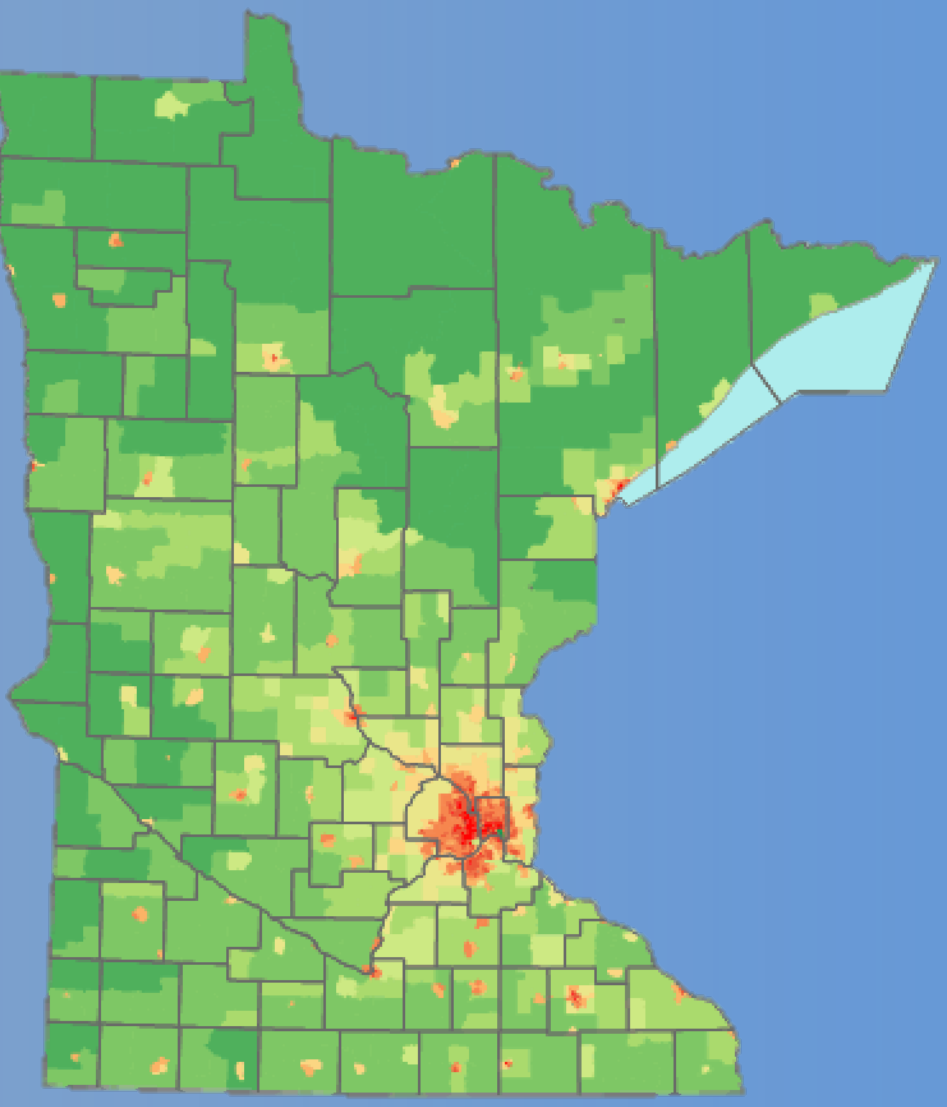
Minnesota Jurisdictional Realignment Project
Guide to Identifying Misaligned Segments



June 2014

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Introduction

It has long been recognized in Minnesota that the jurisdictional responsibilities for roadways need to be reassessed to ensure their efficient and effective management. The issue and discussion of jurisdictional alignment has been ongoing. The topic became a highly focused issue in the 1980s and has been revisited since then. Looking forward, a guiding principle in Minnesota's 50-year vision is to "strategically fix the system," which includes ensuring that roads are aligned with the proper jurisdictional owner.

Key issues with misaligned roads include:

- Misaligned roads may not provide appropriate level of service for users in terms of both capacity and customer expectations, such as safety, ride quality and maintenance
- Misaligned roads may use the wrong source of funding, which may not contain required funds for improvements. This may result in a lower service level than if the road was properly aligned/owned by the appropriate jurisdiction
- Misaligned roads may lead to an "impaired" network of roads due to differing jurisdiction priorities (that is, the road conditions may change significantly while traveling and may not meet traveler's expectations)
- Misaligned roads may not receive the priority for funding or improvements, and as a result, misaligned roads that are widely used may be underserved while others may be over-served

The purpose of this document is to guide jurisdictions in Minnesota—the state, counties, cities, and townships—in identifying segments that may be misaligned. This guide is an output of the Minnesota Jurisdictional Realignment (JR) Project[1], a two year project which looked at current jurisdiction alignment within the State of Minnesota and developed a standard and consistent approach to identifying misaligned segments. The guide covers the entire spectrum of the segment identification process, from defining what constitutes a misaligned segment to preparing a list of misaligned segments. The misalignment list can then be used as a starting point for discussing transfers between jurisdictions.

[1] *The MN Jurisdictional Realignment study is cited throughout this guide.*

Organization

This document is organized into the following sections:

- ***Introduction***: Introduces the document and importance of jurisdictional realignment to the audience
- ***Organization:*** Provides a structure of this document to the audience
- ***Data sources and tools:*** Introduces the data sources and tools that help with segment identification
- ***Segment identification process:*** Discusses the segment identification process and walks the audience through individual steps to identify misaligned segments
- ***Next steps:*** Discusses the steps a jurisdiction may undertake after identifying misaligned segments
- ***Appendix A – Blank Misalignment Register:*** Displays a blank misalignment register that shows all the information (columns) necessary to identify misaligned segments
- ***Appendix B – Misalignment Register Snapshot:*** Presents a snapshot of the misalignment register developed for a subset of the road network during the MN jurisdictional realignment project
- ***Appendix C – County Pilot Details:*** Provides details and results from one of the county pilots (Otter Tail County) conducted during the MN jurisdictional realignment project

Data Sources & Tools

This section outlines the various types of data sources and tools needed in order to identify misaligned segments in the jurisdiction.

Data Sources

The process of identifying misaligned segments requires the tools and data sources mentioned below. We recommend that the users of this guide obtain the data and tools before starting the segment identification process.

HPMS Data

The Highway Performance Monitoring System (HPMS) is a national level highway information system that includes data on the extent, condition, performance, use, and operating characteristics of all segments on the nation's highways. Each Department of Transportation is required to maintain and update their HPMS database annually – and this data includes all segments within the state.

This HPMS database forms the basis of the segment identification. Jurisdictions may choose to obtain the latest database from MnDOT Transportation Data and Analysis division, or obtain the copy used by the project team for its analysis[2] from MN jurisdictional realignment project manager[3].

MN Jurisdictional Realignment Project Misalignment Register

A final work product from the MN jurisdictional realignment project was a misalignment register that included a list of misaligned segments for a subset of the Minnesota road network. Interested jurisdictions can isolate this subset and focus on the rest of the system to efficiently identify misalignments.

Traffic Volumes

Traffic volume is one of the various parameters used in the misalignment identification process. This information can be obtained from MnDOT's website for most of the road network. This data is available at: http://www.dot.state.mn.us/traffic/data/data-products.html/

Other Relevant Local Data

The institutional knowledge that the jurisdiction staff possess is critical to the review of the system using the qualitative parameters listed in the identification process later in this document.

Tools

The tools that aid the segment identification process are as follows:

[2] The project team used the 2012 HPMS dataset for its analysis.

[3] The contact information for MnDOT's project manager is:
Shiloh Wahl, Program Development Manager, District 4 | Shiloh.wahl@state.mn.us | 218-846-3630

Microsoft Excel & Register Template

The project team used Microsoft Excel to prepare a list of all misaligned segments. A blank misalignment register that shows all the information (columns) necessary to identify misalignments is presented in Appendix A of this document.

The template and its use are explained in detail in the next section (*Segment identification Process*) of this guide.

ArcGIS

ESRI's ArcGIS is a geographic information system (GIS) for working with maps and geographic information. The project team used this tool to prepare a map that shows all preliminary misalignments, and later during the project, identified misalignments. The core data required to prepare the maps is available through MnDOT's Transportation and Data Analysis division. More information on ArcGIS is available at: http://www.esri.com/software/arcgis

Google Earth

The project team output the ArcGIS data to a file that can be read by Google Earth to increase the ease of distribution. Google Earth allowed the project team and all stakeholders to view the identified segments on a map. Key benefits of using Google Earth instead of Arc View (ArcGIS companion software) were:

- Use publicly available road and places data to identify properties in proximity of the segments
- Better usability compared to Arc View
- Ability to view historical map data easily, viewing old road alignments if necessary

Google Earth can be downloaded for free through Google website:
http://www.google.com/earth/index.html

Other Mapping Tools

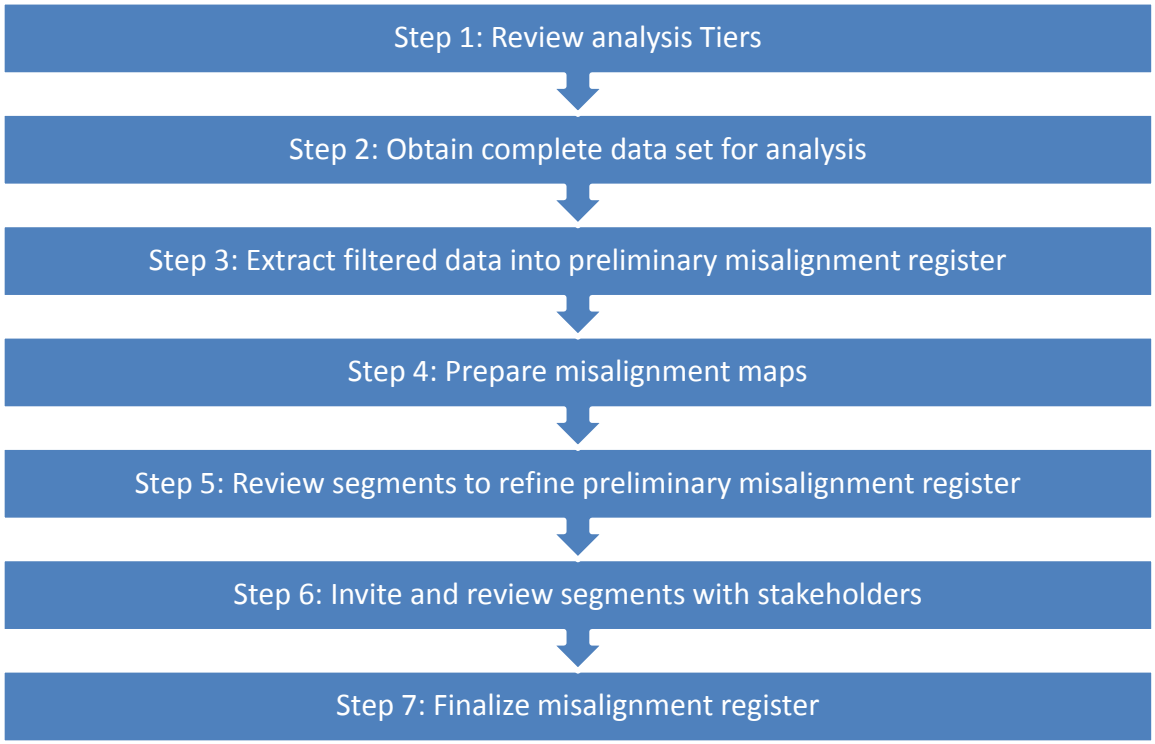
While the misalignment map prepared in ArcGIS and viewed in Google Earth proved very helpful through the project, it is not necessary.

Jurisdictions may choose to use paper maps to view the segments, or use other mapping tools such as Google Maps, Bing Maps or others to view the road network – especially if all stakeholders are very familiar with the network and with the segments under consideration.

Segment Identification Process

This section provides a step-by-step process for identifying misaligned segments and preparing a misalignment register as an output of this process. The process is divided into seven steps as presented in Exhibit 1:

Exhibit 1. Segment identification process overview



Step 1: Review Analysis Tiers

The first step of the segment identification process was to divide the network into three tiers based on the probability of misalignment. The project achieved this goal by cross-referencing the route system and functional class.

The project team used the overarching goals of each agency to cross-reference the route system and functional class. For example, MnDOT's key goal of mobility means that routes with a functional class of principal arterial and many minor arterials and major collectors should be owned by MnDOT. Roads with a functional class of minor collectors and local roads are primarily intended to provide access to homes, businesses, and farms—and should be owned by local agencies. The team divided the road network into three tiers that indicate the probability of misalignment based on cross-referencing the route system and functional class.

These tiers are presented in Exhibit 2 in the form of a mileage chart that cross-references the route system (shown in rows) and the functional class (shown in columns) to indicate the number of miles that fall within each grouping. Exhibit 3 summarizes the mileage information by tiers (shown in rows) and segment owners (shown in columns).

Exhibit 2. Analysis tiers and mileage chart

Road System	Owner	Principal Arterial			Minor Arterial	Major Collector	Minor Collector	Local	Total	Total by Jurisdiction
		Interstate	Other Freeway/ Expressway	Other						
Interstate highway	State*	914							914	914
State highway	State		166	4,143	5,561	1,046	18	9	10,942	10,942
County state-aid highway	Counties			81	2,863	15,049	10,028	2,564	30,584	46,600
County road	Counties				83	514	1,433	12,296	14,326	
Unorganized territory road	Counties					4	4	1,682	1,690	
Municipal state-aid street	Cities			32	610	1,319		1,421	3,382	22,199
Municipal street	Cities			0	41	351	30	18,395	18,816	
Township road	Township				19	76	355	53,268	53,717	53,717
Parks and other roads	Parks or private				1	64	163	4,101	4,329	4,329
Total		**914**	**166**	**4,256**	**9,178**	**18,422**	**12,030**	**93,735**	**138,702**	**138,702**
Total without interstate and parks and other roads										**133,459**

**Policies dictated by FHWA, managed by State*

Legend

Tier 1—High misalignment probability
Tier 2—Medium misalignment probability
Tier 3—Low misalignment probability
Not applicable
Excluded from analysis

Exhibit 3. Analysis tiers by jurisdiction

Tier	MnDOT	Counties	Cities	Townships	Total
Tier 1 (high misalignment probability)	27	2,644	32	19	2,722
Tier 2 (medium misalignment probability)	6,606	12,300	651	431	19,989
Tier 3 (low misalignment probability)	4,310	31,656	21,515	53,268	110,748
Excluded from analysis (not applicable)					5,243
Total	**10,942**	**46,600**	**22,199**	**53,717**	**138,702**

As a part of the MN jurisdictional realignment project, the project team analyzed the following components of the system:

- Tier 1 State-Owned
- Tier 1 Principal Arterials, and
- Tier 2 State Owned

The misalignment register for these components is available as a part of the project final report.

Step 2: Obtain Complete Data Set for Analysis

The second step of the process is to obtain a dataset for the jurisdiction(s) undertaking this identification analysis. As mentioned in the *Data Sources and Tools* section, the HPMS data can be obtained from MnDOT Transportation Data and Analysis division or from the MN jurisdictional realignment project manager. Exhibit 4 presents a sample of the HPMS used for the MN jurisdictional realignment project.

Exhibit 4. HPMS data sample

District	Route #	Begin Pt.	End Pt.	Owner	Miles	Route Number	Route system	Functional Class	City Name	County Name
1	0100000035	163.202	163.219	State	0.017	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	163.219	165.707	State	2.488	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	165.707	167.206	State	1.499	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	167.206	169.567	State	2.361	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	169.567	169.761	State	0.194	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	169.761	170.141	State	0.38	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	170.141	170.588	State	0.447	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	170.588	170.783	State	0.195	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	170.783	175.35	State	4.567	0035	Interstate Trunk Highway	Interstate	.	Pine
1	0100000035	175.35	180.4	State	5.05	0035	Interstate Trunk Highway	Interstate	.	Pine

Step 3: Extract Filtered Data into Preliminary Misalignment Register

The primary input to this step is the data set discussed in step 2, while the primary output of this step is a preliminary misalignment register.

The interested jurisdiction will need to filter the data to obtain a listing of segments that are in Tier 1 and Tier 2 as well as in the correct jurisdiction.

For example, if the analysis is being conducted by the city of Detroit Lakes[4], the users would need to filter the data to view segments owned by the city that fall under either Tier 1 or Tier 2. These segment categories are highlighted in Exhibit 5.

Exhibit 5. Segments to be filtered for city-led analysis

Road System	Owner	Principal Arterial			Minor Arterial	Major Collector	Minor Collector	Local	Total	Total by Jurisdiction
		Interstate	Other Freeway/ Expressway	Other						
Interstate highway	State*	914							914	914
State highway	State		166	4,143	5,561	1,046	18	9	10,942	10,942
County state-aid highway	Counties			81	2,863	15,049	10,028	2,564	30,584	46,600
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Municipal street	Cities			0	41	351	30	18,395	18,816	
Township road	Township				19	76	355	53,268	53,717	53,717
Parks and other roads	Parks or private				1	64	163	4,101	4,329	4,329
Total		**914**	**166**	**4,256**	**9,178**	**18,422**	**12,030**	**93,735**	**138,702**	**138,702**
Total without interstate and parks and other roads										**133,459**

The filters that would apply to the data would include:

- Route system: Municipal state-aid street OR Municipal street system
- Functional class: Principal arterial OR Minor arterial
- Owner: City
- City Name: Detroit Lakes

Exhibit 6 presents a list of segments for the city of Detroit Lakes as filtered from the HPMS data used for the MN jurisdictional realignment project.

The segments that are presented in the data set include discrete segments, and the users may choose to combine them into contiguous segments. For example, in Exhibit 6, the first 10 segments are the same route with matching begin and end points (resulting in one long segment presented as ten different segments).

[4] The city of Detroit Lakes was chosen at random as an example. The city has not volunteered for this analysis.

Exhibit 6. Filtered segments for city of Detroit Lakes

Dist.	Route ID	Begin Pt.	End Pt.	Owner	Miles	Route Number	Route system	Functional Class	City Name	County Name
4	0509950101	0	0.354	City	0.354	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	0.354	0.56	City	0.206	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	0.56	0.64	City	0.08	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	0.64	0.65	City	0.01	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	0.65	0.74	City	0.09	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	0.74	0.88	City	0.14	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	0.88	0.95	City	0.07	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	0.95	1.02	City	0.07	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	1.02	1.17	City	0.15	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950101	1.17	1.23	City	0.06	0101	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950105	0.21	0.422	City	0.212	0105	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker
4	0509950110	0.68	1.37	City	0.69	0110	Municipal State-Aid Street	Minor Arterial	DETROIT LAKES	Becker

Step 4: Prepare Misalignment Maps

As presented in step 3, the HPMS data includes a route number and the beginning and end points. This information, along with the GIS base map obtained from MnDOT, can be used to prepare a map showing only the preliminary misaligned segments.

Users will need ArcGIS or other compatible software to prepare these maps. We recommend saving the filtered maps as files that are compatible with Google Earth.

Step 5: Review Segments to Prepare Revised Misalignment Register

This step includes a review of the segments that are filtered as a part of Step 3 along with the maps prepared as a part of Step 4. This review will allow the jurisdiction undertaking the analysis to further filter the list to identify segments that may be misaligned and then discuss them with the stakeholders.

The primary input to this step is the preliminary misalignment register and map prepared as a part of steps 3 and 4, and the output of this step is a revised misalignment register and accompanying map.

One of the key outputs of the MN jurisdictional realignment project is the list of parameters to analyze the segments. These parameters, along with a short description are as follows:

- ***Road system continuity preferences***: Road begins or ends with another jurisdiction, or the primary purpose is misaligned with the goals of the owning jurisdiction
- ***System spacing***: The road network is relatively too dense or too sparse in the vicinity for the owning jurisdiction
- ***Location***: The segment is located within/outside specific boundaries inconsistent with the owning jurisdiction
- ***Length of segment/road:*** Segment is short, with other jurisdiction owning most of the road from the start/end point or intersection
- ***Truck traffic volume***: Higher truck traffic volume than surrounding roads
- ***Site of national, state, or local interest***: Site of national, state, or local interest that requires being owned by a particular jurisdiction
- ***Road restrictions***: Any restrictions for travel on the road that may guide jurisdictional responsibilities
- ***Traffic volume***: Relative traffic volume is inconsistent with other roads owned by the jurisdiction in the vicinity
- ***Intermodal facilities***: Segment serves an intermodal facility and is of statewide importance

Users of this guide should consistently apply these parameters to the road network to identify misaligned segments. Specifically, traffic volume information (in the form of Average Annual Daily Traffic [AADT]) was found to be particularly helpful in the MN jurisdictional realignment project to segregate Tier 2 segments.

Users of this guide should determine which parameters are of most value for analysis.

As the agency reviews the segments, we recommend recording the information in the form of a preliminary misalignment register. This register should include the columns/information presented in Exhibit 6 along with additional columns as follows:

- Candidate (for further discussions): This value will drive whether the segments are carried over to a revised misalignment register for discussions with other jurisdictions
- Misalignment reasons: Users should note the reasons that a segment is deemed misaligned in this column. Users should use the parameters presented earlier for consistency.
- Proposed jurisdiction: Users should record the jurisdiction (state, county, etc.) they propose as the right owners for the segment.
- Jurisdiction stakeholders: Record the proposed jurisdiction stakeholder information (e.g. name of city/county or MnDOT) in this column.
- Risks: Users may also enter key risks that may be associated with a transfer.

Users should revise the misalignment map to remove/edit segments as necessary

Step 6: Invite and Review Segments with Stakeholders

Users should review the revised misalignment register and accompanying map with the jurisdictional stakeholders identified in Step 5 to further refine the misalignment register. These may include MnDOT, counties, cities, and/or township representatives.

Our project team's experience indicates that a two to four hour session that is guided by the revised misalignment register and accompanying map allows the stakeholders to review the information efficiently.

Stakeholders should use the same parameters presented in Step 5 for this discussion.

The primary output of this step is a jurisdiction misalignment register.

Step 7: Finalize Misalignment Register

This step comprises of sending the jurisdiction misalignment register to all stakeholders for validation and updating it as necessary. Appendix B presents a snapshot of the misalignment register developed for a subset of the road network during the MN jurisdictional realignment project.

Next Steps

Once the misaligned segments are agreed upon, agencies may discuss the timing and funding of transfers, if feasible and mutually agreeable. Specifically, the information collected through the segment identification process can be used to:

- Communicate the business benefits of addressing misalignments to the traveling public and jurisdictional stakeholders
- Discuss misaligned segments and determine mutual benefits with other jurisdictions (e.g. better alignment of maintenance and capital expenditures)
- Establish timing for misalignment transfers based on available funding
- Assist in answering the question, “is it owned by the right jurisdiction?”
- Discuss policy questions such as:
    - Transfer program queue
    - Transfer timing, given agency agreement and funding availability
    - How to better communicate benefits of transfers to all stakeholders, including the traveling public

Appendix A: Blank Misalignment Register

Dist.	Route ID	Begin Pt.	End Pt.	Owner	Miles	Route Number	Route system	Functional Class	City Name	County Name	Proposed Jurisdiction	Jurisdiction Stakeholder	Misalignment Reasons

Appendix B: Misalignment Register Snapshot

Dist.	Route #	Route System	Owner	Functional Class	County	City/ Closest terminus	Miles	GIS Beg. Pt.	GIS End Pt.	Proposed Jurisdiction	Jurisdiction Stakeholder	Misalignment Reasons
1	0011	Minnesota State Highway	State	Minor Arterial	Koochiching	International Falls (terminus), Ranier	1.828	208.143	209.971	County	Koochiching	• Road system continuity preferences • Location
1	0027	Minnesota State Highway	State	Major Collector	Carlton	Moose Lake (terminus)	1.365	246.258	247.623	County	Carlton	• Traffic volume • System spacing
1	0169	Minnesota State Highway	State	Major Collector	St Louis, Lake	Ely (terminus), Winton (terminus)	4.199	415.07	419.269	County	St Louis, Lake	• Road system continuity preferences • Location
1	0289	Minnesota State Highway	State	Local	Carlton	Moose Lake	0.512	0	0.512	State prison system City (~.25 mi)	Moose Lake	• Road system continuity preferences

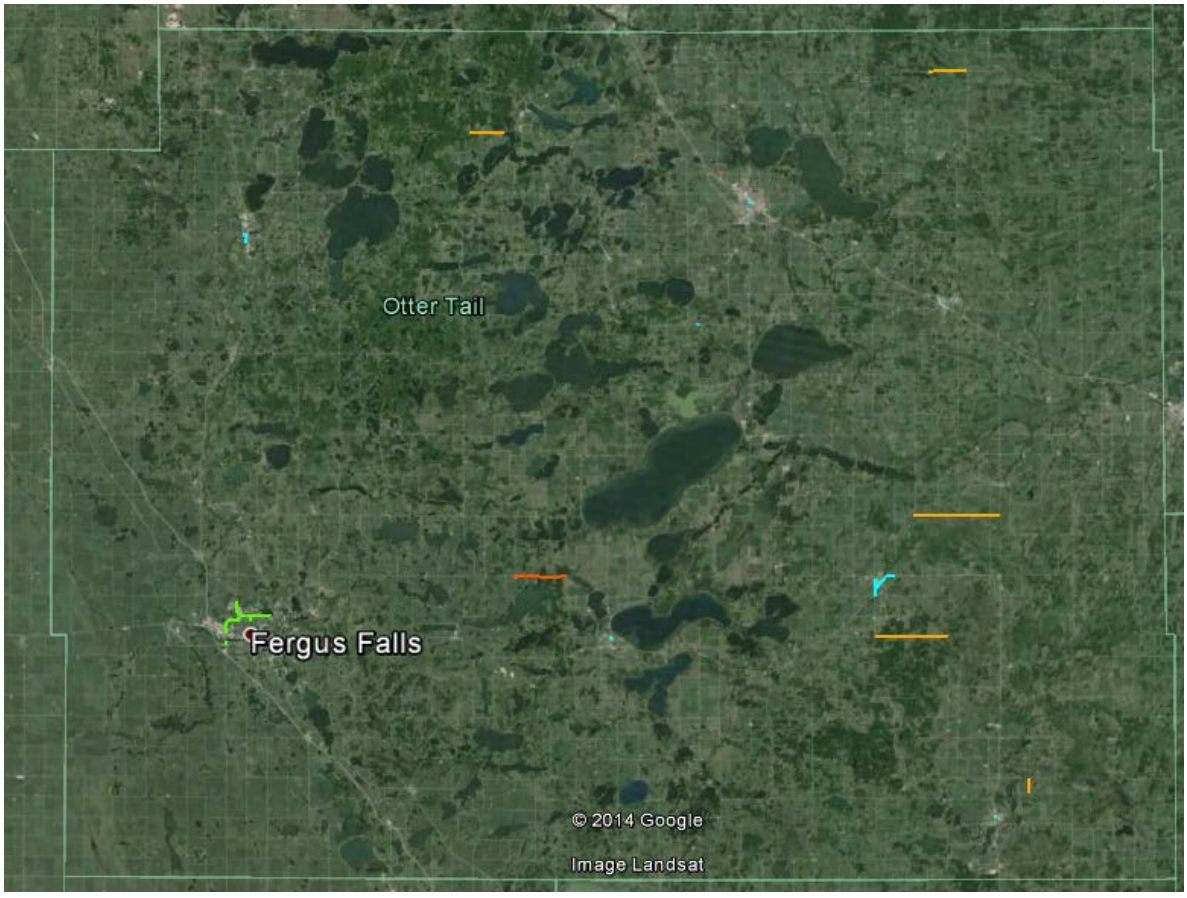
Appendix C: County Pilot Details

In order to ensure the segment identification approach was feasible and applicable to all parts of the road network within the state, the project team piloted the process with three counties during the MN jurisdictional realignment project. The project team invited all counties to volunteer, and ultimately identified three volunteers to test the approach. The volunteer counties included Kandiyohi, Otter Tail and Douglas counties.

The first step of the pilot included conducting a discussion with the counties and reviewing preliminary misaligned segments. Representatives from cities as well as townships participated in the preliminary review meetings. The team tweaked the segment identification process to add additional details for misalignment reasons to ensure standard applicability across the state. The project team then conducted follow-up sessions with each county to review all preliminary misaligned segments and prepare a misalignment register by county.

For the user's reference, below is an example of the final map and register from the Otter Tail county pilot.

Otter Tail County Map



Otter Tail County Register

Dist.	Route #	Route System	Owner	Functional Class	County	City/ Closest terminus	Miles	GIS Beg. Pt.	GIS End Pt.	Proposed Jurisdiction	Jurisdiction Stakeholder	Misalignment Reasons
4	0065	County State-Aid Highway	County	Local	Otter Tail	Henning	0.84	10.65	11.49	City	Henning	• Location
4	0067	County State-Aid Highway	County	Local	Otter Tail	Henning	1.333	0	1.333	City	Henning	• Location
4	0090	County State-Aid Highway	County	Local	Otter Tail	Battle Lake	0.29	0	0.29	City	Battle Lake	• Location
4	0091	County State-Aid Highway	County	Local	Otter Tail	Dent	0.07	0	0.07	City	Dent	• Location
4	0094	County State-Aid Highway	County	Local	Otter Tail	New York Mills	0.07	0	0.07	City	New York Mills	• Location
4	0095	County State-Aid Highway	County	Local	Otter Tail	Parkers Prairie	0.14	0	0.14	City	Parkers Prairie	• Location
4	0096	County State-Aid Highway	County	Local	Otter Tail	Pelican Rapids	0.24	0	0.24	City	Pelican Rapids	• Location
4	0098	County State-Aid Highway	County	Local	Otter Tail	Perham	0.21	0	0.21	City	Perham	• Location
4	0099	County State-Aid Highway	County	Local	Otter Tail	Richville	0.09	0	0.09	City	Richville	• Location
4	0100	County State-Aid Highway	County	Local	Otter Tail	Pelican Rapids	0.29	0	0.29	City	Pelican Rapids	• Location
4	0140	County Road	County	Local	Otter Tail	Deer Creek (near)	4.11	0	4.11	Township	Deer Creek, Inman	• Relative traffic volume
4	0134	County Road	County	Local	Otter Tail	Henning (near)	3.53	0	3.53	Township	Henning, Folden, Inman, Elmo	• Location
4	0139	County Road	County	Local	Otter Tail	Parkers Prairie (near)	0.78	0	0.78	Township	Parkers Prairie	• Relative traffic volume

Dist.	Route #	Route System	Owner	Functional Class	County	City/ Closest terminus	Miles	GIS Beg. Pt.	GIS End Pt.	Proposed Jurisdiction	Jurisdiction Stakeholder	Misalignment Reasons
4	0148	County Road	County	Local	Otter Tail	Perham (near), New York Mills (near)	1.85	0	1.85	Township	Butler	• Location
4	0130	County Road	County	Local	Otter Tail	Vergas (near)	1.63	0	1.63	Township	Candor	• Location
4	0104	Municipal State-Aid Street	City	Minor Arterial	Otter Tail	Fergus Falls	1.53	1.575	3.105	County	Otter Tail	• Relative traffic volume • Location
4	0125	Municipal State-Aid Street	City	Minor Arterial	Otter Tail	Fergus Falls	1.918	0	1.918	County	Otter Tail	• Relative traffic volume • Location
4	0137	Municipal State-Aid Street	City	Minor Arterial	Otter Tail	Fergus Falls	1.06	0	1.06	County	Otter Tail	• Relative traffic volume • Location
4	1012	Township Road	Township	Minor Collector	Otter Tail	Underwood (near), Battle Lake (near)	2.56	0	2.56	County	Otter Tail	• Relative traffic volume • Location