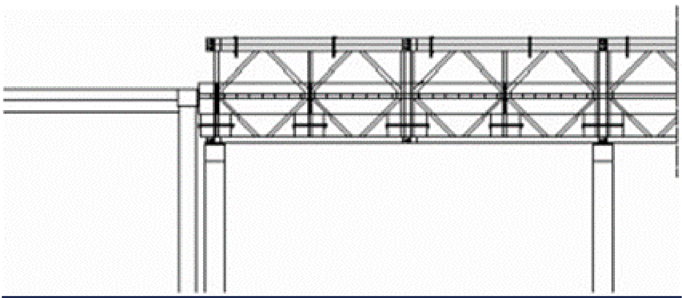
Girder Bridge



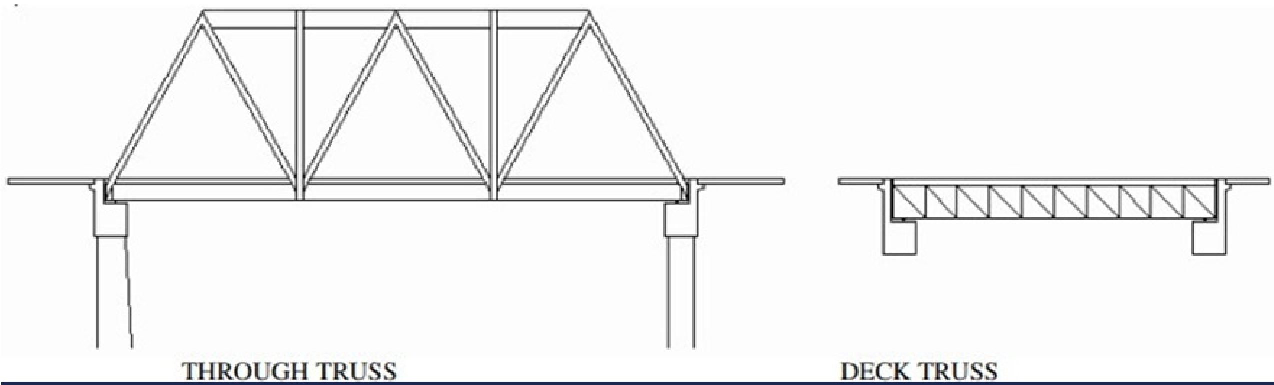
Cantilever bridge



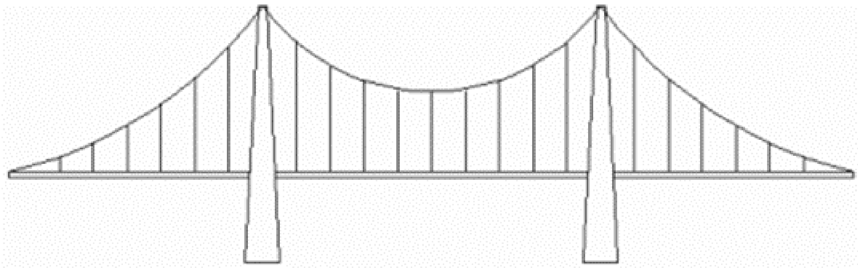
Slab bridge



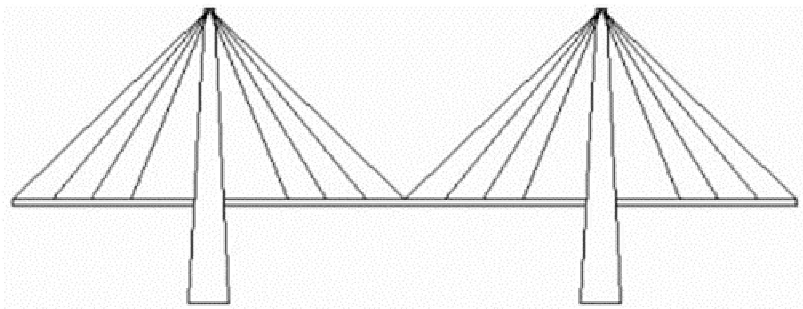
Bailey bridge



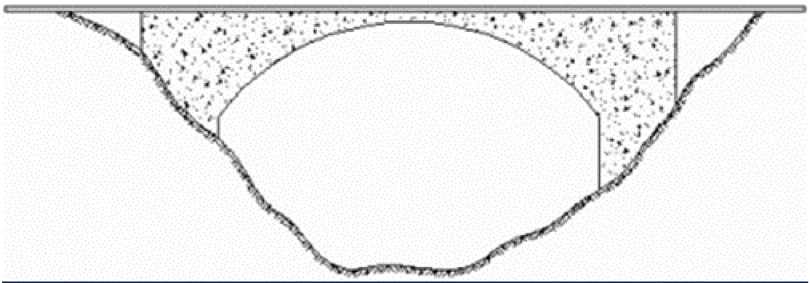
Truss bridge



Suspension bridge

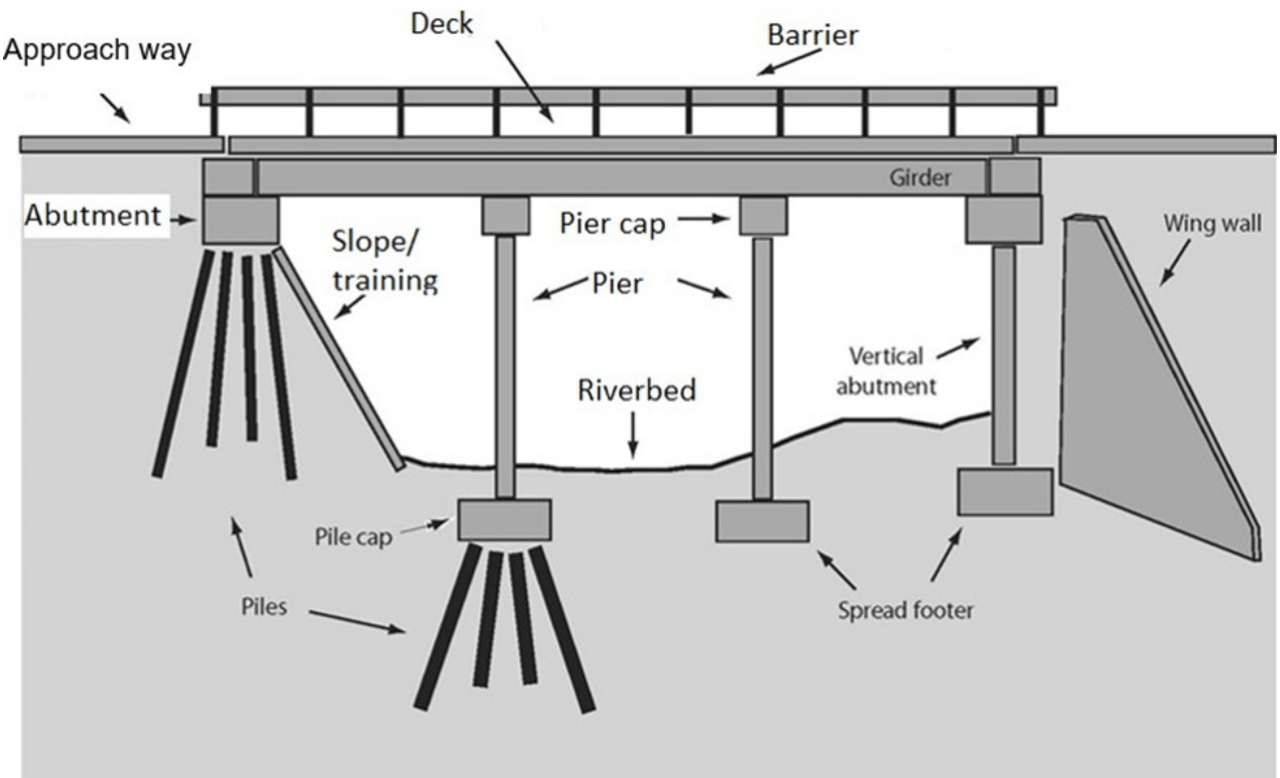


Cable stayed bridge



Arch bridge

The Bridge Inspector should be acquainted with the main components of the bridge, if not then Annex A includes the main information. The overall position of elements is presented below.



Typical bridge element locations

Elements

Surface

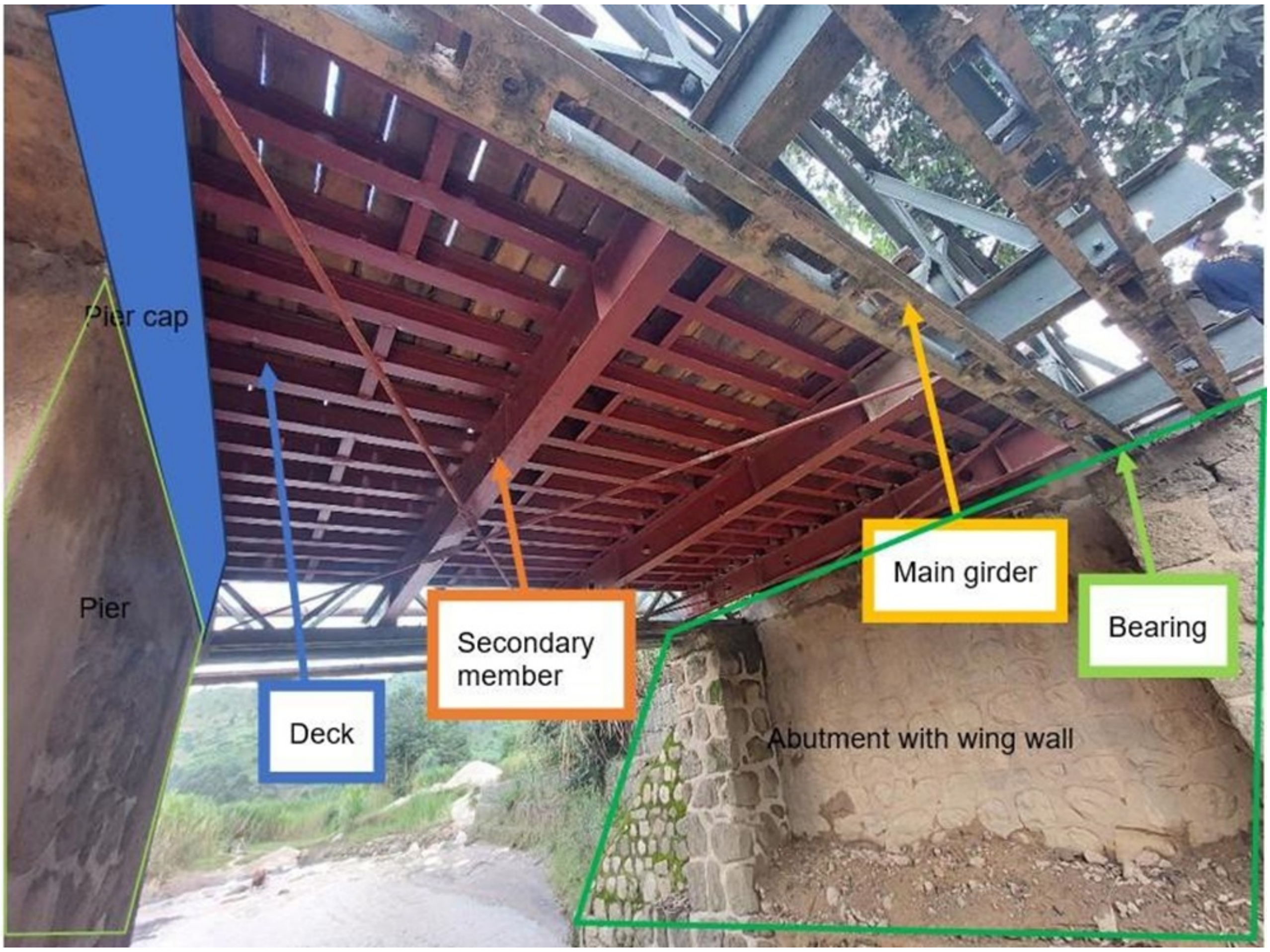
- Approach way (cover) 10 metres of roadway before and after the structure
- Approach way (side) 10 metres of roadway sides before and after the structure

- Overlay/Deck wearing surface –top layer of the bridge, mainly influenced by the traffic.
- Barrier and handrails – safety elements on the sides of a structure

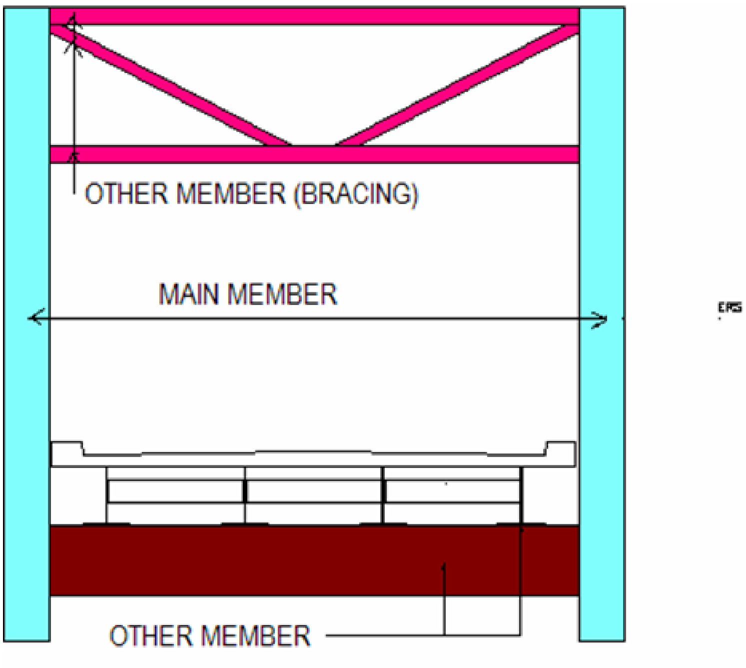
- Signs – related to traffic management, typically sign with a bridge name.
- Parapet

Superstructure

- Deck – load-bearing element that distributes the traffic load from top-layer to girders.
- Edge beam – side of a bridge deck that protects main girders from water and other pollutants.
- Expansion joints – connection points of a road and a bridge or different spans of a bridge. Allows the structure to deform longitudinally without causing additional stresses.
- Main girder – main load-bearing element
- Secondary member – load bearing element for secondary or perpendicular forces

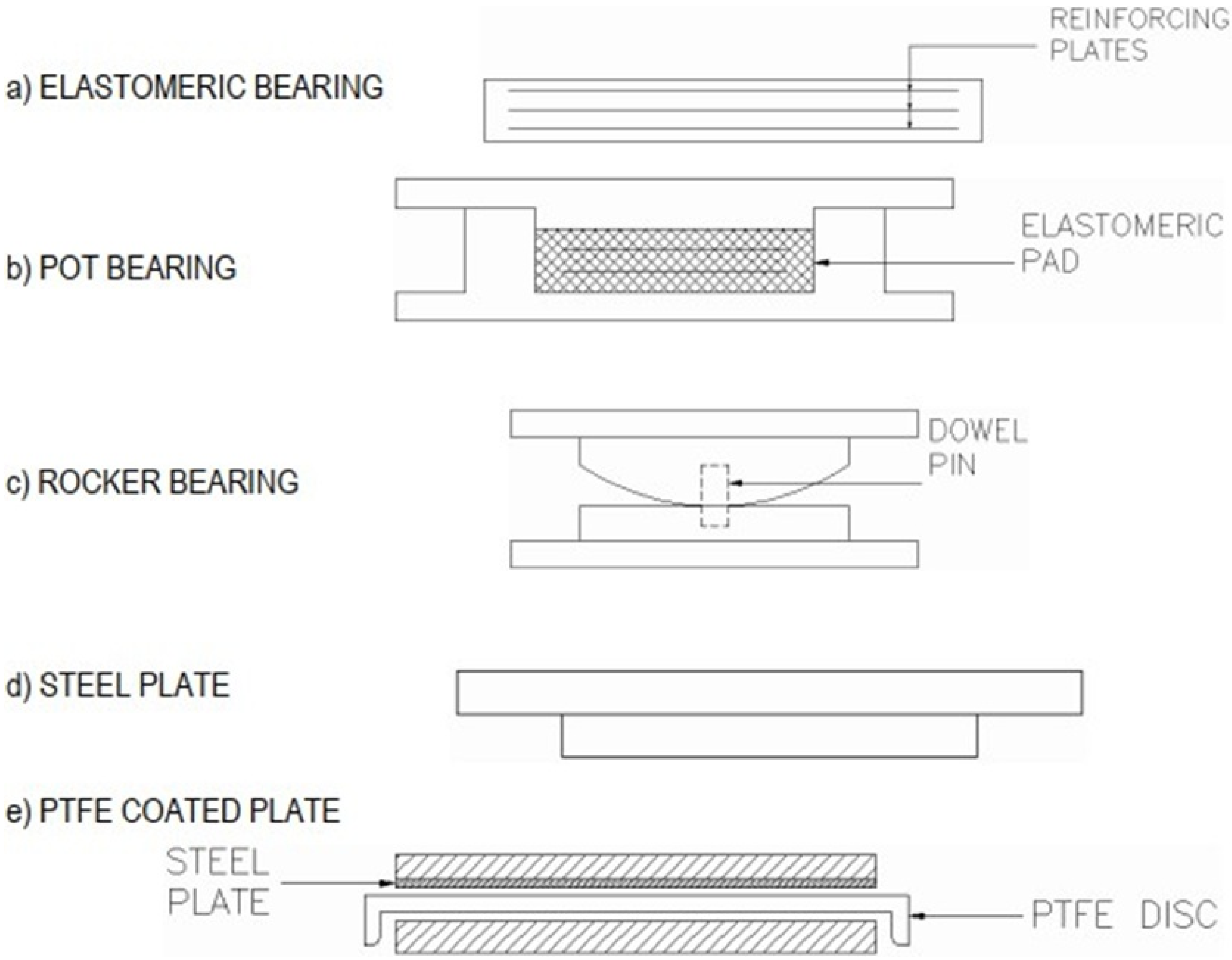


- Other member



Substructure

- Bearings (Select TWO times) – connection between super- and substructure. Allows superstructure to move without causing additional stresses



- Bearing movement indicator
- Drainage – water management elements
- Construction joints/Hinges – special elements of longer structures or structurally designed, keeping the stresses in a safe zone.
- Abutments – load bearing elements of substructure
- Wing walls – keeping the soil of a roadway in place to prevent settlements.
- Piers – load-bearing elements of a substructure located in the middle of a structure.
- Pier Cap – top of the pier, mostly made to transfer the forces from superstructure to substructure.
- Abutment Cap

Other

- Foundation – bottom load-bearing element of a structure. Mainly located in the soil and not visible
- Riverbed protection
- Slope training
- Scour protection

Project Monitoring Preparation - Work Instruction

06/10/2025 4:27 pm +10

Purpose

In preparation for monthly project monitoring beginning in February 2025, it is important that all of the projects that need to have a monthly report are entered in the AWM System.

Roles and Responsibilities

Adding Projects

The Monitoring and Evaluation Branch at DoWH Headquarters are responsible for adding the projects data into the System currently. However, any of the Provincial or Regional Staff may also add projects if their project is not in the System and they would prefer to add it themselves.

Validating Projects

The Provincial Staff and most specifically the Officer responsible for reporting on the Project and Contract should be responsible for making sure that the information about the project in the System is correct.

How to add and edit Projects and Contracts

Use the following guidance documents and resources:

- HOW TO – Add Project Data
- HOW TO - Add Projects Data on a road that is not in the AWM System
- HOW TO – Edit Project Data
- HOW TO - Add Photos to Project Monitoring Records
- Project Tables Field Descriptions

Support

If you need assistance please email elliot.mcbride@ghd.com or support@pngroads.com

Monthly Project Monitoring - Work Instruction

06/10/2025 4:27 pm +10

Purpose

From February 2025 monthly project monitoring will be carried out in the AWM system. It is important that the relevant provincial staff understand their roles and responsibilities, and have the knowledge necessary to perform the required tasks.

Roles and Responsibilities

Updating Project and Contract Monitoring records

The Officer who is assigned as the 'Monitoring Officer' in the Project record is responsible for updating the monthly project monitoring and contract monitoring records. The Monitoring Officer will most likely be the Project Engineer or PCE. The Monitoring Officer should complete the Monitoring record by the 4th of the month after the reporting month.

Validating Project and Contract Monitoring records

The Officer who is assigned as the 'Approving Officer' in the Project record is responsible for approving the monthly project monitoring and contract monitoring records. The Approving Officer will most likely be the PWM unless this is delegated to a PCE. The Approving Officer should validate the Monitoring record by the 7th of the month after the reporting month.

How to update and validate Monthly Project Monitoring records

All of the necessary information required to carry out these tasks are provided in the Monthly Project Monitoring page. This page contains the following guidance articles:

- HOW TO - Project Monitoring (including step-by-step video)
- HOW TO - Add Photos to Project Monitoring Records
- Monitoring Tables - Field Descriptions

If you need assistance please email elliot.mcbride@ghd.com or support@pngroads.com

Project Validation - Work Instruction

06/10/2025 4:49 pm +10

1. Is there missing **reference IDs** that could be added? For example, if you are using an ID in your other reporting lines, can we use this in the system? Such as PIP.
2. Is the **Type of Work** correct?
3. Is the **Project Status** correct? For example, if this project is now completed but is still on 'Physical Works' it needs to be updated to 'Completed'
4. Are the **Monitoring Officer** and **Approving Officer** correct? Sometimes these roles change – please update if a role has been delegated or if the officer has moved to a different region and has been replace with a new officer. If the Officer's name is not available in the list, please request for it to be added to rexie.rei@pngroads.com and support@pngroads.com
5. Is the **Road**, **Start** and **End** chainage correct? Check in the map view that the start and end of the line representing the project is accurate. (The chainage in the System may be slightly different from the chainage you are familiar with). Please note, the AWM system does not yet represent the updated 2025 Gazette.
6. Has the original funding been increased or decreased? (this will need to be adjusted in the **Project Monitoring** record for the month you are editing data). This automatically updates the **Current Allocated Funding.**
7. Do the **Revised Start Date** and/or **Revised End Date** need to be updated? For example, if it has been agreed in contract that the project will run for an extra six months – this should be updated in the Revised End Date.
8. Are the **Report Requirements** correct? For example, does the contract include a Defects Liability Period? If so, please turn this option to Yes.
9. Do you need to add a **DoWH Contract** record? If the project is in the Physical Works stage, we know there must be a contract attached. You can use the Works Kuru to guide you in this process.
10. Once all of this has been checked, you can provide any notes in the **Provincial Team Notes** field. This helps the Network, Monitoring and Evaluation (NME) team understand the changes you have made.
11. Then move the **Project Validated** button to 'Yes'.