

Gravel Road Management Spreadsheet Tool Supplemental Guidance



LRRB Report #2019RIC03

March 2019

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Technical Report Documentation Page

1. Report No. MN/RC - 2019RIC03		2.		3. Recipients Accession No.	
4. Title and Subtitle Gravel Road Management Spreadsheet Tool			5. Report Date March 2019		
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12. Sponsoring Organization Name and Address Local Road Research Board and Minnesota Department of Transportation Research Services & Library 395 John Ireland Boulevard, MS 330 St. Paul, Minnesota 55155-1899			10. Project/Task/Work Unit No.		
			11. Contract (C) or Grant (G) No. 2017-050		
15. Supplementary Notes Supplemental Guidance Document: http://mndot.gov/research/reports/2019/2019RIC03.pdf Spreadsheet: http://mndot.gov/research/reports/2019/2019RIC03.xlsx			13. Type of Report and Period Covered Final Report		
			14. Sponsoring Agency Code		
16. Abstract (Limit: 200 words) This spreadsheet tool is designed to be a data management resource for county engineering offices to better track and manage gravel roads. This spreadsheet can be used as an inventory tool, providing one location for keeping all maintenance and construction data about a gravel road system. It can also be used to track costs and optimize spending. The tool was developed to be flexible and customizable for a variety of purposes and system sizes.					
17. Document Analysis/Descriptors			18. Availability Statement		
Gravel Road		Potholes		No restrictions. Document available from: National Technical Information Services, Springfield, Virginia 22161	
Gravel Road Management		Rutting			
Asset Management		Grading			
Data management		Washboarding			
Maintenance Data		Spreadsheet tool			
Construction Data		Dust control			
Inventory Tool					
19. Security Class (this report) Unclassified		20. Security Class (this page) Unclassified		21. No. of Pages 14	
				22. Price	

Acknowledgements

We wish to thank the Minnesota Local Road Research Board (LRRB) and its Research Implementation Committee (RIC) for the financial support to make this important report a reality. The Technical Advisory Panel (TAP) that steered this project was extremely helpful in identifying key issues and concerns. In addition, the TAP was very generous with its time in attending meetings, reviewing, and providing oversight for this final document and spreadsheet. The authors would like to thank TAP members and their organizations for their contributions to this document.

Technical Advisory Panel

The following members comprise the project's Technical Advisory Panel (TAP) that contributed to this project:

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Introduction

This tool is meant to be a data management resource for county engineering offices to better track and manage gravel roads. This spreadsheet can be used as an inventory tool, providing one location for keeping all maintenance and construction data about a gravel road system. It can also be used to track costs and optimize spending. The tool was developed to be flexible and customizable for a variety of purposes and system sizes.


All gravel road surfaces require regular scheduled maintenance, and individual counties have certainly developed their own preferred methods and treatment intervals for that purpose. The developers of this spreadsheet have pre-populated many of the input cell locations, but the user may also choose to customize those options very easily. It is important to note that clearing those pre-loaded fields is permanent. If the user wants the pre-loaded fields restored, they will be required to download the spreadsheet from the original source, and begin the customizing process from scratch. So, don't clear the pre-loaded cells!

Column coding:



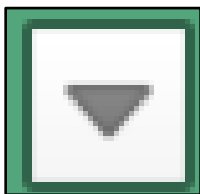
Columns in blue are locked and contain a formula that will automatically populate based on manipulation of adjacent columns and cells.



Columns in white are editable and their corresponding instructions will appear in a small pop-out window when the user selects an editable cell. Look for the "drop down" icon [] to the right of the cell to aid in inputting data.

WARNING: Do not use the **CLEAR CONTENTS** command, or the cells will lose the drop-down values. Instead, highlight cells to be cleared and type the delete/backspace key on your keyboard.

To Filter Data



Each column can be filtered by clicking this small white button with a black triangle; it will give you a menu to allow each user to decide how to filter the data.

Each column can be filtered in this way, in order to give a picture of what maintenance looked like in that year/on that segment/performed that way.



Once the data is filtered, the button will look this. The filter can be cleared by clicking the button again and hitting the clear filter button.

To use this spreadsheet:

Step 1: The spreadsheet contains several pre-loaded columns that can be edited and customized; each user can edit the “Agency Dropdowns Customization” tab (in red) to reflect data for a given County.

Step 2: Start entering gravel road SEGMENTS on the Road Segment Inventory tab and complete equivalent inventory information. This tab contains the most information and will require the most time and effort.

Step 3: Enter data on the Maintenance Record tab PER DATE of maintenance. When entering “Type of maintenance” in column C, the field must match that pre-loaded data in column H on the “dropdowns” tab. Note that after information is entered, data can be filtered by segment, date, or type of maintenance performed per year.

Step 4: Enter data on the Desired Thickness tab PER SEGMENT. Note that after information is entered, data can be filtered or sorted as needed.

Step 5: Enter data on the Segment Evaluation tab PER SEGMENT, evaluating the listed stresses in each column based on their appearance at the time of the evaluation. Reference the “Evaluation Guide” tab for guidance on the descriptions of the ratings of Excellent, Good, Fair, Poor and Deficient.

Road Segment Inventory Tab

This tab is used to enter data to keep gravel road segments organized.

Cell Color	Column Heading	Column Data Description
	Segment ID	This column is updated automatically. It is an identifier for each segment that is subsequently used in other tabs to look up segments. It is created from Road Name:BeginTerminiEndTermini
	County	This is a drop-down that allows the user to choose the county in which the road segments are located.
	CTY_CODE	This will automatically update when a county is chosen. It is used to find the TIS CODE, once the MNDOT Road Name is populated.
	Road Name	Road Name can be populated with the name given to the road segment locally.
	Begin Termini	This is the road name for the starting location of the segment.
	End Termini	This is the road name for the ending location of the segment.
	Start Lat/Long	
	End Lat/Long	
	MNDOT Road Name	These are prepopulated in order to later connect the segments to GIS.
	TIS CODE	Automatically updates if CTY_CODE and MNDOT Road Name have been populated.
	Segment Length	Length of the road segment in miles.
	Surface Type	Surface type is the type of gravel used.
	Treatment Type	This is a drop-down that can be changed based on whether road is stabilized, treated for dust control, drainage, or another method.
	Date of Construction	Original construction date.
	Average Graded Width	Width of road that is bladed on a regular basis in feet units .
	Average Maintained Surface Width	Width of road from ROW to ROW in feet units .
	Depth of Surface Layers	This is the depth of only the surface gravel in inch units .
	Subbase R Value	R Values and Soil Factors are dropdowns to be updated by the user in the dropdown list and reflect locally used values; if necessary a companion list with suggested values is attached in the appendix of this guide.
	Subbase Soil Factor	

Important: Do NOT clear contents of pre-loaded cells in the spreadsheet fields.

Maintenance Record Tab

This tab allows the user to keep a record of maintenance on the road segment that can be filtered by segment, date, type of maintenance, and cost. There is a pivot table companion in the [appendix](#) of this user guide that gives guidance on creating tables to interpret this data if desired.

Cell Color	Column Heading	Column Data Description
	Segment ID	Select a dropdown based on values entered in the Road Segment Inventory Tab that can then be chosen based on the segment that is being maintained.
	Date of Last Maintenance	Date the maintenance was performed on the segment.
	Type of Maintenance	Dropdown that can be edited for county specific maintenance
	Maintenance Cost	This will automatically populate based on a cost that has been entered in the maintenance cost dropdown tab.
	Maintenance ID	This is automatically created and can be used in a pivot table to allow for inconsistencies in maintenance activities.

Important: Do NOT clear contents of pre-loaded cells in the spreadsheet fields.

Desired Thickness Tab

This tab allows the user to quickly gather cost information for amount of gravel added to road segments and to filter that data for how much gravel is added to each road per season year to year.

Cell Color	Column Heading	Column Data Description
	Segment ID	Select a dropdown based on values entered in the Road Segment Inventory Tab that can then be chosen based on the segment that is being maintained.
	Type of Gravel	This is a dropdown that can be edited based on gravel type and procurement location; when editing this dropdown there also a place for Cost/Ton and Cubic Feet/Ton.
	Miles	This will populate automatically based on Segment ID chosen.
	Date of Last Measurement	This is the date of the surface layer measurement.
	Desired Thickness	This is the desired thickness of surface layers for the segment.
	Measured Thickness	Current measured road segment surface thickness.
	Difference	Calculated thickness difference will highlight in pink if there a positive difference in thickness, meaning the segment needs gravel to reach desired thickness.
	Tons Needed	Converts the difference in thickness to Tons based on desired thickness, length of segment, and graded width of segment.
	Cost of additional gravel	Will calculate cost based on entered costs in dropdowns tab.

Important: Do NOT clear contents of pre-loaded cells in the spreadsheet fields.

Segment Evaluation Tab

The Segment Evaluation tab gives a preliminary rating system to each road segment evaluated by rating distresses usually found on gravel roads.

Cell Color	Column Heading	Column Data Description
	Segment ID	Select a dropdown based on values entered in the Road Segment Inventory Tab that can then be chosen based on the segment that is being maintained.
	Date of Evaluation	This is the date of the evaluation.
	"Distress" Rating	Each distress rating has a dropdown list of words that correspond to the level of distress found on the segment being evaluated. Definitions of the condition ratings (excellent, good, poor, etc.) for each surface issue are included in the "Evaluation Guide" tab. For a greater degree of consistency across agencies the dropdowns are not editable.
	Usability Rating	This is a segment rate given based on the distress ratings entered for each distress.

Appendix A: Soil Factor, R-Value, and MnDOT Grading and Base Specifications

The soil R-value is a measure of the response of a compacted sample of soil or aggregate to a vertically applied pressure under specific conditions. It represents the ability of a soil medium to resist lateral spreading due to an applied vertical load, such as tire loads. This power point, entitled [*Pavement Design Soil R-Value Determination for MN Cities and Counties*](#) provides guidance on the R-Value to be used in various applications. It also provides information about the correlation between R-value and Soil Factor, which is another strength value for soils.

This [link](#) also provides a comprehensive overview of MnDOT's Soil Factor, R-value, and Granular Equivalent. Click [here](#) for information on both the Soil Factor and the R value of a soil.

MnDOT's [grading and base specification 3138](#) provides guidance on gradations and material requirements.

Appendix B: Creating Pivot Tables

Once the data has been entered, the user may want to analyze the data and create reports. This gravel roads spreadsheet allows the user to easily create a “Pivot Table”. A Pivot Table allows the user to quickly analyze data, make reports that make the data easy to communicate, and assist in making decisions. PivotTables allow the user to summarize, analyze, explore, and present data, and they are easy to create. They are also very flexible and can be quickly adjusted. Lastly, PivotCharts based on PivotTables will automatically update each time a PivotTable is updated.

Microsoft Office directions for creating these helpful Pivot Tables are given [here](#).

Appendix C: Linking to GIS data

In order to link an excel spreadsheet to a GIS file, at least one attribute must be unique to each segment in this case and must match in both the spreadsheet and the file. The Excel spreadsheet will then be viewable in any GIS application as an attribute table matching existing objects to the information provided via the matching attribute.

More information on linking excel to GIS can be found [here](#). (Although this is specific to ArcGIS, the basic principles are repeatable for any GIS application.)

Appendix D: Additional Resources

Additional resources that may be helpful to users of this spreadsheet are listed below, along with links.

Upper Great Plains Transportation Institute (UGPTI) GRIT program

The GRIT program, which stands for Geographic Roadway Inventory Tool was developed as an asset management tool for Counties to manage their roads and bridges. When developed, the objectives of GRIT were as follows:

- Easy to use web-based tool
- Built on Google Maps
- Compatible with DOT's
- Ability to add other transportation assets
- Minimal cost
- Data is easily available for counties to make informed decisions

Find the Upper Great Plains Transportation Institute website, www.ugpti.org and click on "Other Resources" under the "Resources Tab," then click "Asset Inventory Toolkit.

[UGPTI GRIT management tool](#)

Wyoming LTAP Gravel Roads Implementation Tool

The Gravel Roads Management: Implementation Guide is a useful guide that was developed by the Wyoming Technology Transfer Center. Written by George Huntington, PE and Khaled Ksaibati, PhD, PE to help assist local road and street departments with implementation or improvement of a gravel roads management system (GRMS). Much of the advice in this guide will apply to developing management systems in general. It was written primarily for road managers who realize that their agencies could operate more efficiently, and that they could present a clearer picture of their operations to elected officials and the public if they did a better job of collecting, managing, analyzing, using, and presenting information.

The preparation of this guide was funded by the Wyoming Department of Transportation (WYDOT) and the Mountain-Plains Consortium (MPC). Its goal is to address the lack of a GRMS designed for small, local government agencies. For further guidance on the issues raised in this guide, refer to the final report submitted to WYDOT and MPC on the Wyoming T2/LTAP Center's website. A companion guide, the Programming Guide, provides advice to programmers who may be writing software to assist road and street departments with the implementation of a GRMS. All three documents are linked below.

[Gravel Roads Management: Implementation Guide](#)

FHWA Gravel Roads Construction and Maintenance Guide

The Gravel Roads Construction and Maintenance Guide was published by the FHWA and was mainly designed for the benefit of local agency officials, managers, and grader operators who are responsible for designing and maintaining gravel surfaced roads. The information provided in this manual is as nontechnical as possible without sacrificing clear guidelines and instructions on how to perform the operation well. This manual was developed with a major emphasis on the maintenance of gravel surfaced roads, including some basic design elements.

Gravel roads are often considered to provide lower quality service than paved road surfaces. Yet, in many rural regions, the volume of traffic is so low that paving and maintaining a paved road is not economically feasible. Budget constraints are causing some agencies to revert failing paved surfaces to gravel surfaces. Consequently, understanding gravel road design, construction, and maintenance is very important. In many cases, gravel roads exist to provide a means of transporting agricultural products in and out of farm fields, timber out of forests, or access to remote areas such as campgrounds and lakes. Many gravel roads serve rural residents as well. This guide will help to maintain those gravel roadways with a variety of tools.

[FHWA Gravel Road Construction and Maintenance Guide](#)

MnDOT Transportation Research Synthesis on Gravel Roads Management

The LRRB funded a Transportation Research Synthesis on Gravel Roads Management Tools. That guide is still relevant and available on MnDOT's website at this [link](#).