

Road Asset Management Systems + Performance-Based Contracting

Session 1.4: Method of Data Collection

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Agenda

Day 1 Road Asset Management System (RAMS)	Day 2 Road Asset Management System (RAMS)	Day 3 Performance Based Contracting (PBC)
Session 1.1 Introduction to RAMS	Session 2.1 Data processing and management	Session 3.1 Introduction to PBCs
Coffee break	Coffee break	Coffee break
Session 1.2 Functions of a RAMS	Session 2.2 Data analysis and planning	Session 3.2 Performance standards
Lunch	Lunch	Lunch
Session 1.3 Data to be collected	Session 2.3 Road asset management	Session 3.3 Inspections and Payments
Coffee break	Coffee break	Coffee break
Session 1.4 Method of data collection	Session 2.4 Conclusions and way forward	Session 3.4 Conclusions and way forward

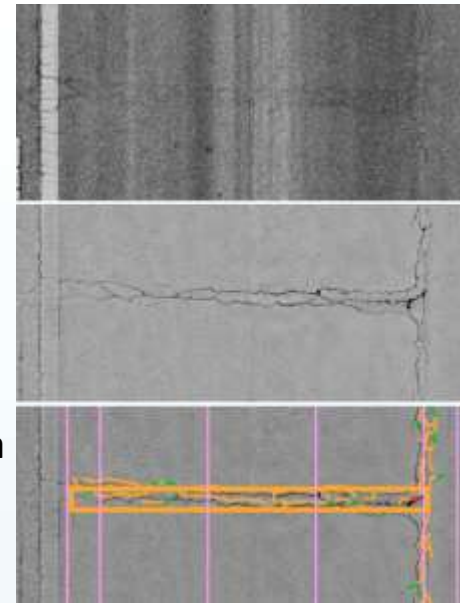


Data

- Needs to be up-to-date (depends on type of data)
- Needs to be complete (entire network)
- Needs to cover the data types required for the function of the RAMS
- Needs to be reliable
- Needs to be sufficiently accurate for the function of the RAMS

Data collection

- Different ways to collect the same or similar data
 - Depends on the required accuracy
 - Depends on how we will use the data – functions of the RAMS
- Example: potholes and cracking
 - Number and size of potholes or cracking
 - Degree of potholes or cracking (Low, Medium, High, Very High)
- Manual survey in the field
 - Visual assessments from a vehicle
 - Measurements on the road itself - costly
- Post-processing of video data
 - Visual assessment of categories based on forward-looking camera
 - Low accuracy measurements based on forward-looking camera
- Automated data collection
 - High accuracy measurements based on downward-looking camera



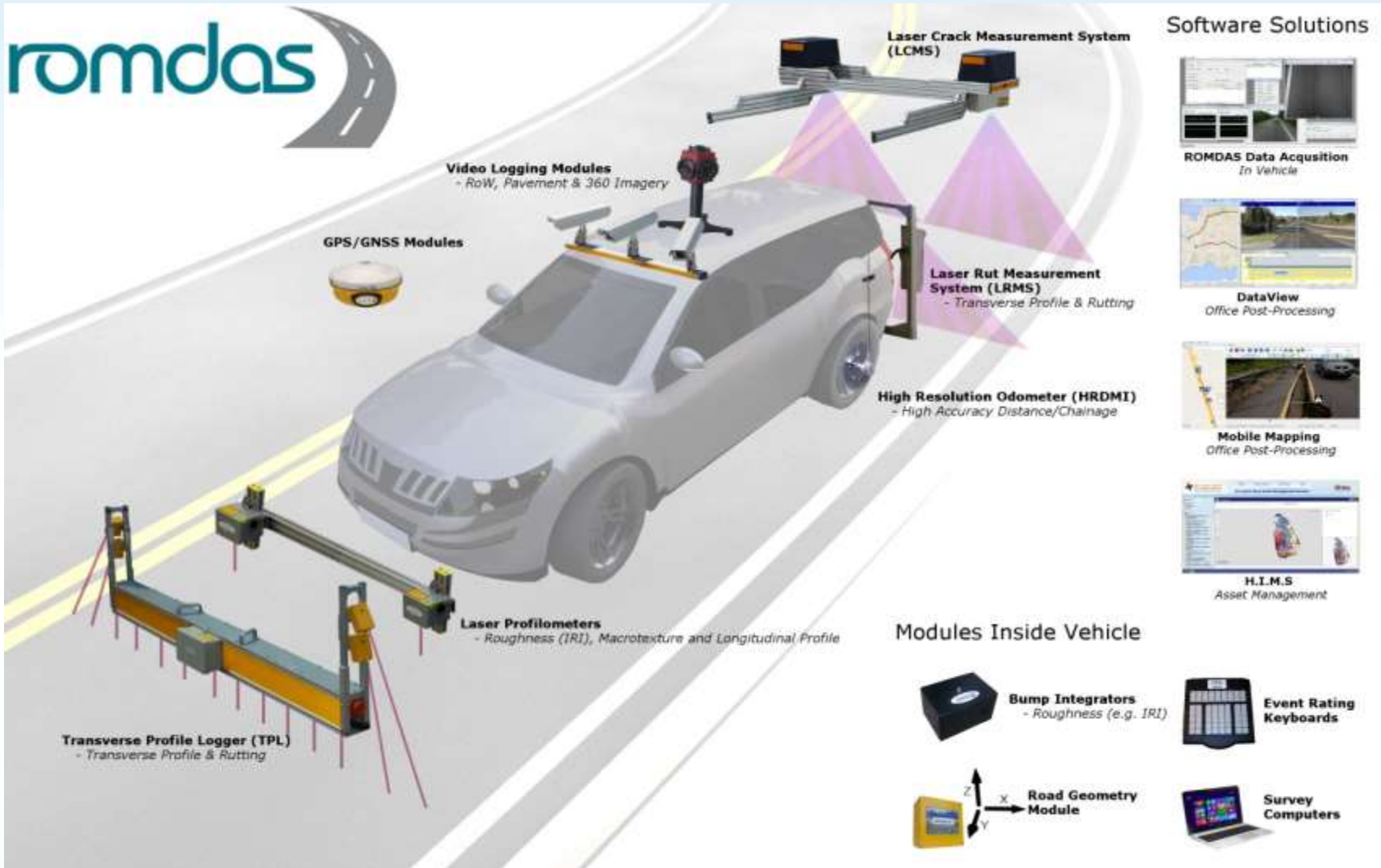


Combining data collection

- Different data types are often collected together
 - Using different equipment
 - During a single survey
 - This reduces data collection costs
- Not possible for all data
 - Some data can be collected in a drive-over survey
 - IRI data
 - Video
 - Road length
 - Some data requires stopping (and measuring)
 - Culvert data
 - Bridge abutment data
 - Falling Weight Deflectometer

Example of survey equipment

- Example from ROMDAS – this is only one of many possible suppliers



The diagram illustrates a vehicle equipped with various surveying modules. The ROMDAS logo is in the top left. The vehicle is shown from a top-down perspective, with various sensors and cameras mounted on its roof and front. The modules are labeled as follows:

- Laser Crack Measurement System (LCMS)**: Located at the rear of the vehicle, projecting a laser beam onto the road surface.
- Laser Rut Measurement System (LRMS)**: Located at the rear of the vehicle, projecting a laser beam onto the road surface.
- High Resolution Odometer (HRDMI)**: Located at the rear of the vehicle, measuring distance and chainage with high accuracy.
- Laser Profilometers**: Located at the front of the vehicle, measuring roughness (IRI), macrotexture, and longitudinal profile.
- Transverse Profile Logger (TPL)**: Located at the front of the vehicle, measuring transverse profile and rutting.
- Video Logging Modules**: Mounted on the roof, capturing road width, pavement, and 360-degree imagery.
- GPS/GNSS Modules**: Mounted on the roof, providing location data.

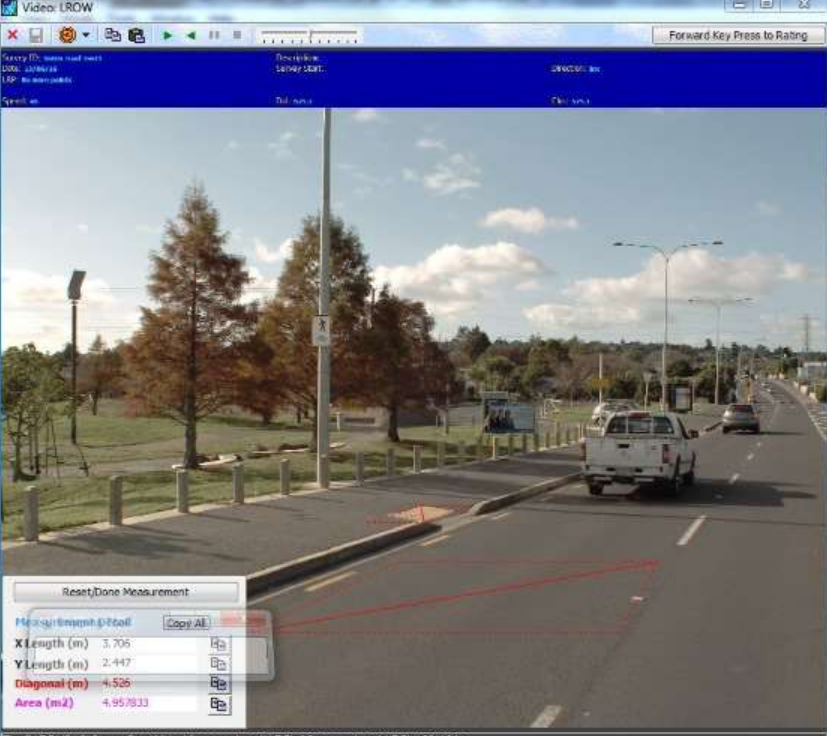
Software Solutions

- ROMDAS Data Acquisition In Vehicle**: A software interface for real-time data collection.
- DataView Office Post-Processing**: A software interface for processing data in an office setting.
- Mobile Mapping Office Post-Processing**: A software interface for processing mobile mapping data.
- H.I.M.S Asset Management**: A software interface for managing road assets.

Modules Inside Vehicle

- Bump Integrators**: Used for measuring roughness (e.g., IRI).
- Event Rating Keyboards**: Used for manual data entry.
- Road Geometry Module**: A module for measuring road geometry, shown with a 3D coordinate system (X, Y, Z).
- Survey Computers**: Laptops used for data processing and visualization.

Example of Post-Processing



Video: LR0W

Forward Key Press to Rating

Reset/Done Measurement

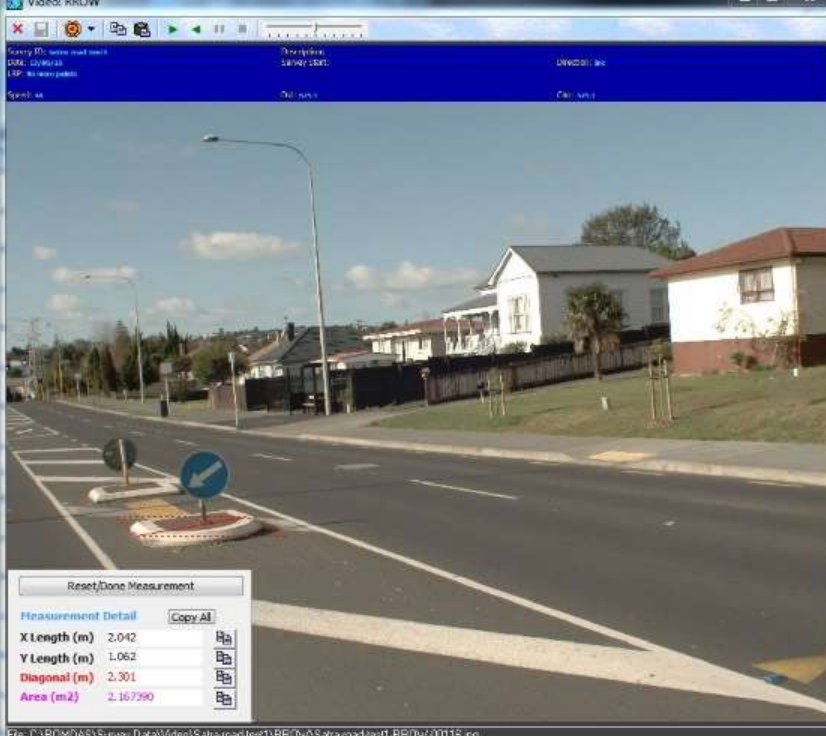
Measurement Detail

X Length (m) 3.705

Y Length (m) 2.447

Diagonal (m) 4.526

Area (m²) 4.957833



Video: RR0W

Forward Key Press to Rating

Reset/Done Measurement

Measurement Detail

X Length (m) 2.042

Y Length (m) 1.062

Diagonal (m) 2.301

Area (m²) 2.167390

ed Key Code List

Forward Key Press to Rating

- - asdf
- / - Intersection
- m - Crack
- 7 - Slippage
- 9 - Guard Rail
- A - Bleeding
- a - Pothole 0.5 m²
- r - Failure
- s - Pothole 1 m²
- t - Raveling
- w - Wide Cracks
- z - Pothole 0.25 m²
- All Cracking
- l - 15-37%
- k - >50%
- 1 - 5-15%
- m - 37-50%
- p - No Cracking
- Bleeding/Flushing
- h - 5-15%
- L - 35-50%
- M - 15-35%
- u - 0-5%
- y - >50%
- Rutting
- 6 - +30mm
- b - 20 - 30 mm
- c - 3 - 8 mm
- n - > 30 mm
- v - 8 - 20 mm
- x - 0 - 3mm
- Signs
- P - Regulatory Sign
- I - Information Sign
- 1 - Warning Sign

Condition Rating Control Panel

Satra-road-test1 Satra-road-test1

LR0W Chainage: 575.1 / 5749.5m Frame: 115 / 1149

in Rating Definitions Use Survey File Use Integrated Database

FRAME_START	FRAME_END	SWITCH_GROUP	EVENT	EVENT_DESC	COMMENT	COMMENT_1	COMMENT_2	COMMENT_3	COMMENT_4
1	460	Bleeding/Flushing	L	35-50%	Medium	0-3m			
1	460	Rutting	v	8 - 20 mm					
60	465	All Cracking	k	>50%		1-3m			
90			9	Guard Rail		>3m			
90			w	Wide Cracks		1-3m			
90		All Cracking	l	5-15%	Low				
90		Bleeding/Flushing	L	35-50%					
on		20 - 30mm	b	20 - 30 mm					

Data collection timing

- Data generally collected after winter or rainy season
 - Most damage occurs during that season
 - Data remains up-to-date until next winter/rainy season
- Post-processing can be carried out throughout the year
- Data to be used for planning and budgeting
 - Needs to be aligned with budget submission / fiscal year
 - Take account of time required for data processing and analysis
- Generally a peak period for data collection
 - Few months each year
 - Depends on network size and portion to be surveyed each year
 - Depends on frequency of surveys

Data collection frequency

- Inventory data
 - Only changes if road is damaged or improvements are made
 - Recording damages/improvements in RAMS will keep it up-to-date
 - Still need to update inventory data every 5-10 years
 - Entire network or only portion
 - Can be simple check of existing data – correct/add only where incorrect/missing
- Condition data
 - Changes rapidly – old data not useful
 - New data needs to be collected
 - Generally every 1-2 years for planning
 - May be longer period for low level roads (monitoring)
 - Less frequently for structures
- Traffic data
 - Can be adjusted based on general traffic growth
 - Still need to update traffic data every 5 years



Data collection frequency

- Lower frequency = Lower accuracy/reliability (data is outdated)
- Higher frequency = Higher cost

- Again the question is what accuracy is required

- Programme analysis
 - Higher accuracy required to determine treatment for each road link
- Strategy analysis
 - Lower accuracy required to determine mix of treatments for entire network



In-house or contracted out

- Condition data collection has peak each year
- Inventory/traffic data collection has peak every few years
- Data collection by in-house staff has benefits
 - Develop specific skills particular to your system
 - Avoid procurement delays and other issues
- It also has drawbacks
 - What will in-house staff do between peaks? Can they be involved in other aspects of the RAMS and planning?
 - How to ensure budget for operation (fuel, per diems) and equipment repairs?
- Can certain data collection tasks be outsourced?
 - Does the capacity/equipment exist in-country?
 - How can quality be ensured?

Example: Georgia

- Data collection is done in-house
 - ROMDAS survey vehicle
 - GPS, odometer, 3 video cameras, laser profilometer
 - 2 mobile traffic counting stations
 - Operated by RAMS unit – 3 staff
- Data needs expected to increase
 - Road inventory (passportization)
 - Bridge Management System
 - iRAP assessments using video data
- Some data collection likely to be outsourced
 - Maintenance contractors already required to collect traffic data
 - Just data collection or also post-processing





Example: Timor-Leste

- No data collection carried out yet
 - ROMDAS survey vehicle used for contract performance monitoring
 - GPS, odometer, laser profilometer, bump integrator, (1 video camera, DataView software)
- Currently a RAMS is being developed
 - Requires data to operate
- WB to support data collection for national and municipal roads
 - Using the existing ROMDAS vehicle
 - Basic inventory and condition data
 - Post-processing of video data using DataView software (e.g. bridges, surface distress)
 - Providing fixed/mobile traffic counters to roads department for traffic counts
 - On-the-job training to government staff
 - Government staff to replicate in future years (RAMS unit, Maintenance Department)



Group Work

- How will we collect the data from the previous session?
- Who will collect it?
- How often will the data be collected?
- What resources are needed?
- Can we reduce the data collection from the previous session?