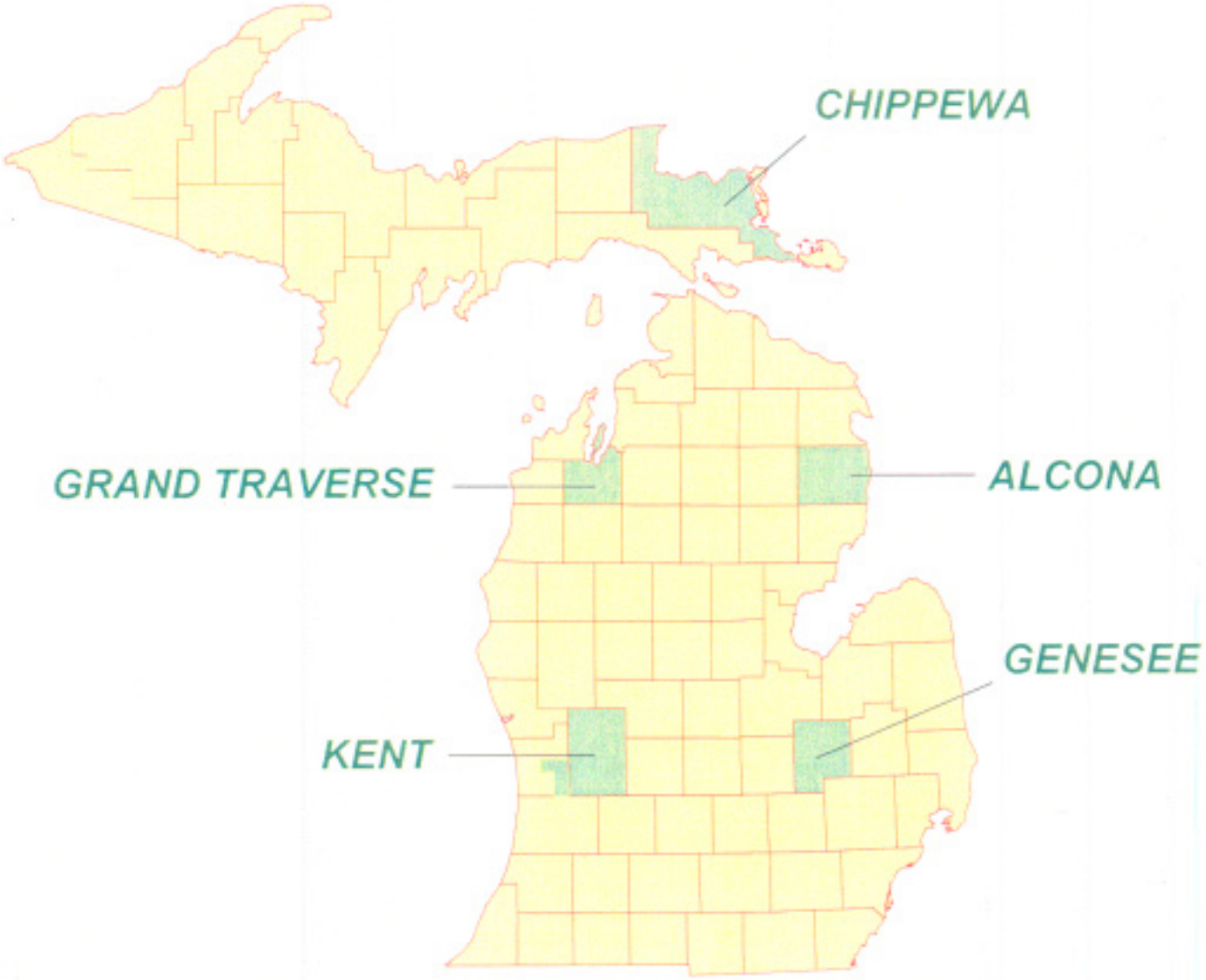
PASER
Cooperative Road Condition Survey
DEMONSTRATION PROJECT



Conducted By:

The County Road Association of Michigan

and

The Michigan Department of Transportation

COOPERATIVE ROAD CONDITION SURVEY

PROJECT CONCEPT

This demonstration project was created by County Road Association of Michigan (CRAM), and the Michigan Department of Transportation (MDOT) to jointly develop and implement asset management concepts. This project specifically dealt with creating and evaluating methodologies for surveying road surface conditions, which is the first step in the process of Asset Management on our roadway systems. It was directed by John Daly, Manager of the Genesee County Road commission and Louis Lambert, Deputy Director, Bureau of Transportation Planning, MDOT and was coordinated by MDOT's GIS Team. The objective of this project is to develop a baseline asset management capability that, with selected analytical tools, can be placed in the hands of road maintenance agencies to assist in planning cost-effective maintenance of the public roadway. If the Asset Management legislation currently pending in the legislature passes, a Transportation Asset Management Council (TAMC) will be established. If that occurs, this pilot project should then become the responsibility of the TAMC. The project included the following goals:

1. Evaluate the feasibility of using the Pavement Surface Evaluation and Rating System (PASER) for rating Michigan's road system;

2. Determine the time and resources necessary to conduct road condition surveys on Federal Aid and Non-Federal Aid road systems in Michigan;

3. Evaluate procedures for mobile collection of road condition data using Geographic Information Systems (GIS) and Global Positioning Satellite Systems (GPS);

4. Appraise using the Michigan Information Center's (MIC) "Framework" files as a foundation for the GIS road map and database and;

5. Promote working relationships between government agencies involved in Transportation asset management activities.

In order to have a representative sample of Michigan's road system, a diversified sample of five counties were selected for this demonstration project. They included Alcona, Chippewa, Genesee, Grand Traverse, and Kent counties (see Map 1). This sample was selected to provide a geographical distribution of counties in the southern lower peninsula, northern lower peninsula, and the upper peninsula. The counties were also selected so that they included land uses varying from urban, suburban, rural, commercial, and recreational. The project called for the rating all of the Federal Aid System in each county. In several counties the Non-Federal Aid System was also rated to determine the applicability of using this technology for rating all Act 51 roads.

PASER

The Pavement Surface Evaluation and Rating System (PASER) was selected for evaluating the road networks. The purpose of PASER is to provide a uniform road rating system that, when combined with economic analysis, can he used to formulate short and long range plans based on a variety of budget levels. An important factor in selecting PASER was that detailed instructional rating manuals and training videos are available to facilitate the road evaluation process. The

videos and manuals include training in identifying the different types of pavement distress, the degrees of it over the life of a pavement, the PASER rating system, and examples of different ratings (Exhibits 1-5). PASER is the rating system currently used by RoadSoft, the integrated road management system for Michigan's counties and cities that has been developed at Michigan Technological University with funding from MDOT.

FIELD COLLECTION PROCEDURES

MDOT's GIS Team developed a procedure which combines GIS, GPS, the Framework mapping network, and the PASER rating system to create a relational data base "on the fly" as the roads are driven. Exhibit 6 shows the computer screen that the road raters see as they drive down the road. The screen displays a GIS map of the road system, the vehicle's exact location from the GPS receiver (the red arrow) and the data record for that specific segment of road. The program also includes a routine to quickly split network road links at any location where an attribute such as pavement type or condition changes.

Field data collection was conducted by a three-person team in each vehicle. One team member drives, the second operates the computer, while the third navigates, determining the most efficient routing to drive the roads with the least amount of backtracking (Exhibits 7 and 8). The PASER ratings were arrived at by team consensus with the right being reserved that if a consensus could not be reached, the owner of the road would make the final call. It might be noted that there were no instances where a team could not reach an agreement on the rating. Once the PASER rating is determined, it is simply entered into the data record along with other attributes such as pavement type. Upon completion of driving all the roads and combining the databases, the network and database are ready for statistical analysis and thematic mapping for use in developing short and long range plans.

PROJECT ORGANIZATION

Staffing- A total of 58 individuals from 11 organizations participated in this project. This included staff from five county road commissions, two planning agencies, three cities, Michigan Technological University and MDOT. The participants represented a wide variety of expertise and included county road commission managers, assistant managers, engineers, planners, foremen, technicians, maintenance workers, programmers and GIS specialists.

Team Development- In order to accomplish this task, teams were established in each county, which consisted of members from each of the participating organizations (Exhibits 9-1 2). A schedule was designed so that each of the crews consisted of at least one person from each organization. Also, staff was rotated so that everyone had a chance to work together. The diversification of team members from different organizations and expertise served to give participants a better understanding of each others functions and an opportunity to share knowledge with each other which had been gained from years of experience.

Training - The next step in this process was training, which included the following topics on the use of this technology:

1. PASER - Road Condition Rating training
2. Maptitude GIS basics
3. Field Computer Operations & GPS operations

PASER Field Survey **-** The major task of the project was for our teams to drive all of the designated roads in each county while applying PASER ratings and collecting attributes such as pavement type and the number of lanes for each road segment. In order to evaluate the efficiency of the survey procedures, each crew maintained a detailed daily "Road Inventory Log" which documented the miles of roads that were rated under different geographical and environmental conditions. The field work, in the five counties, consisted of rating 6,332.1 miles of roads and was completed in 438.1 crew hours, which averages out to rating 16.1 miles per hour. Table 1 is a summary of the daily log sheets which were kept throughout the project.

Table 1

Summary of Rating Activities

County	Miles Rated	Hours	Miles Rated/Hour	Miles Driven
Alcona	835.5	53.1	18.1	1,278.0
Chippewa	607.9	30.8	20.6	1,062.0
Genesee	2,220.3	184.2	12.4	3,840.0
Grand Traverse	1,133.3	84.8	13.1	1,541.0
Kent	1,535.1	85.2	16.1	2,159.0
TOTAL	6,332.1	438.1	16.1(ave.)	9,880.0

The entire survey, in all counties, went very smoothly from the beginning to the end, which is a tribute to the planning and hard work on the part of **the** participants from all of the agencies. During the surveys a number of procedures were improved and refined to streamline the data collection process.

SURVEY RESULTS

Road Conditions- Following the completion of each of the county road surveys, the databases from the individual crews were combined and checked for any missed segments, duplicated segments, errors in data entry, or mile point coding irregularities. Upon finishing this task, the network and database was ready for statistical analysis and thematic mapping of roadway attributes. The results of the PASER condition ratings, which utilizes a graduated rating scale from 1 to 10, with a 1 rating being a road that has totally failed and a 10 being a newly constructed road, are displayed on Maps 2 thru 8.

SURFACE CONDITION RATING SCALE

Following the completion of the first *survey* in Genesee County the PASER Ratings were classified into Good, Fair, and Poor rankings as displayed on Map 9. After review and analysis this road rating team felt that the good, fair, poor PASER labels were too broad for determining road needs or developing plans. Therefore, the team evaluated several possible scales and settled on a scale recommended in the PASER manual that we are calling the Surface Condition Rating Scale. This ordered system associates degrees o f pavement distress into categories that relate to the levels of maintenance and rehabilitation required. Each category represents a major increase in the amount of work needed and the associated costs. Therefore, from these categories, short and long-range pavement management plans can be created for different financial scenarios. The Surface Condition Rating Scale consists of the following categories:

Category I (Ratings 9 & 10) **No Maintenance Required**

Category 2 (Ratings 7 & 8) **Routine Maintenance** (joint & cracksealing, minor patching)

Category 3 (Ratings 5 & 6) **Preservative Treatments** (patching, sealcoat or nonstructural overlay)

Category 4 (Ratings 3 & 4) **Structural Improvement** (structural overlay or recycling)

Category 5 (Ratings 1 & 2) Reconstruction

Maps 10 thru 17 display the Surface Condition Rating Scale applied to the PASEK rating in each of counties surveyed in this demonstration project.

It should be noted that this Surface Condition Rating Scale was developed as a planning tool and is not intended to dictate the type work that must be done for specific PASER ratings. Final decisions on a rehabilitation level and technique must also take into consideration many other factors such as traffic volume, original construction quality, pavement strength and professional engineering judgment.

The following comments relating to this scale were received after review of the draft of this report and the committee may wish to evaluate their merits:

Steve Warren, of the Kent County Road Commission, states "Essentially, this scale is too prescriptive of the type of improvement required for a particular level of distress" and also notes "KCRC uses a three-tiered condition scale that works well for our asset management process as well as for communication road needs to government officials and the general public. KCRC's scale distinguishes needs according to MAINTAIN, PRESERVE and RECONSTRUCT."

Terry McNinch of MTU states "Why not stick with the good-fair-poor concept and use "very good, good, fair, poor, very poor."

CONCLUSIONS

Based on the objectives created at the onset of this project, the following conclusions have been made:

1. PASER Rating System **-** The procedures used in this demonstration project have proved to be efficient and allow an inventory of road conditions to be completed in a timely fashion. During this demonstration project PASER has proved to be easy to learn and easy to apply in the field. With the use of training videos, rating manuals and a little coaching in the field, it was possible for team members to very rapidly become proficient raters. The mobile data collection procedures worked equally well on both the Federal Aid System and the Non-Federal Aid System.

2. Time and Resources - From the experience gained during this project and data collected on the Road Inventory Logs, it is relatively easy to project the time and resources necessary for conducting future PASER road condition surveys. This is demonstrated in Table 2, which utilizes this information to project the time to needed to conduct a condition survey for all the Federal Aid System and Rural Minor Collectors for each county in Michigan. Future updates of road conditions should require less time, as many inventory attributes will not require changing and there will be fewer instances of road segments that require splitting.

3. ***GIS/GPS Technology*** - These demonstration projects have proved that the combination of GIS, GPS and the PASER rating system is an excellent methodology for the rapid, accurate, and cost-effective collection of surface condition data along with the other physical attributes of our roadway systems.

4. Framework GIS **-** The Michigan Information Center's Framework GIS provided a good foundation for the roadway network and database. When used with GPS, it allowed the raters to know exactly where they were on the road so that the mile points of changes in pavement condition could be accurately mapped.

5. Multi Agency Rating Teams - The rating teams made up of staff from different agencies worked quite well together, with everyone learning from each other and better understanding how their individual roles in Asset Management of our transportation system are interrelated.

OBSERVATIONS AND LESSONS

Local Road Expertise - In all surveys, it was evident that the knowledge of the Road Commission's staff in relation to the construction and design history of past work on their roads was invaluable in determining the condition ratings. This was particularly true in instances such as identifying whether a pavement was Sealcoat or Asphalt with a Sealcoat treatment overlay.

Automation Of Entering New Roads - In all five counties we encountered instances of new roads, realigned roads and closed roads which were not included on the Framework's road network.

Therefore, MDOT's GIS Team needs to develop an automated process to accurately add new roads onto the network as they are being driven, by using the coordinates from the GPS receiver. Also, procedures should be set up to submit these new roads to MIC for inclusion in the Framework and for review by MDOT for Act 51 and Functional Class mapping.

Sealcoat Ratings and the Surface Condition Rating Scale - Several counties commented on the following inconsistencies with Sealcoat ratings and the Surface Condition Rating Scale. The PASER manual establishes a specific procedure for rating "Sealcoat" roads because they perform very differently from Asphalt and Gravel roads. The PASER Sealcoat Manual has been established to rate these kinds of roads on a scale of 1 to 5, with the 5 being the best possible rating. The rationale behind applying different scales for Sealcoat and Asphalt is that these surfaces are not equal in terms of Service Life and Structural Capacity.

For this project, the procedure for rating roads that have a sealcoat over gravel surface was to apply an even numbered 2 thru l0 rating. It is imperative that any and all analysis of pavement networks includes the surface type as a factor for calculating conditions. As mentioned earlier, these surface types (Asphalt and Sealcoat) are not equal, and maintenance and rehabilitation on these two surfaces is much different. For example, if a road that has an asphalt surface is rated a 2,3, or a 4, the Surface Condition Rating Scale would identify that segment to be in need of a major structural improvement, or complete reconstruction. However, if a road that has a treated surface (Sealcoat) is rated 1,2, or 3 (or 2,4, or 6 for this project), it is most commonly improved by applying another surface treatment. Therefore the Surface Condition Rating Scale that has been established needs to be adjusted to account for the difference between surface types. The following scale may be an appropriate adjustment for Sealcoat roads:

Category 1 (Rating 8-10) No Maintenance Required

Category 2 (Rating 6) Routine Maintenance (minor patching)

Category 3 (Rating 4) Preservative Treatments (sealcoat)

Category 4 (Rating 2) Structural Improvement (new double sealcoat)

Gravel, Graded Earth and Unimproved Roads on Local Road Systems - It was observed, during the Alcona and Grand Traverse surveys, that the Surface Condition Rating Scale does not

adequately address gravel, graded earth and unimproved roads. These types of roads constitute the major portion of the Local Road System in many counties and particularly in northern Michigan. The major portion of the unpaved roads fell into Asset Management Categories of 4 and 5 **,** which indicate that major work is needed (see Map 18). Part of this may he due to the fact that a PASER rating for Gravel roads cannot be rated higher then 4 if the road does not have adequate drainage on at least 50% of its length. It is possible, that given northern Michigan's well-drained sandy soil, that this criterion is overly harsh. Also, many of these are very low volume seasonal roads that provide access to recreational, forest and agricultural lands. Even though they received low ratings, many are probably adequate, needing only routine maintenance to serve the function that they perform.

Therefore, the Surface Condition Rating Scale needs to be reevaluated for better representing the needs on these types of roads. Recently a new PASER manual for Graded Earth and Unimproved Roads was published, which was not available during this survey. This new manual utilizes a four class rating system for graded earth and unimproved road-trails. A field test of this manual needs to be conducted in order to determine how this new rating scale can he incorporated into our Surface Condition Rating Scale.

Data Transfer - In order for the PASER survey data to be used with RoadSoft software, a method needs to be developed to transfer this collected data directly into RoadSoft. Another possibility is that this technology becomes a subroutine or module of RoadSoft. It is fortunate that a number of staff members from Michigan Technological University's Local Technical Assistance Program were involved in these surveys and will be able to explore these possibilities.

Ramps - Michigan has approximately 900 miles of ramps on our freeway system which have never been included in pavement condition surveys. Therefore, freeway ramps in Genesee, Kent, and Chippewa counties were included in this project to determine the difficulty and time required to obtain their condition ratings. They did prove to he more difficult and time consuming, as a considerable amount of backtracking was necessary. This was particularly true in urban areas with major interchanges between two freeways. Based on information collected in this project, it is estimated that it would require four to six weeks to rate all the ramps on the State Trunkline system.

Seasonal Roads - Seasonal Road designations were also collected during the surveys in Alcona and Grand Traverse Counties. During the project in Alcona County, it was requested that the survey include identifying Seasonal Roads in the database. The request was made as Seasonal Roads, in northern Michigan, play a role in the planning and plowing operations and the counties are required by law to maintain a map of these roads. Therefore, a column for this designation was added to the database and included in surveys of northern counties. Maps 19 and 20 display the locations of Seasonal Roads in these counties. This demonstrates how easily additional attributes can be added and collected using this technology.

PHASE 2 GOALS AND OBJECTIVES

The Phase 2 efforts are planned to continue until October, 2002. PASER surveys will continue in two other counties. A mini-Beta test of the new strategic planning module in RoadSoft will be undertaken. Cross-survey efforts between the Genesee County Road Commission and the Kent County Road Commission to explore the sensitivity of the field gathering of data are also planned.

PASER Manuals

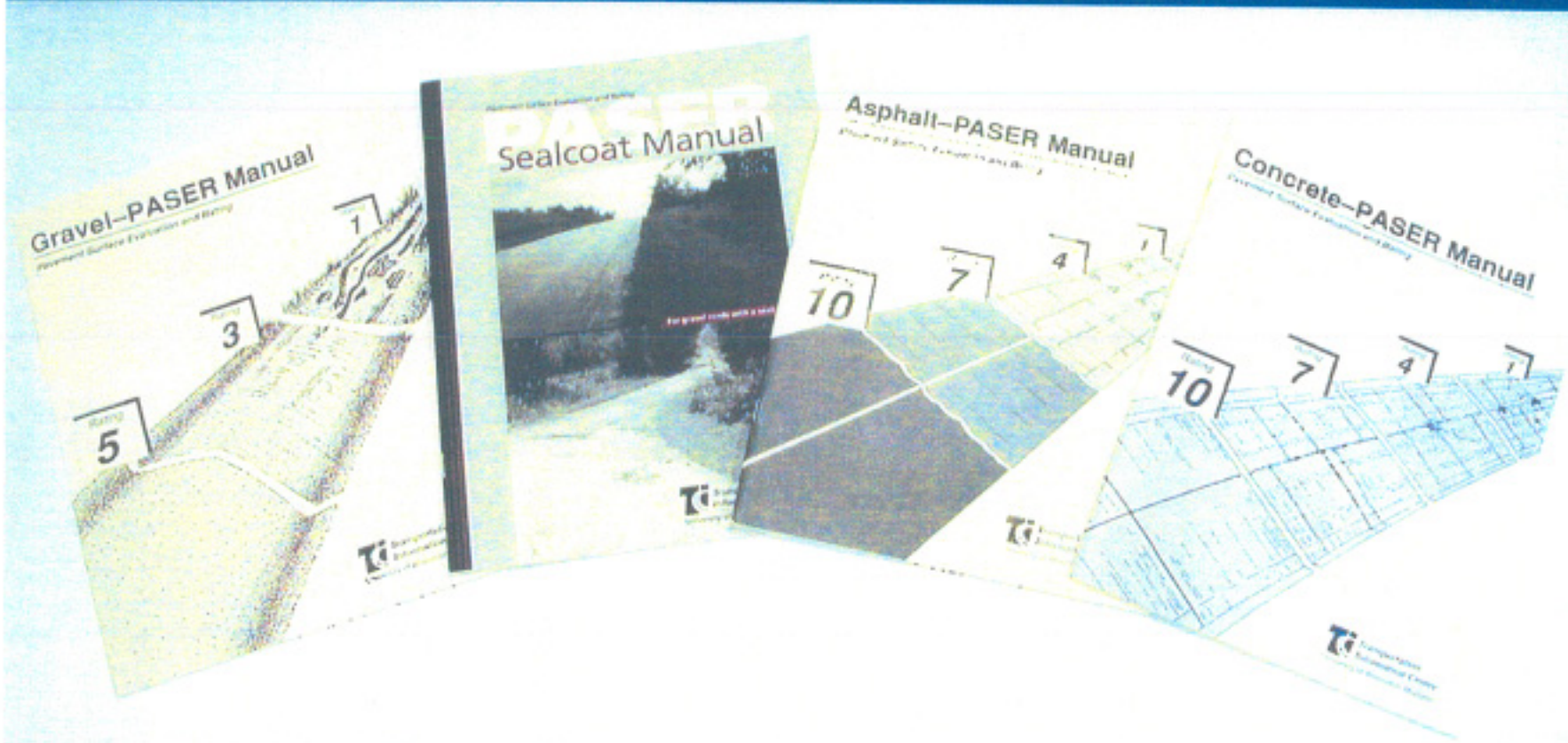


Exhibit 1

PASER – Rating System

Surface Rating	Visible Distress*	General Condition/ Treatment Measures
10 Excellent	None.	New construction.
9 Excellent	None.	Recent overlay, like new.
8 Very Good	No longitudinal cracks except reflection of paving joints. Occasional transverse cracks, widely spaced (40' or greater). All cracks sealed or tight (open 1/4" or less).	Recent sealcoat or new road mix. Little or no maintenance required.
7 Good	Very slight or no ravelling, surface shows some traffic wear. Longitudinal cracks (open 1/4") due to reflection or paving joints. Transverse cracks (open 1/4") spaced 10 feet or more apart, little or slight crack ravelling. No patching or very few patches in excellent condition.	First signs of aging. Maintain with routine crack filling.
6 Good	Slight ravelling (loss of fines) and traffic wear. Longitudinal cracks (open 1/4"–1/2") due to reflection and paving joints. Transverse cracking (open 1/4" to 1/2") some spaced less than 10 feet. First sign of block cracking. Slight to moderate flushing or polishing. Occasional patching in good condition.	Show signs of aging, sound structural condition. Could extend life with sealcoat.
5 Fair	Moderate to severe ravelling (loss of fine and coarse aggregate). Longitudinal and transverse cracks (open 1/2") show first signs of slight ravelling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Some patching or edge wedging in good condition.	Surface aging, sound structural condition. Needs sealcoat or nonstructural overlay.
4 Fair	Severe surface ravelling. Multiple longitudinal and transverse cracking, with slight ravelling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (1/2" deep or less).	Significant aging and first signs of need for strengthening. Would benefit from recycling or overlay.
3 Poor	Closely spaced longitudinal and transverse cracks often showing ravelling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate rutting or distortion (1" or 2" deep). Occasional potholes.	Needs patching and major overlay or complete recycling.
2 Very Poor	Alligator cracking (over 25% of surface). Severe distortions (over 2" deep). Extensive patching in poor condition. Potholes.	Severe deterioration. Needs reconstruction with extensive base repair.
1 Failed	Severe distress with extensive loss of surface integrity.	Failed. Needs total reconstruction.

* *Note:* **Individual pavements will *not* have all of the types of distress listed for any particular rating. They may have only one or two types.**

Exhibit 2

Rating 7

Routine crack filling required

Roads show first signs of aging, and they may have very slight raveling. Any longitudinal cracks are along paving joint. Transverse cracks may be approximately 10 feet apart. All cracks are 1/4" or less with little or no crack erosion. Few if any patches, all in very good condition.

Transverse and longitudinal cracks

Cracks are tight and sealed

Transverse cracks

About 10' apart and well sealed

Rating 7

Longitudinal crack

Open crack at construction joint and tight transverse cracks

Good example of a 7 rating

Too many cracks to rate 8; cracks are too tight and small to rate 6

Exhibit 3

Rating 3

Structural improvement required

Roads must be strengthened soon. Will require a thick overlay or recycling and very likely will require pavement patching and repair beforehand. Cracking will likely be extensive and show raveling and erosion. Surface may have severe block cracking and show first signs of alligator cracking. Patches are in fair to poor condition. There is moderate distortion or rutting (1"-2") and occasional potholes.

Many, ravelled cracks

Wide and ravelled cracks indicate need for recycling asphalt surface

Severe block cracking

Open cracks with some deterioration

Rating 3

Alligator cracking

Near edge. Needs repair and drainage improvement prior to rehabilitation

Patches and distortion

Patches are in poor condition with road settled around patch

Exhibit 4

Rating 2

Reconstruction required

Roads are severely deteriorated and need reconstruction. These roads have more than 25% alligator cracking, severe distortion, potholes or extensive patches in poor condition.

Extensive alligator cracking

Patches and rutting

Patches are in poor condition and there is rutting in wheelpaths

Severe edge distortion

Water trapped at pavement edge softening subgrade

Rating 1

Reconstruction required

Roads have failed, showing severe distress and extensive loss of surface integrity

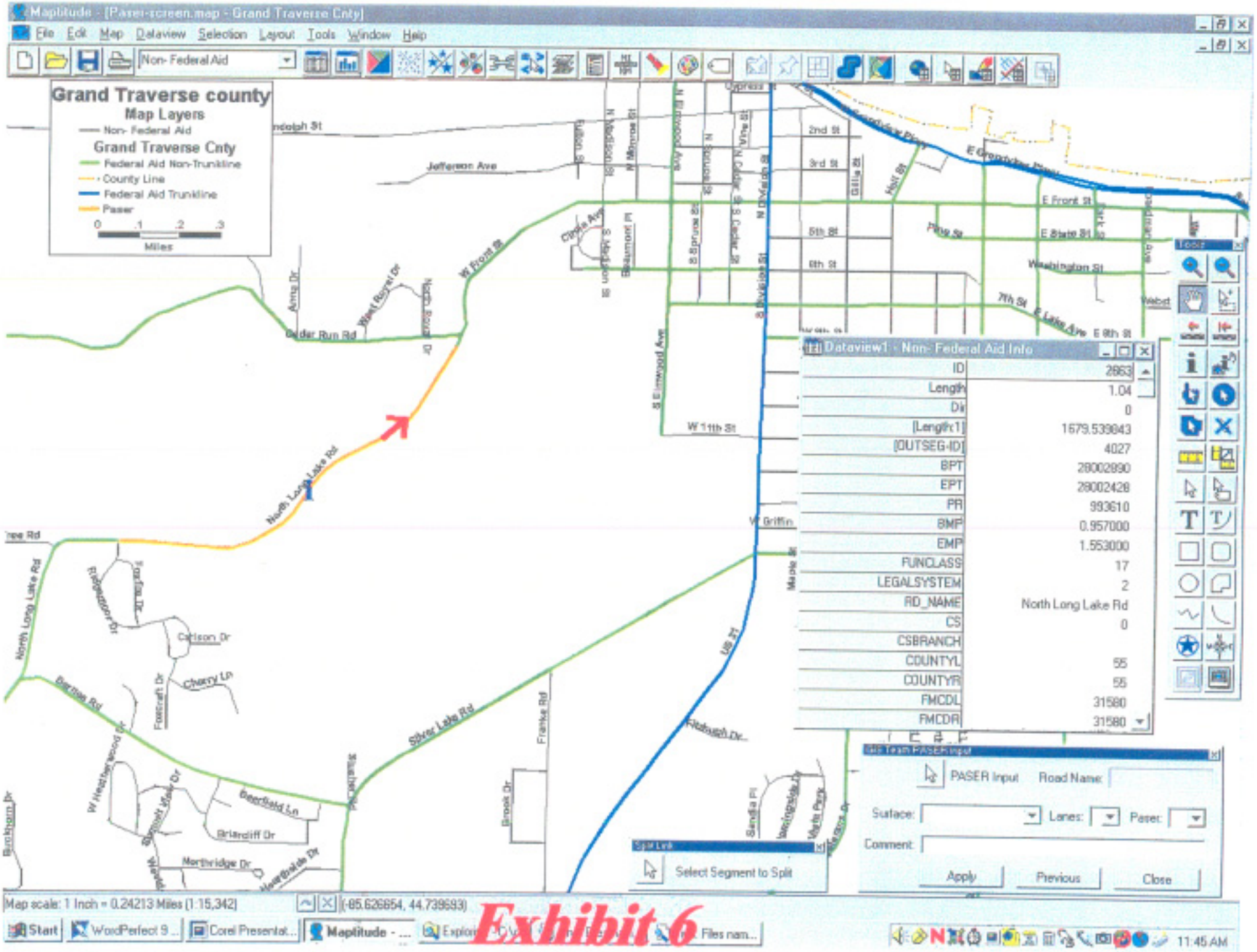
Potholes

Extensive loss of surface

Failed

Pavement surface mostly lost

Exhibit 5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Grand Traverse county
Map Layers
Non- Federal Aid
Grand Traverse Cnty
Federal Aid Non-Trunkline
County Line
Federal Aid Trunkline
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EMP 1.553000
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LEGALSYSTEM 2
RD_NAME North Long Lake Rd
CS 0
CSBRANCH
COUNTYL 55
COUNTYR 55
FMCDL 31580
FMCDR 31580
PASER Input
Road Name:
Surface:
Lanes:
Paser:
Comment:
Apply
Previous
Close
Select Segment to Split
Jefferson Ave
W Front St
Cedar Run Rd
North Long Lake Rd
Silver Lake Rd
US 31
W 11th St
E Front St
E State St
Washington St
E Lake Ave
Map scale: 1 Inch = 0.24213 Miles (1:15,342)
(-85.626854, 44.739593)
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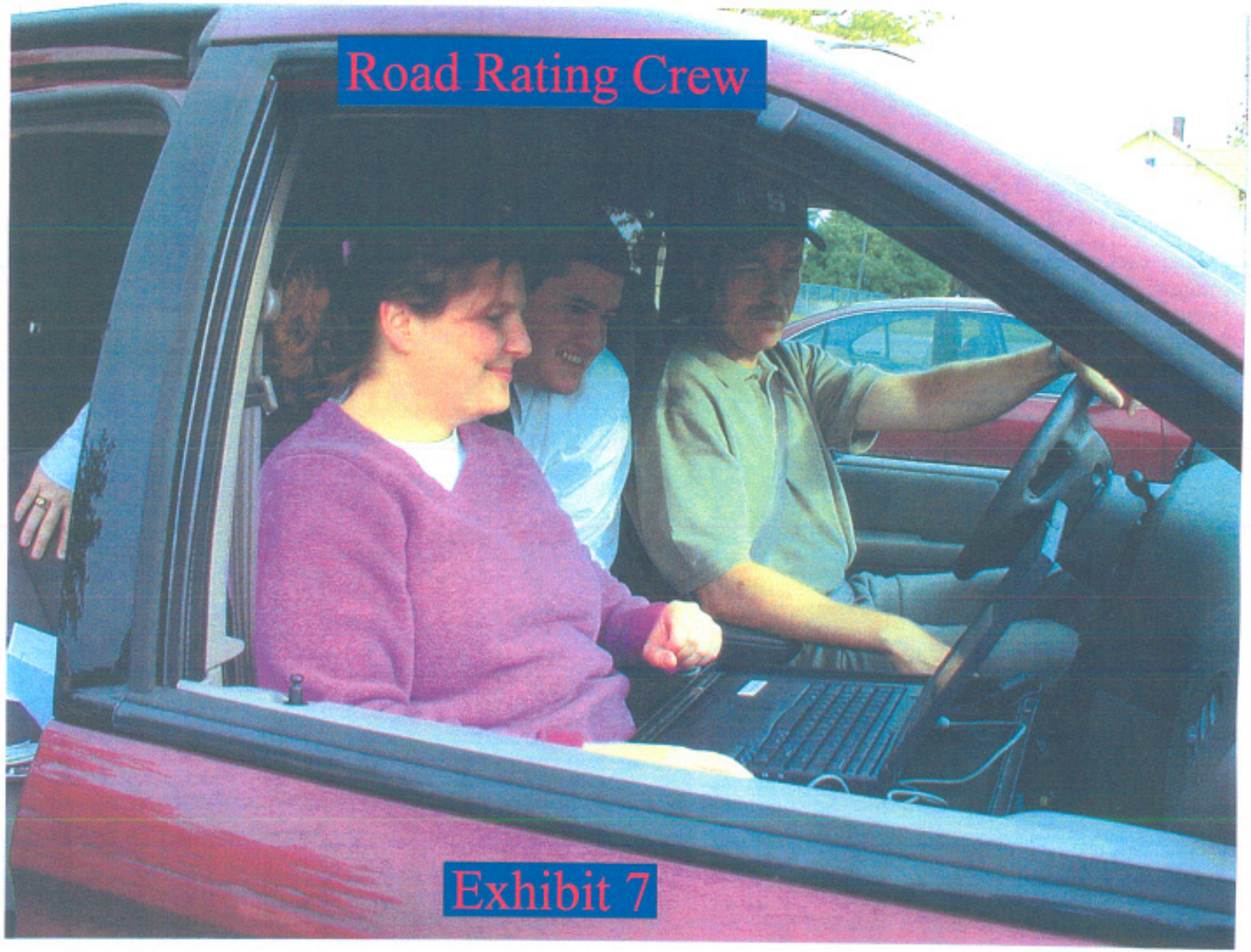
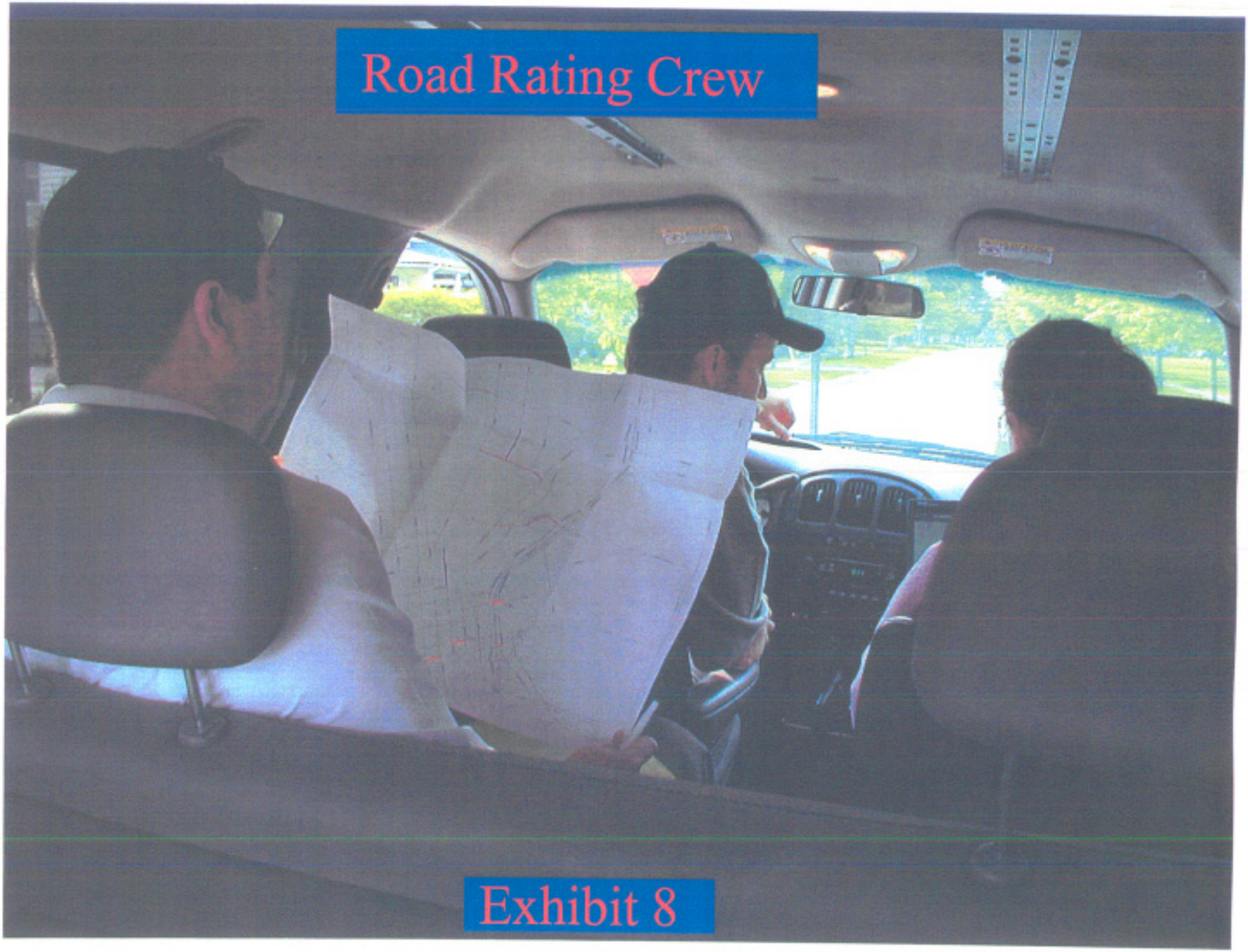
Corel Presentat...
Maplitude - ...
11:45 AM

Exhibit 6


Road Rating Crew
Exhibit 7


Road Rating Crew
Exhibit 8

Genesee County Road Rating Team

Exhibit 9

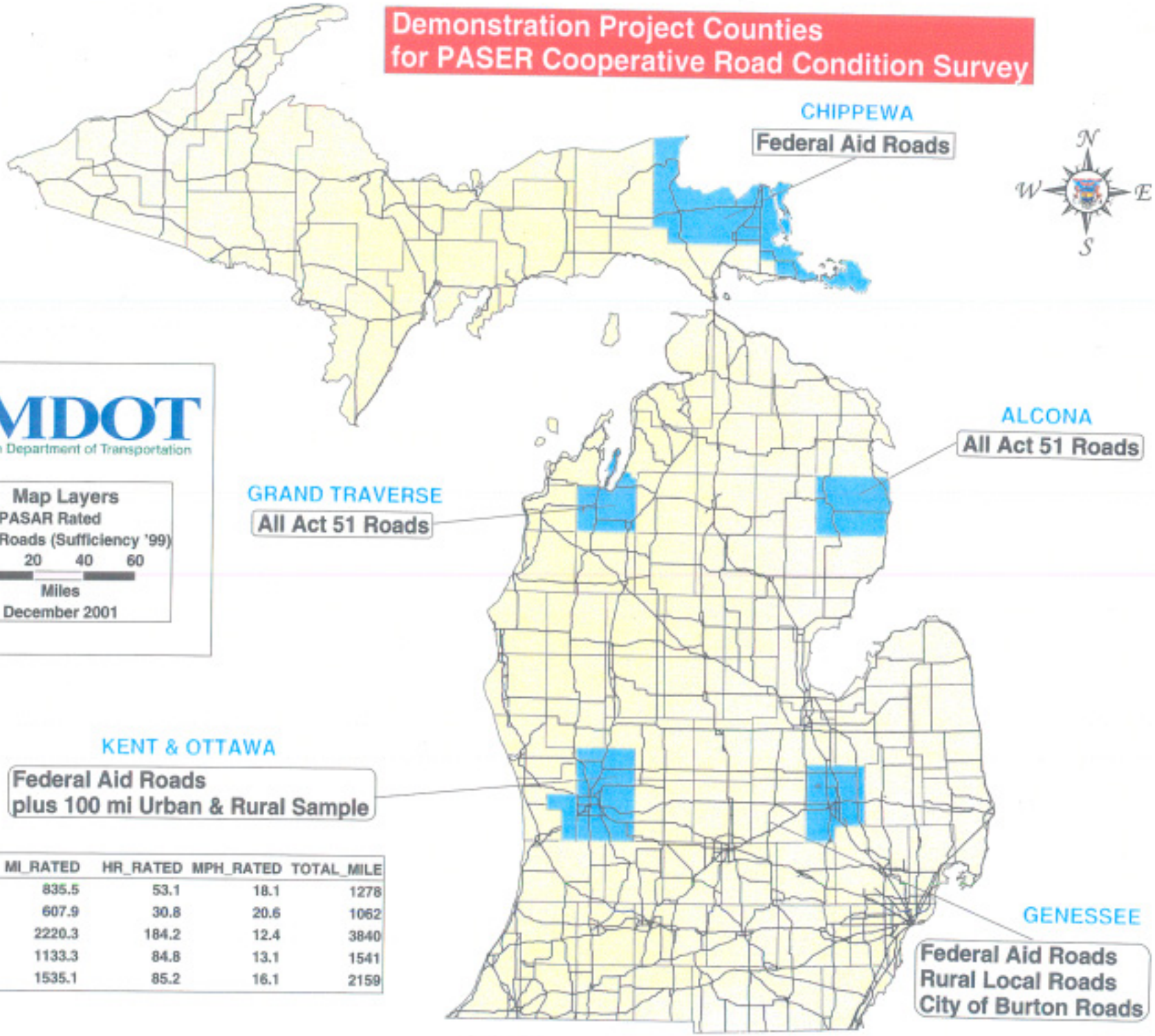

GRAND TRAVERSE
COUNTY
ROAD COMMISSION
Exhibit 10


Alcona County Road Rating Team
Exhibit 11

Chippewa County Road Rating Team

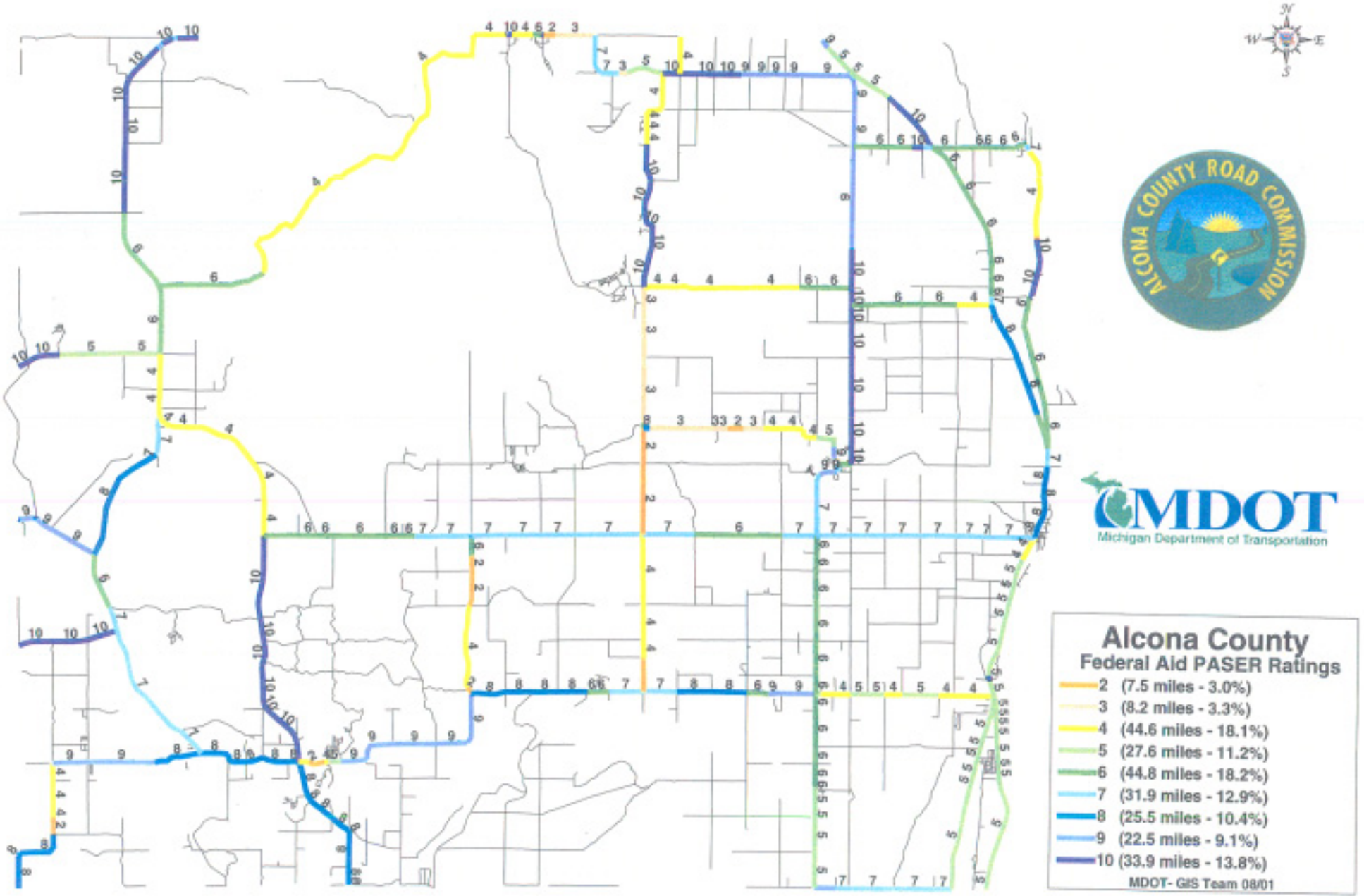
Exhibit 12

Demonstration Project Counties for PASER Cooperative Road Condition Survey

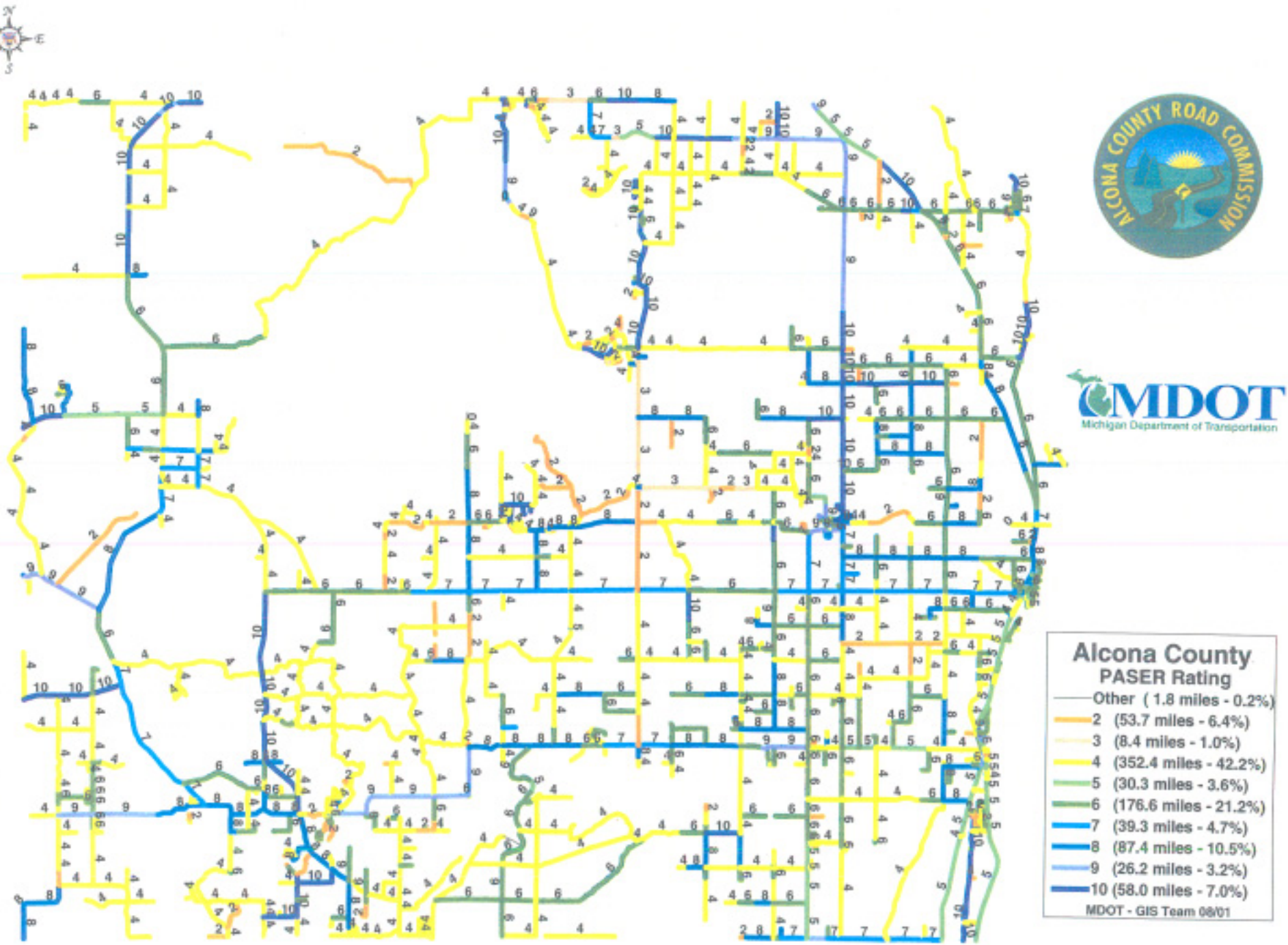


COUNTY	MI_RATED	HR_RATED	MPH_RATED	TOTAL_MILE
Alcona	835.5	53.1	18.1	1278
Chippewa	607.9	30.8	20.6	1062
Genesee	2220.3	184.2	12.4	3840
Gd. Traverse	1133.3	84.8	13.1	1541
Kent	1535.1	85.2	16.1	2159

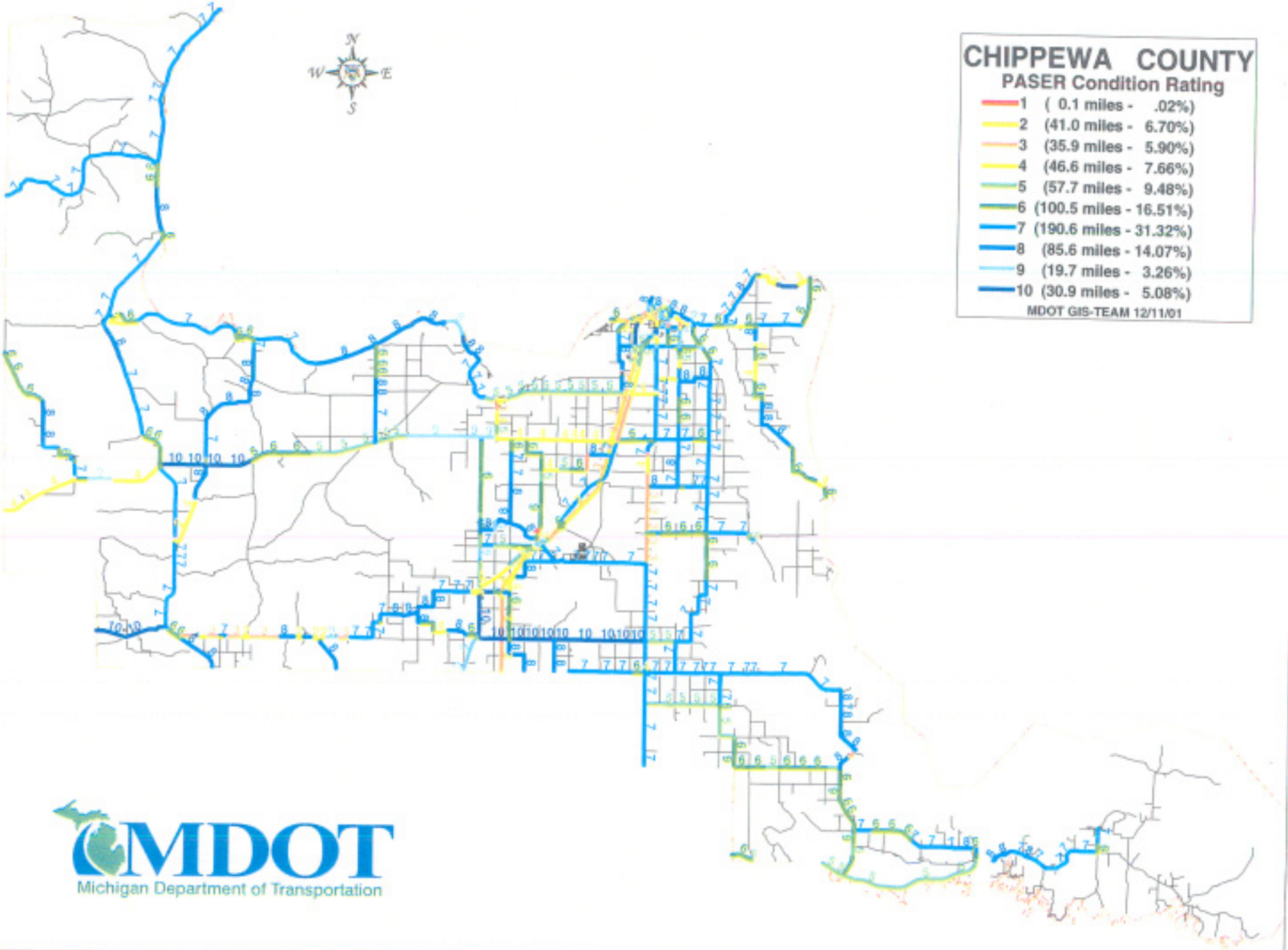
Map 1


ALCONA COUNTY ROAD COMMISSION
MDOT
Michigan Department of Transportation
Alcona County
Federal Aid PASER Ratings
2 (7.5 miles - 3.0%)
3 (8.2 miles - 3.3%)
4 (44.6 miles - 18.1%)
5 (27.6 miles - 11.2%)
6 (44.8 miles - 18.2%)
7 (31.9 miles - 12.9%)
8 (25.5 miles - 10.4%)
9 (22.5 miles - 9.1%)
10 (33.9 miles - 13.8%)
MDOT- GIS Team 08/01

Map 2


N
W
E
S
ALCONA COUNTY ROAD COMMISSION
MDOT
Michigan Department of Transportation
Alcona County
PASER Rating
Other (1.8 miles - 0.2%)
2 (53.7 miles - 6.4%)
3 (8.4 miles - 1.0%)
4 (352.4 miles - 42.2%)
5 (30.3 miles - 3.6%)
6 (176.6 miles - 21.2%)
7 (39.3 miles - 4.7%)
8 (87.4 miles - 10.5%)
9 (26.2 miles - 3.2%)
10 (58.0 miles - 7.0%)
MDOT - GIS Team 08/01

Map 3


CHIPPEWA COUNTY
PASER Condition Rating
1 (0.1 miles - .02%)
2 (41.0 miles - 6.70%)
3 (35.9 miles - 5.90%)
4 (46.6 miles - 7.66%)
5 (57.7 miles - 9.48%)
6 (100.5 miles - 16.51%)
7 (190.6 miles - 31.32%)
8 (85.6 miles - 14.07%)
9 (19.7 miles - 3.26%)
10 (30.9 miles - 5.08%)
MDOT GIS-TEAM 12/11/01
N
W
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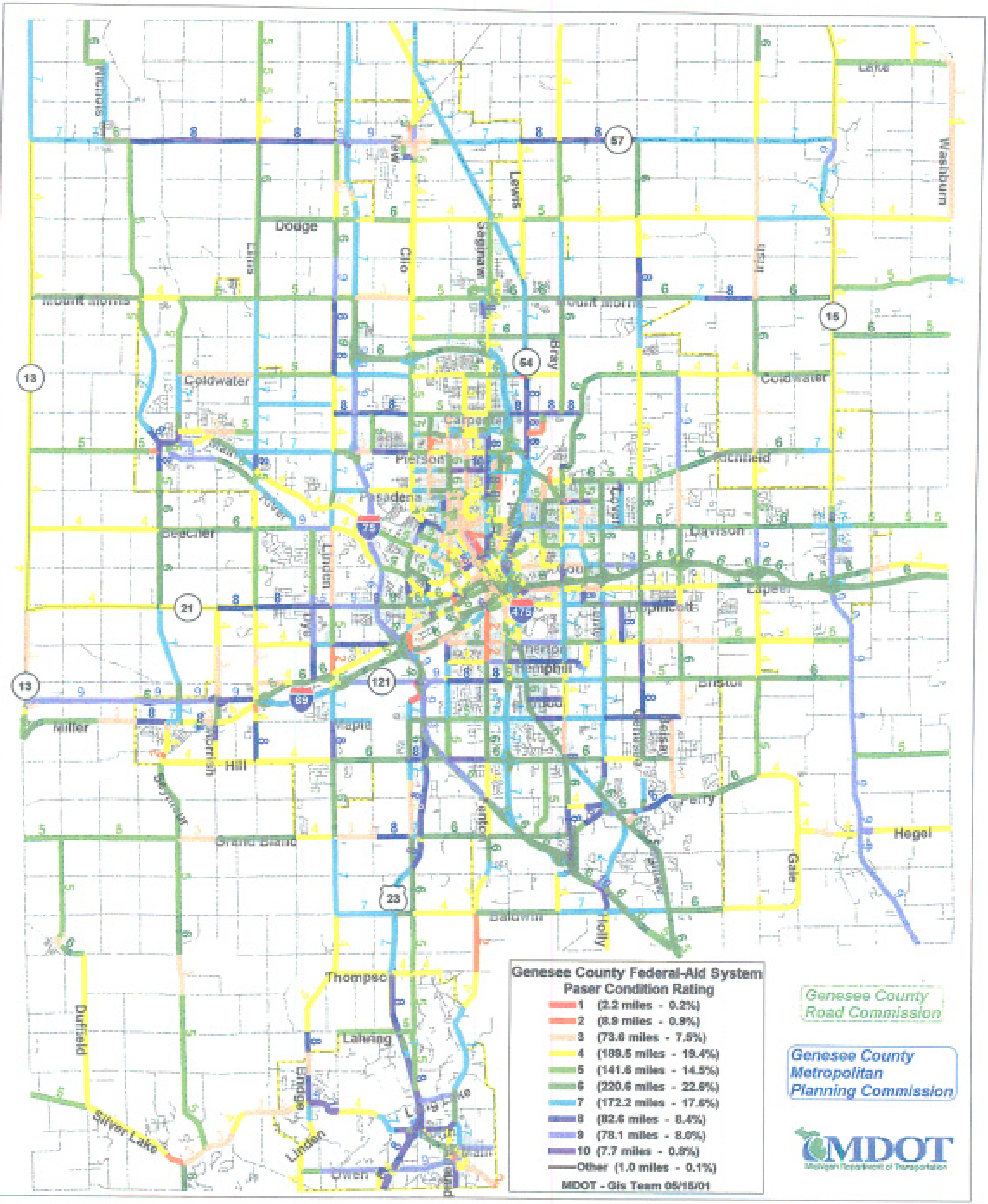
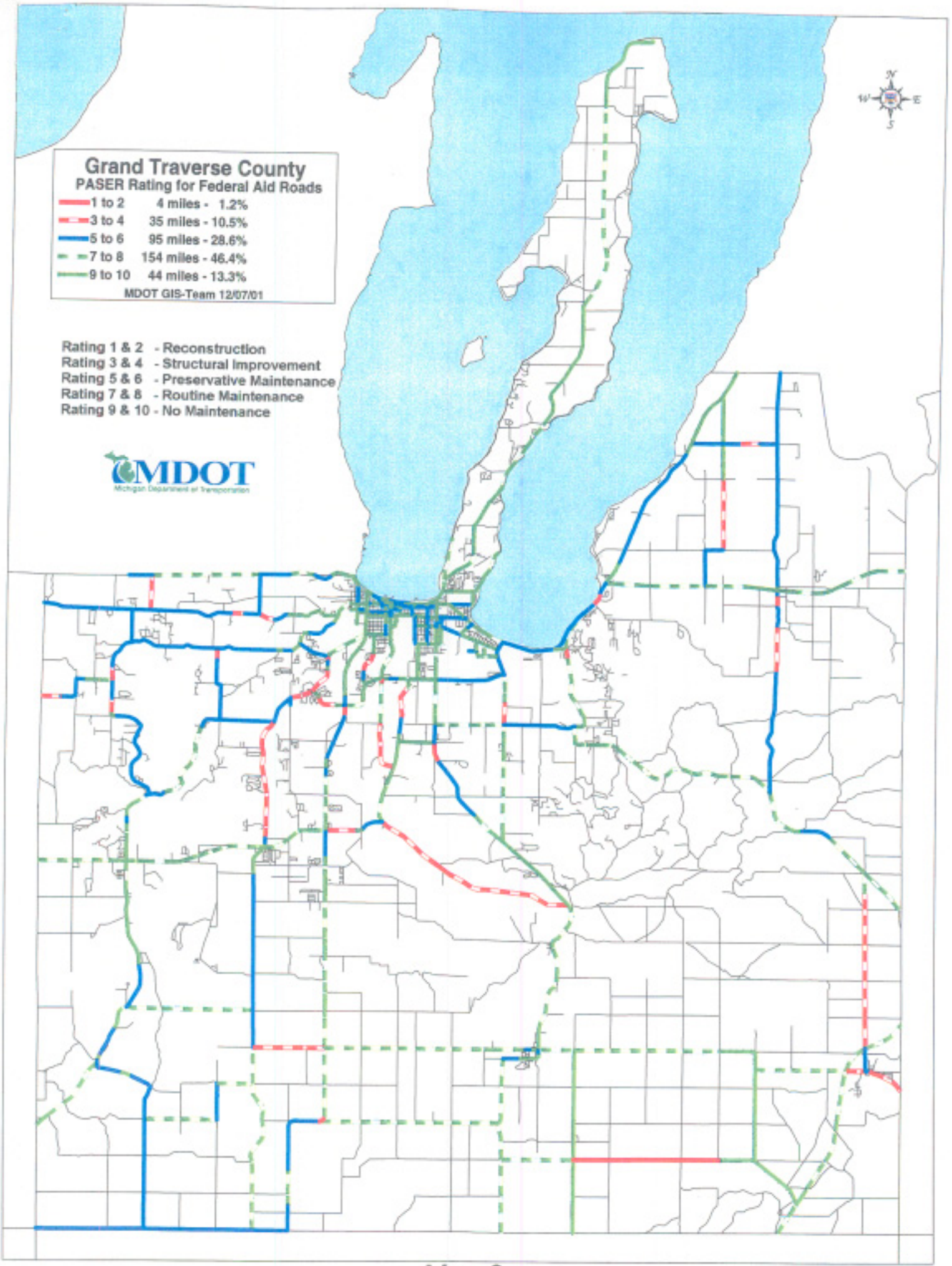
S
MDOT
Michigan Department of Transportation

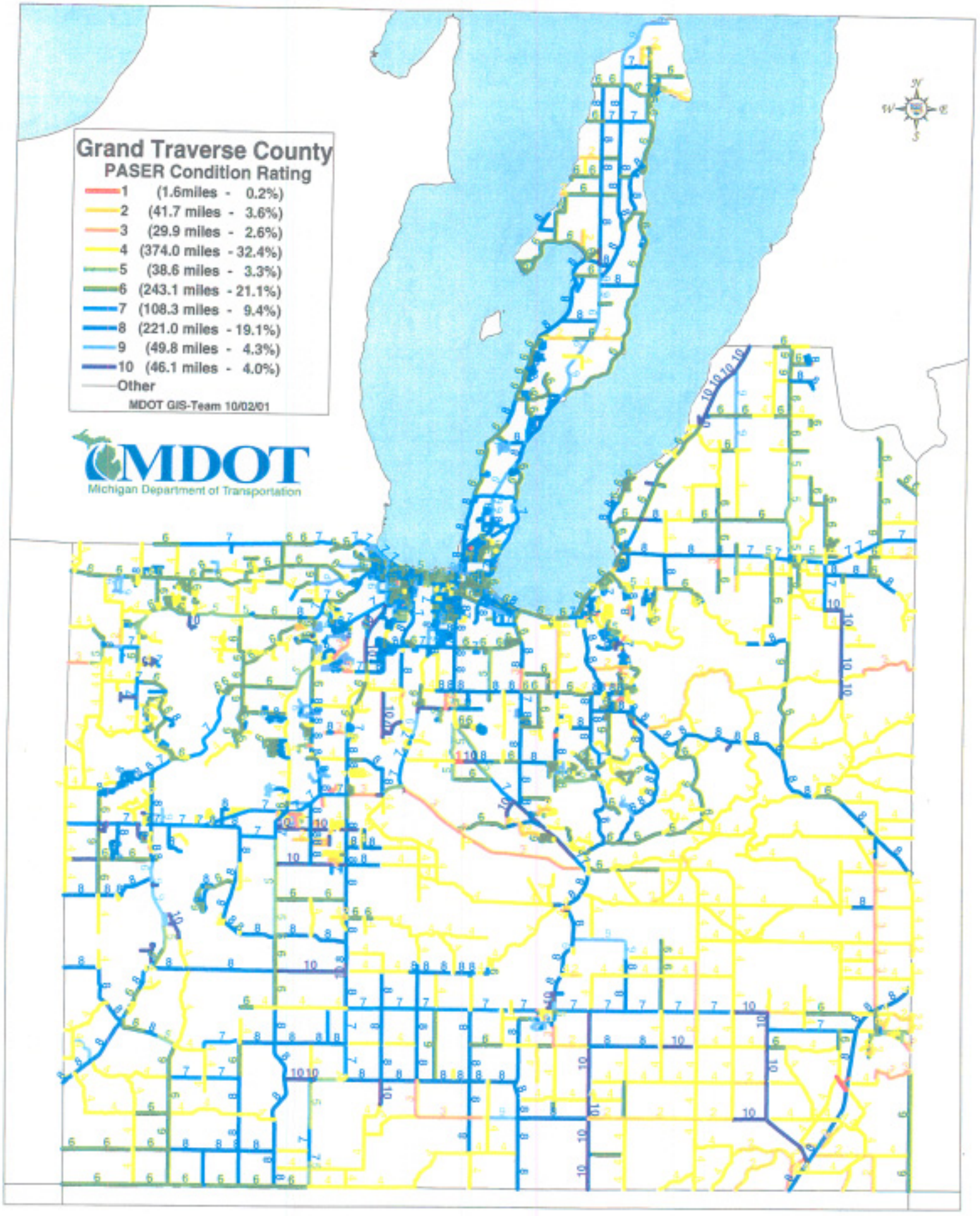
Map 4


Genesee County Federal-Aid System
Paser Condition Rating
1 (2.2 miles - 0.2%)
2 (8.9 miles - 0.9%)
3 (73.6 miles - 7.5%)
4 (189.5 miles - 19.4%)
5 (141.6 miles - 14.5%)
6 (220.6 miles - 22.6%)
7 (172.2 miles - 17.6%)
8 (82.6 miles - 8.4%)
9 (78.1 miles - 8.0%)
10 (7.7 miles - 0.8%)
Other (1.0 miles - 0.1%)
MDOT - Gis Team 05/15/01
Genesee County Road Commission
Genesee County Metropolitan Planning Commission
MDOT
Michigan Department of Transportation
Dodge
Coldwater
Beecher
Miller
Hill
Grand Blanc
Baldwin
Thompson
Lahring
Silver Lake
Duffield
Hegel
Gale
Davison
Lapeer
Bristol
Hemphill
Pasadena
Pierson
Carpenter
Richfield
Washburn
Lake
Lewis
Clio
Saginaw
Bray
Linden
Maple
Holly
Owen
Fenton
Genesee
Belsay
Irish
Mount Morris
Nichols
13
15
21
23
54
57
69
75
121
475

Map 5


Grand Traverse County
PASER Rating for Federal Aid Roads
1 to 2 4 miles - 1.2%
3 to 4 35 miles - 10.5%
5 to 6 95 miles - 28.6%
7 to 8 154 miles - 46.4%
9 to 10 44 miles - 13.3%
MDOT GIS-Team 12/07/01
Rating 1 & 2 - Reconstruction
Rating 3 & 4 - Structural Improvement
Rating 5 & 6 - Preservative Maintenance
Rating 7 & 8 - Routine Maintenance
Rating 9 & 10 - No Maintenance
MDOT
Michigan Department of Transportation
N
W
E
S

Map 6


Grand Traverse County
PASER Condition Rating
1 (1.6miles - 0.2%)
2 (41.7 miles - 3.6%)
3 (29.9 miles - 2.6%)
4 (374.0 miles - 32.4%)
5 (38.6 miles - 3.3%)
6 (243.1 miles - 21.1%)
7 (108.3 miles - 9.4%)
8 (221.0 miles - 19.1%)
9 (49.8 miles - 4.3%)
10 (46.1 miles - 4.0%)
Other
MDOT GIS-Team 10/02/01
MDOT
Michigan Department of Transportation
N
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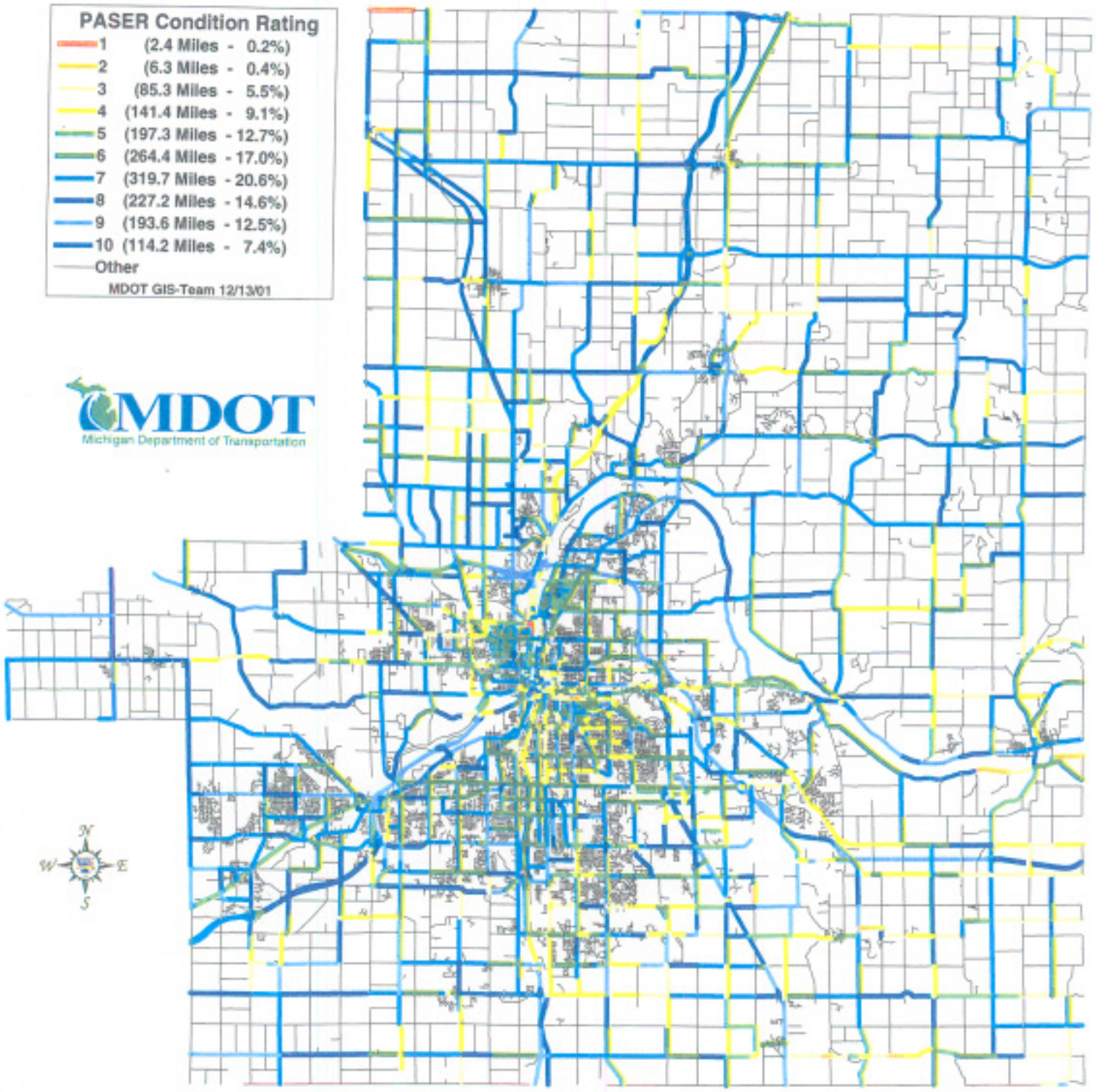
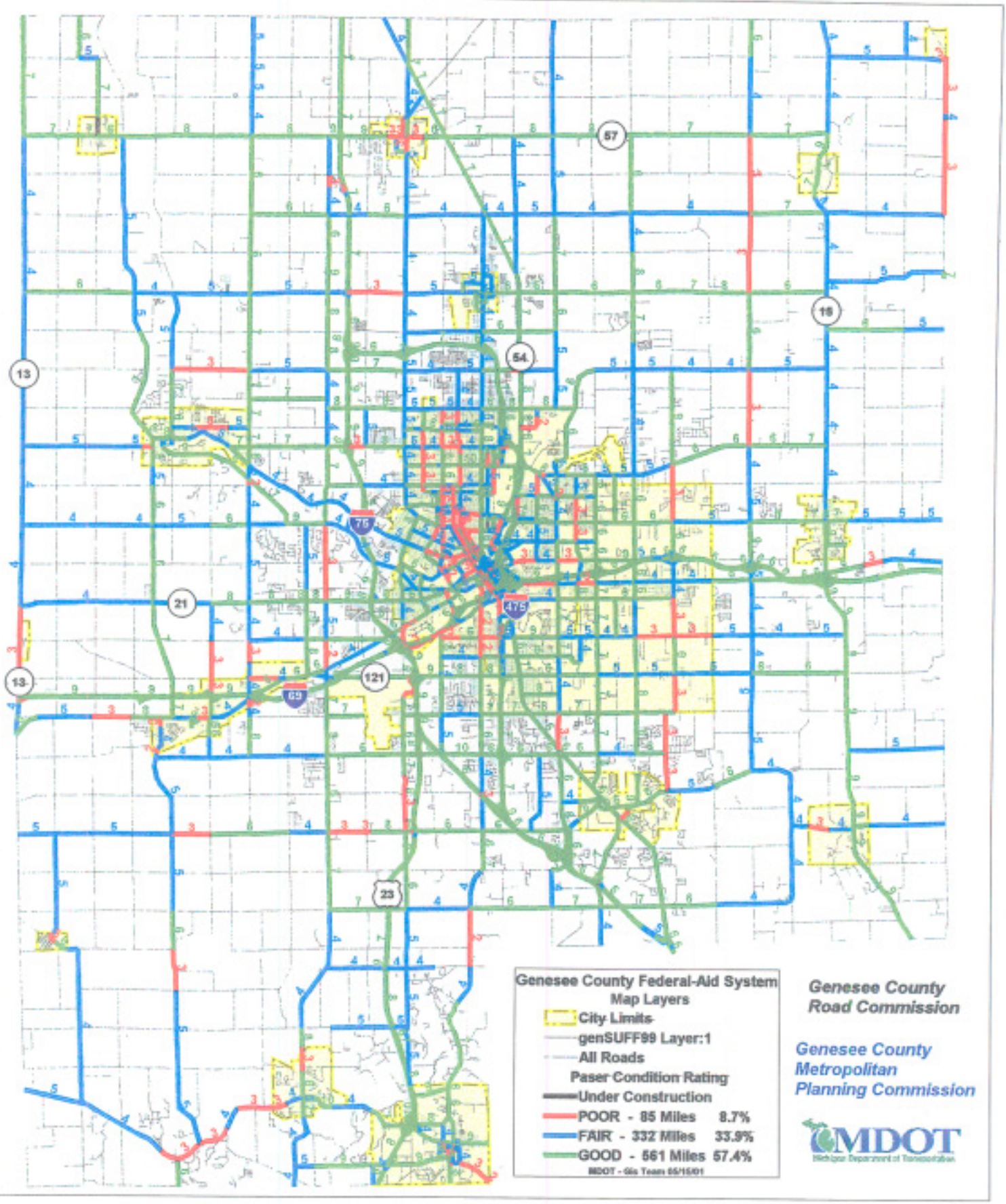
Map 7

PASER Rating

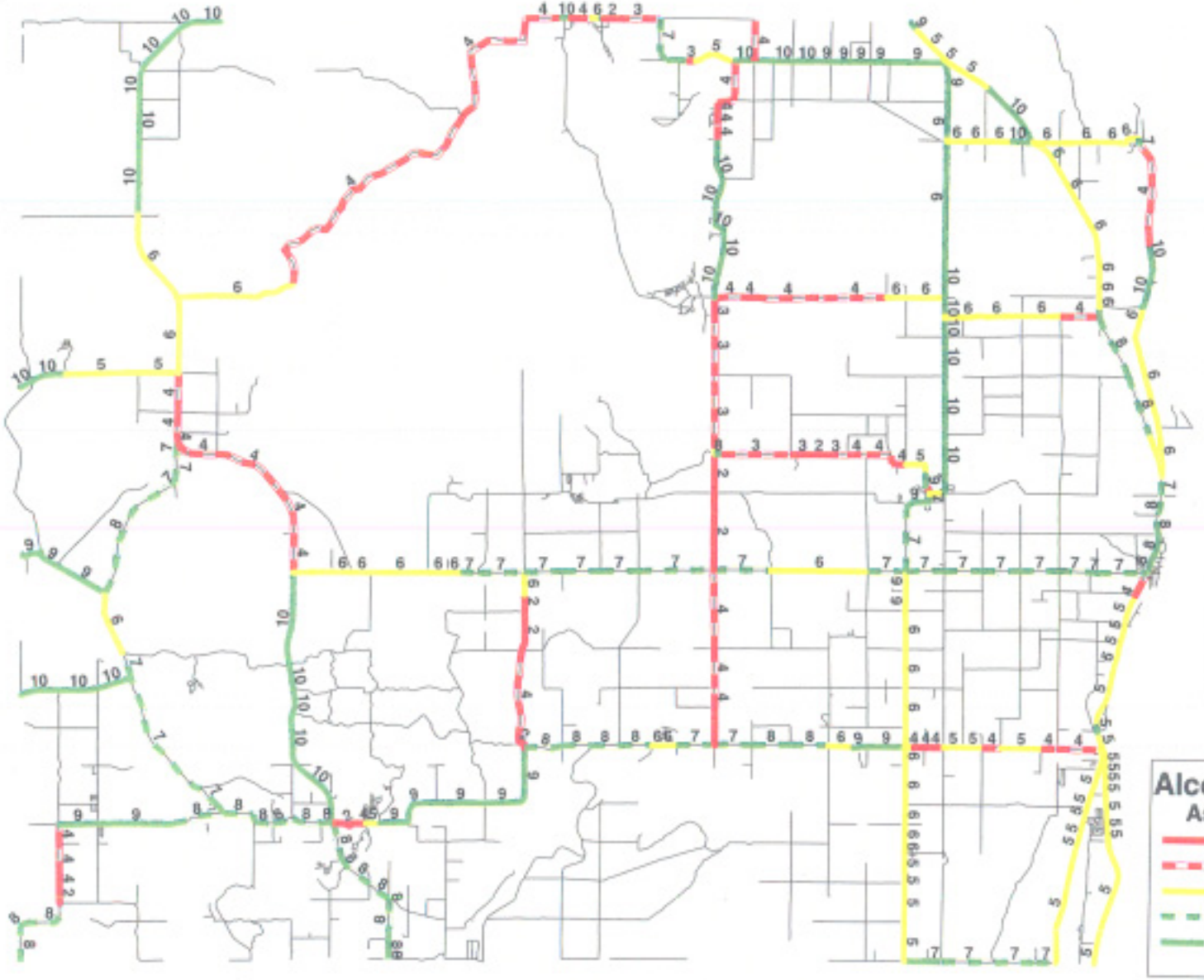
Kent County - Plus Ottawa County Portion of the Grand Valley Metro Council



Map 8


Genesee County Federal-Aid System
Map Layers
City Limits
genSUFF99 Layer:1
All Roads
Paser Condition Rating
Under Construction
POOR - 85 Miles 8.7%
FAIR - 332 Miles 33.9%
GOOD - 561 Miles 57.4%
MDOT - Gis Team 05/15/01
Genesee County
Road Commission
Genesee County
Metropolitan
Planning Commission
MDOT
Michigan Department of Transportation

Map 9



ALCONA COUNTY ROAD COMMISSION

MDOT
Michigan Department of Transportation

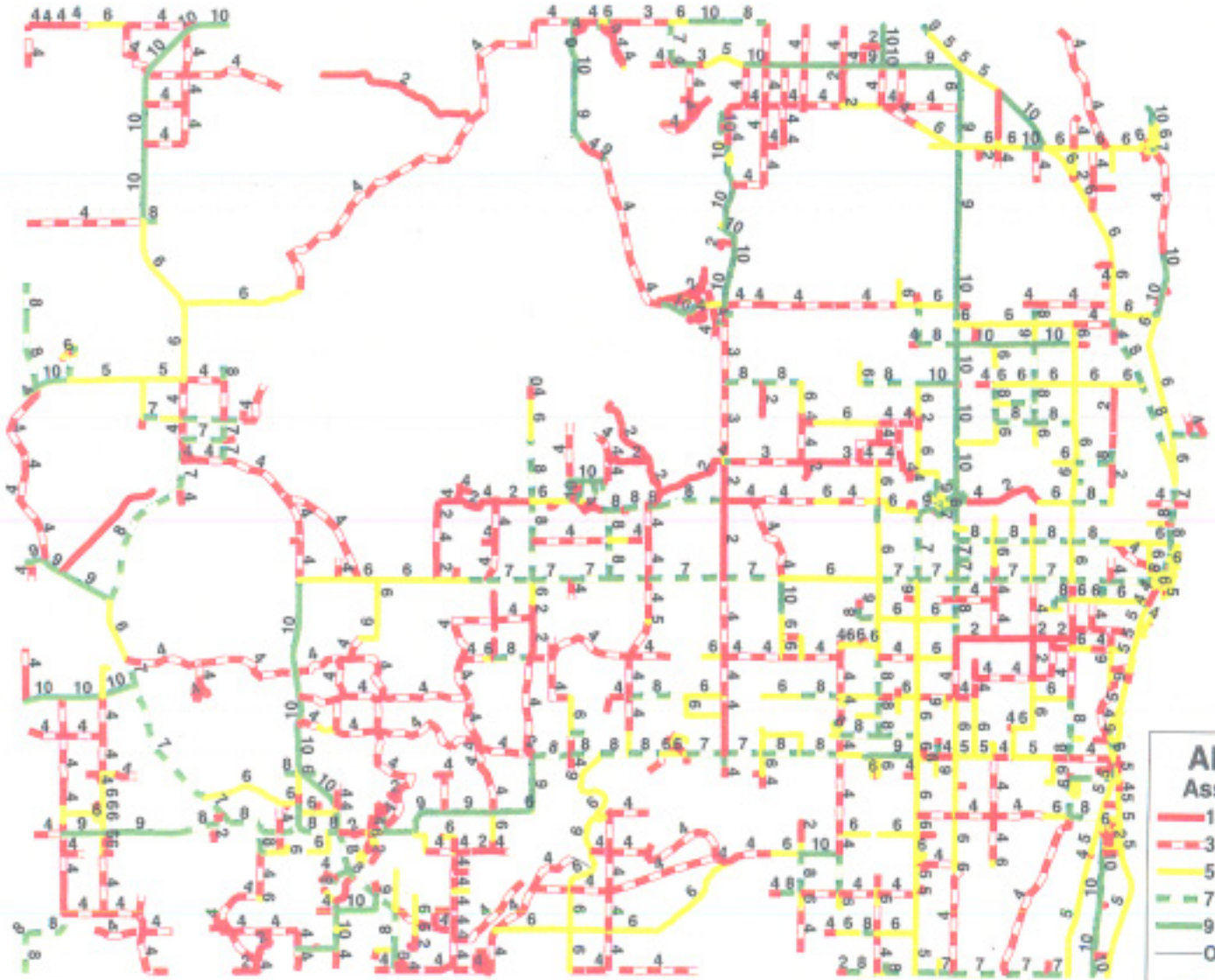
Rating 1 & 2 - Reconstruction
Rating 3 & 4 - Structural Improvement
Rating 5 & 6 - Preservative Maintenance
Rating 7 & 8 - Routine Maintenance
Rating 9 & 10 - No Maintenance

Alcona County - PASER Rating
Asset Mgt. Scale on Fed. Aid Roads

- 1 to 2 (7.5 miles - 3.0%)
- 3 to 4 (52.7 miles - 21.4%)
- 5 to 6 (72.4 miles - 29.4%)
- 7 to 8 (57.5 miles - 23.3%)
- 9 to 10 (56.4 miles - 22.9%)

MDOT - GIS Team 08/01

Map 10



ALCONA COUNTY ROAD COMMISSION

MDOT
Michigan Department of Transportation

Rating 1 & 2 - Reconstruction
Rating 3 & 4 - Structural Improvement
Rating 5 & 6 - Preservative Maintenance
Rating 7 & 8 - Routine Maintenance
Rating 9 & 10 - No Maintenance

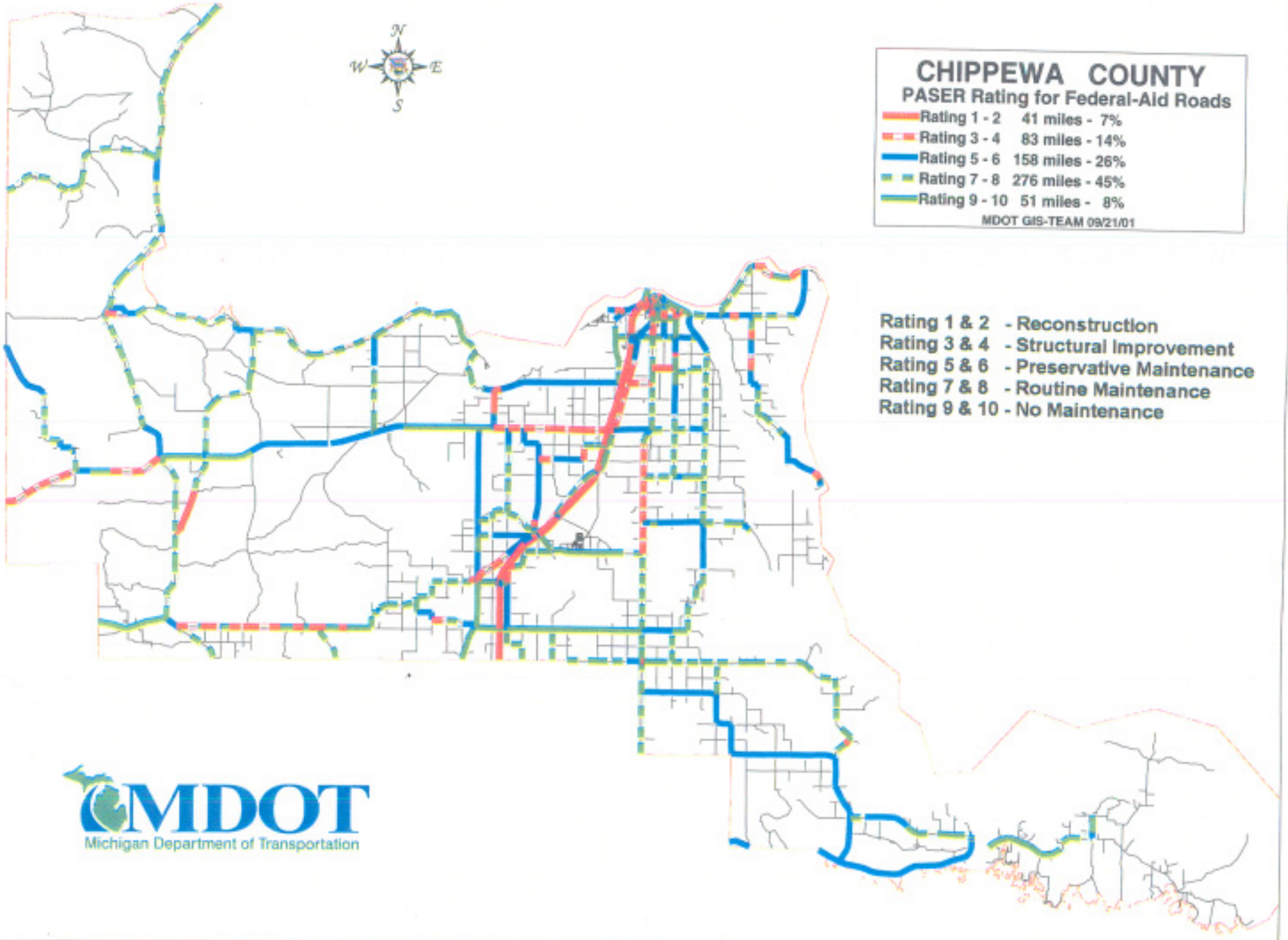
Alcona County - PASER Rating

Asset Mgt. Scale on Act 51 Certified Roads

- 1 to 2 (53.7 miles - 6.4%)
- 3 to 4 (360.8 miles - 43.3%)
- 5 to 6 (207.0 miles - 24.8%)
- 7 to 8 (126.6 miles - 15.2%)
- 9 to 10 (84.2 miles - 10.1%)
- Other (1.8 miles - 0.2%)

MDOT - GIS Team 08/01

Map 11


N
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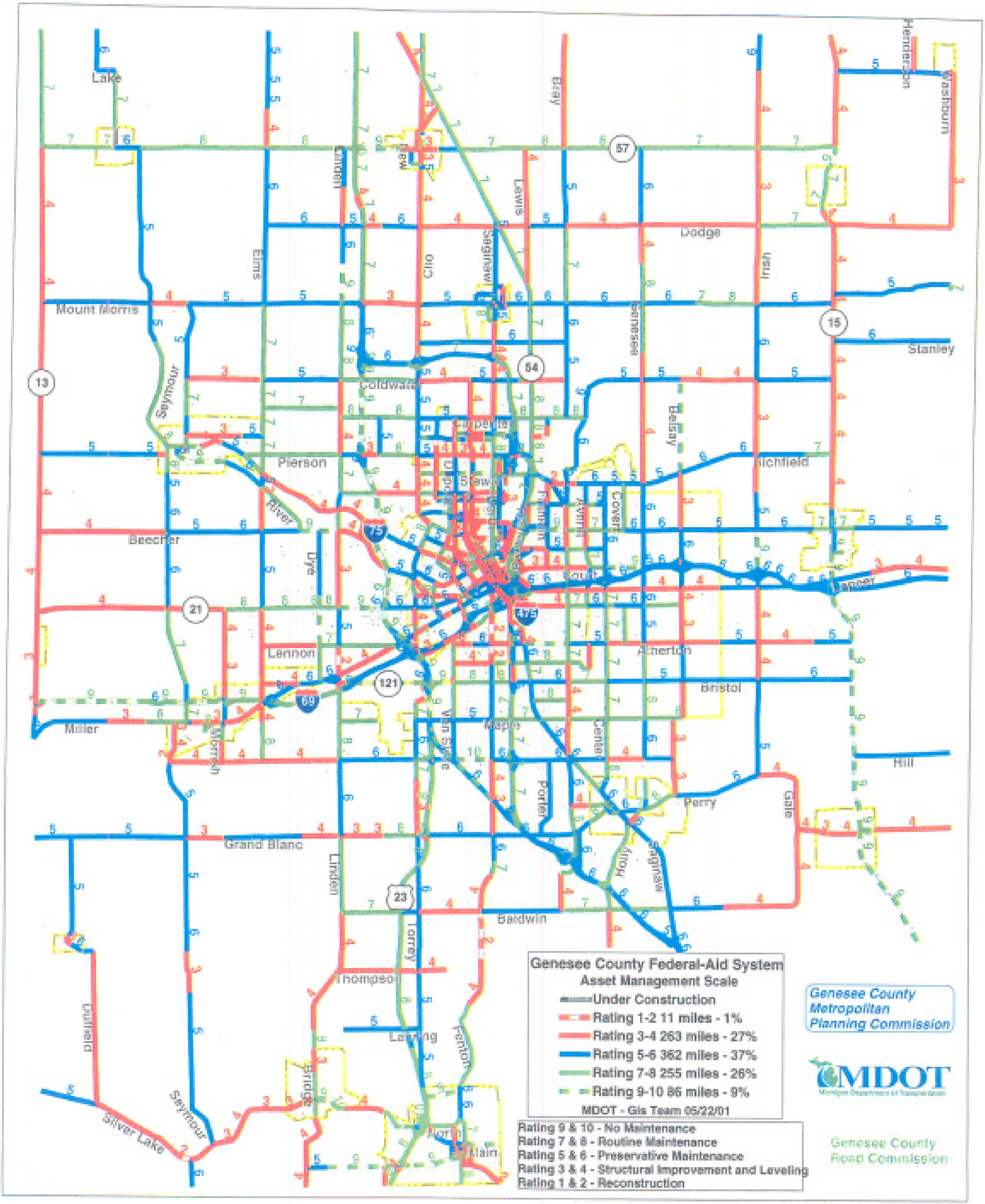
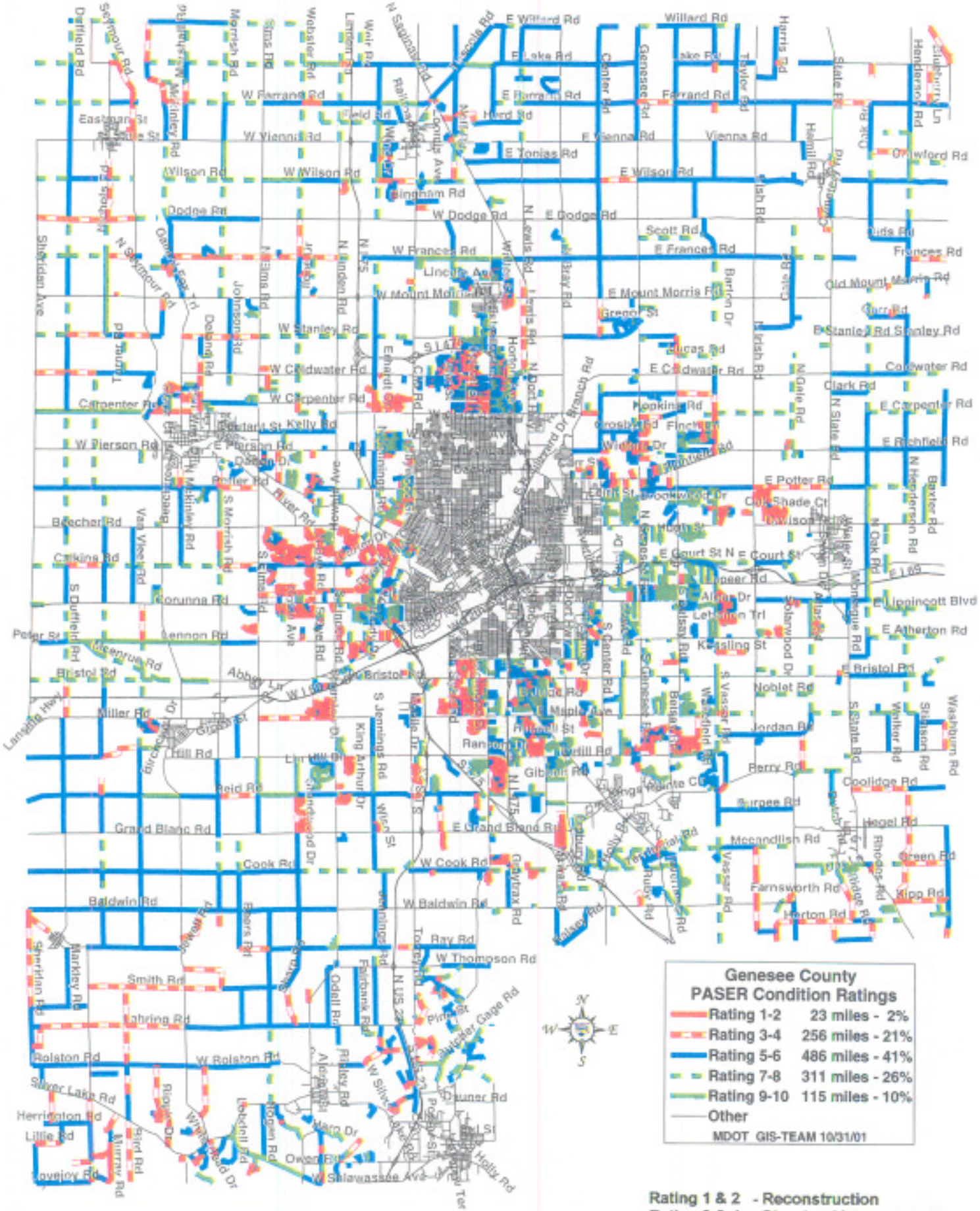
CHIPPEWA COUNTY
PASER Rating for Federal-Aid Roads
Rating 1 - 2 41 miles - 7%
Rating 3 - 4 83 miles - 14%
Rating 5 - 6 158 miles - 26%
Rating 7 - 8 276 miles - 45%
Rating 9 - 10 51 miles - 8%
MDOT GIS-TEAM 09/21/01
Rating 1 & 2 - Reconstruction
Rating 3 & 4 - Structural Improvement
Rating 5 & 6 - Preservative Maintenance
Rating 7 & 8 - Routine Maintenance
Rating 9 & 10 - No Maintenance
MDOT
Michigan Department of Transportation

Map 12


Genesee County Federal-Aid System
Asset Management Scale
Under Construction
Rating 1-2 11 miles - 1%
Rating 3-4 263 miles - 27%
Rating 5-6 362 miles - 37%
Rating 7-8 255 miles - 26%
Rating 9-10 86 miles - 9%
MDOT - Gis Team 05/22/01
Rating 9 & 10 - No Maintenance
Rating 7 & 8 - Routine Maintenance
Rating 5 & 6 - Preservative Maintenance
Rating 3 & 4 - Structural Improvement and Leveling
Rating 1 & 2 - Reconstruction
Genesee County Metropolitan Planning Commission
MDOT
Genesee County Road Commission
Lake
Henderson
Washburn
Bray
Linden
Lewis
Dodge
Elms
Clio
Saginaw
Irish
Mount Morris
Genesee
Stanley
Seymour
Coldwater
Belsay
Carpenter
Pierson
Richfield
Stewart
River
Beecher
Dye
Center
Lapeer
Lennon
Atherton
Bristol
Miller
Morrish
Maple
Van Slyke
Hill
Porter
Perry
Gale
Grand Blanc
Holly
Baldwin
Torrey
Thompson
Duffield
Fenton
Lansing
Bridge
Silver Lake
North
Main
13
21
57
54
15
75
475
69
121
23

Map 13

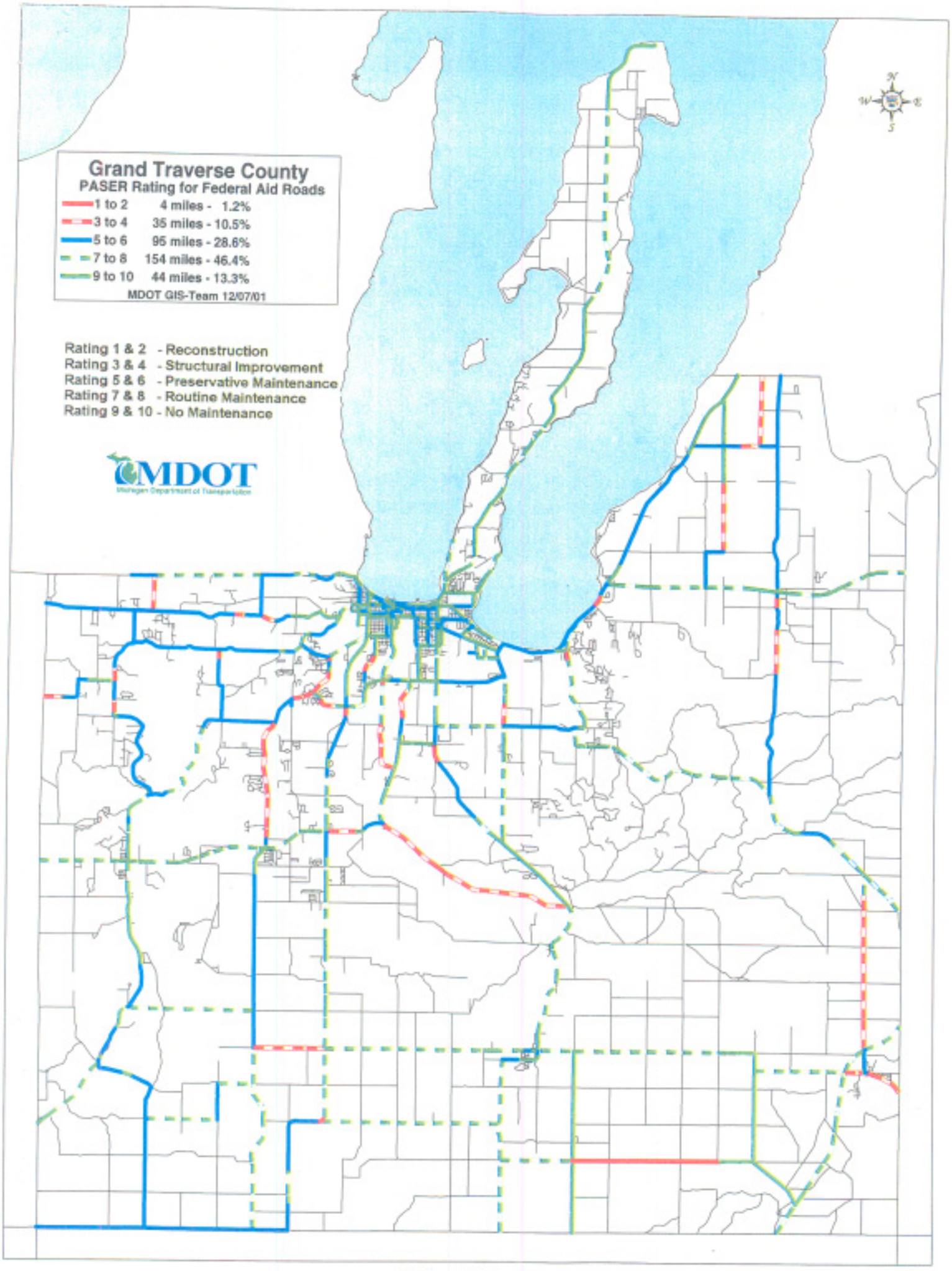


MDOT
Michigan Department of Transportation

Roads Rated Includes: Rural Non-Federal Aid and City of Burton Local Streets

Rating 1 & 2 - Reconstruction
Rating 3 & 4 - Structural Improvement
Rating 5 & 6 - Preservative Maintenance
Rating 7 & 8 - Routine Maintenance
Rating 9 & 10 - No Maintenance

Map 14


Grand Traverse County
PASER Rating for Federal Aid Roads
1 to 2 4 miles - 1.2%
3 to 4 35 miles - 10.5%
5 to 6 95 miles - 28.6%
7 to 8 154 miles - 46.4%
9 to 10 44 miles - 13.3%
MDOT GIS-Team 12/07/01
Rating 1 & 2 - Reconstruction
Rating 3 & 4 - Structural Improvement
Rating 5 & 6 - Preservative Maintenance
Rating 7 & 8 - Routine Maintenance
Rating 9 & 10 - No Maintenance
MDOT
Michigan Department of Transportation
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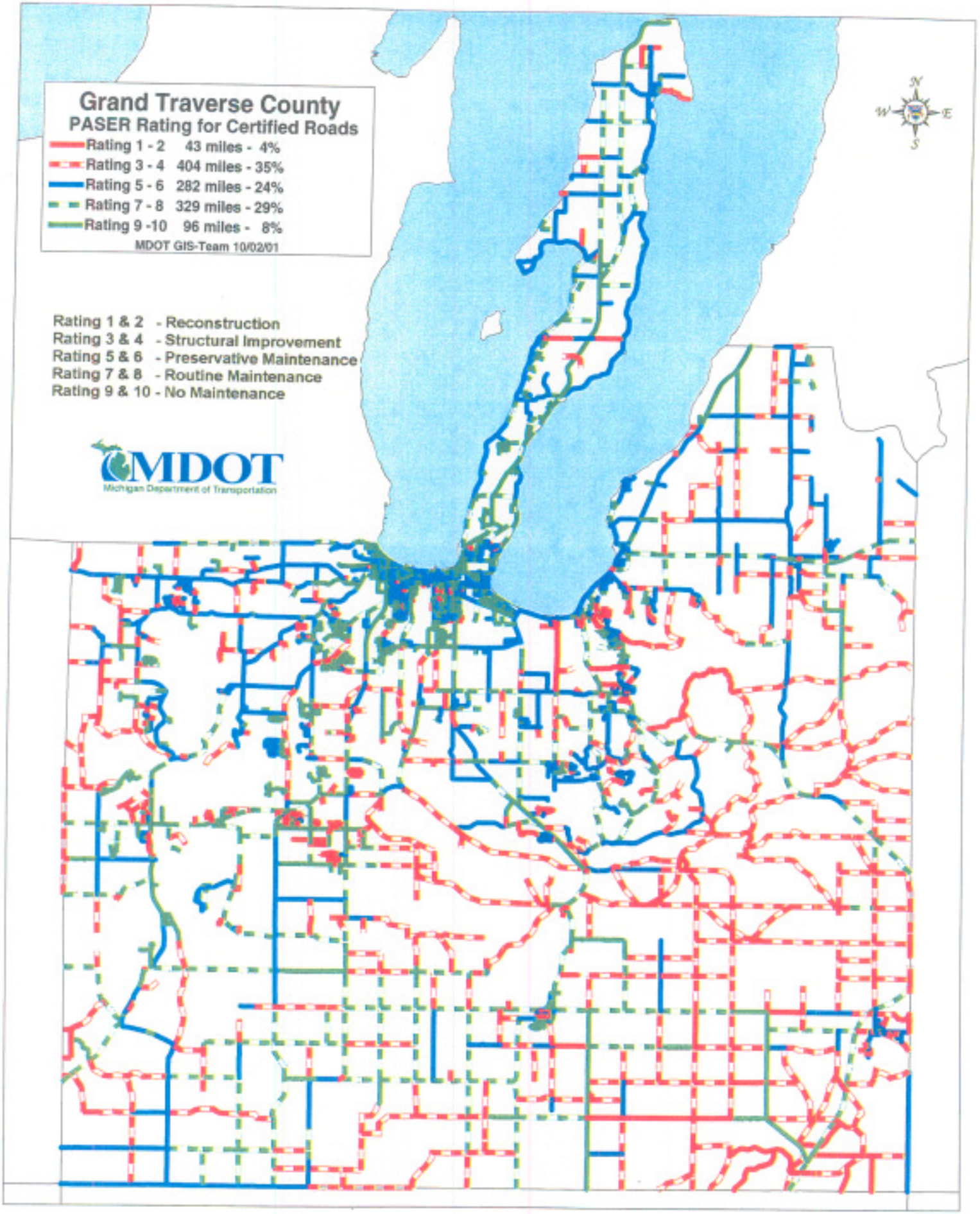
Grand Traverse County
PASER Rating for Certified Roads
Rating 1 - 2 43 miles - 4%
Rating 3 - 4 404 miles - 35%
Rating 5 - 6 282 miles - 24%
Rating 7 - 8 329 miles - 29%
Rating 9 -10 96 miles - 8%
MDOT GIS-Team 10/02/01
Rating 1 & 2 - Reconstruction
Rating 3 & 4 - Structural Improvement
Rating 5 & 6 - Preservative Maintenance
Rating 7 & 8 - Routine Maintenance
Rating 9 & 10 - No Maintenance
MDOT
Michigan Department of Transportation
N
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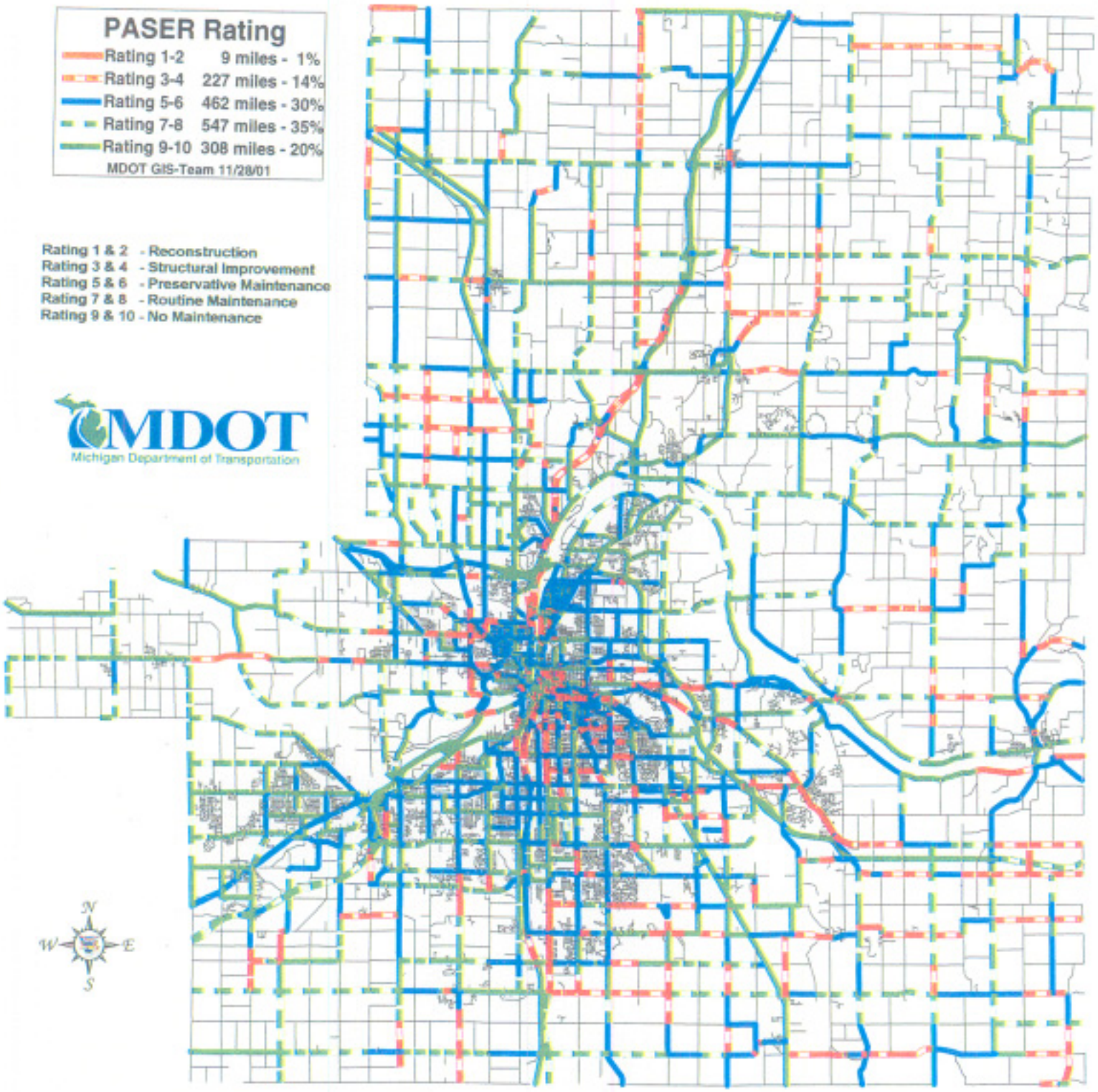
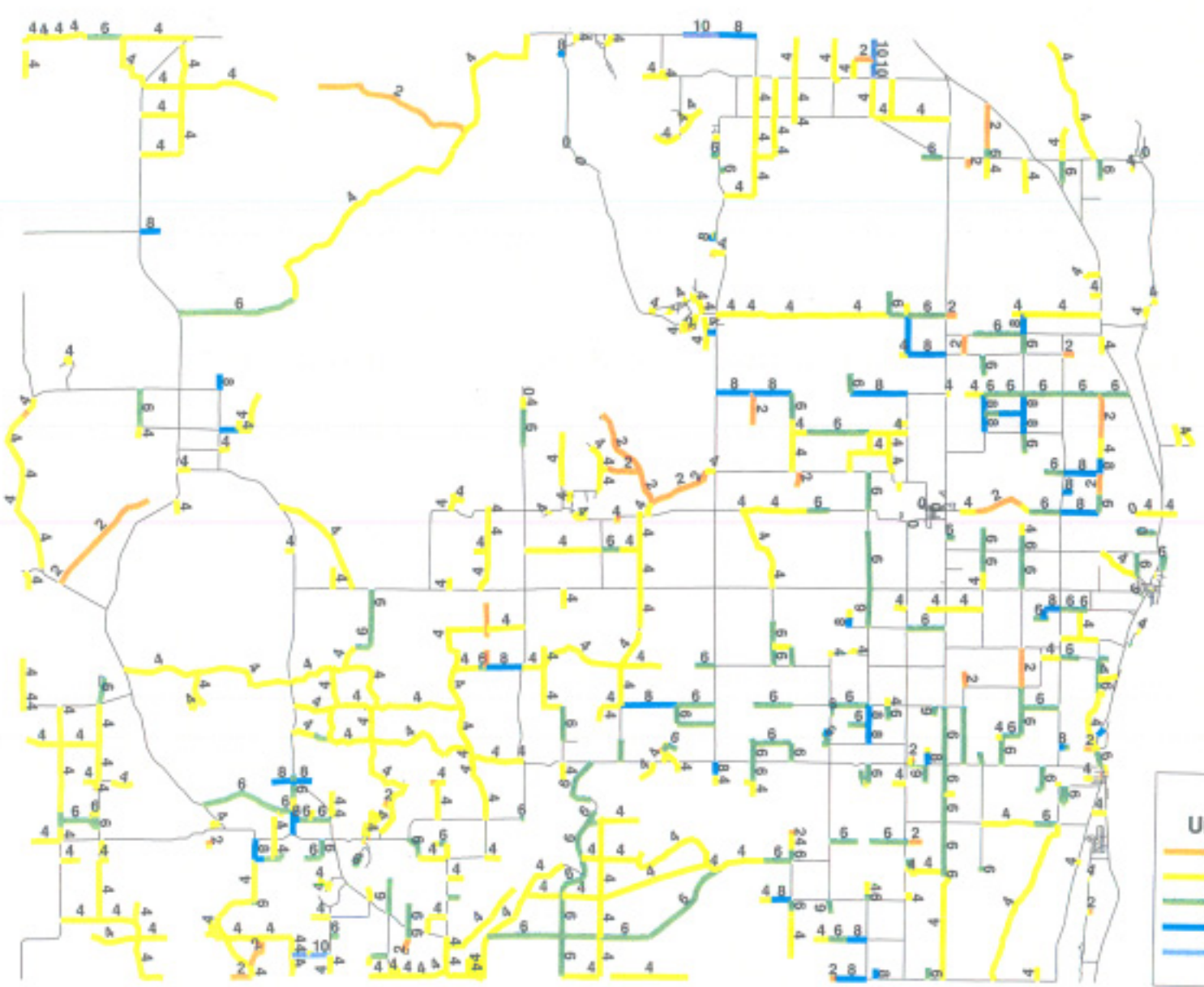
Map 16

PASER Ratings

Kent County - Plus Ottawa County Portion of the Grand Valley Metro Council



Map 17



ALCONA COUNTY ROAD COMMISSION

MDOT
Michigan Department of Transportation

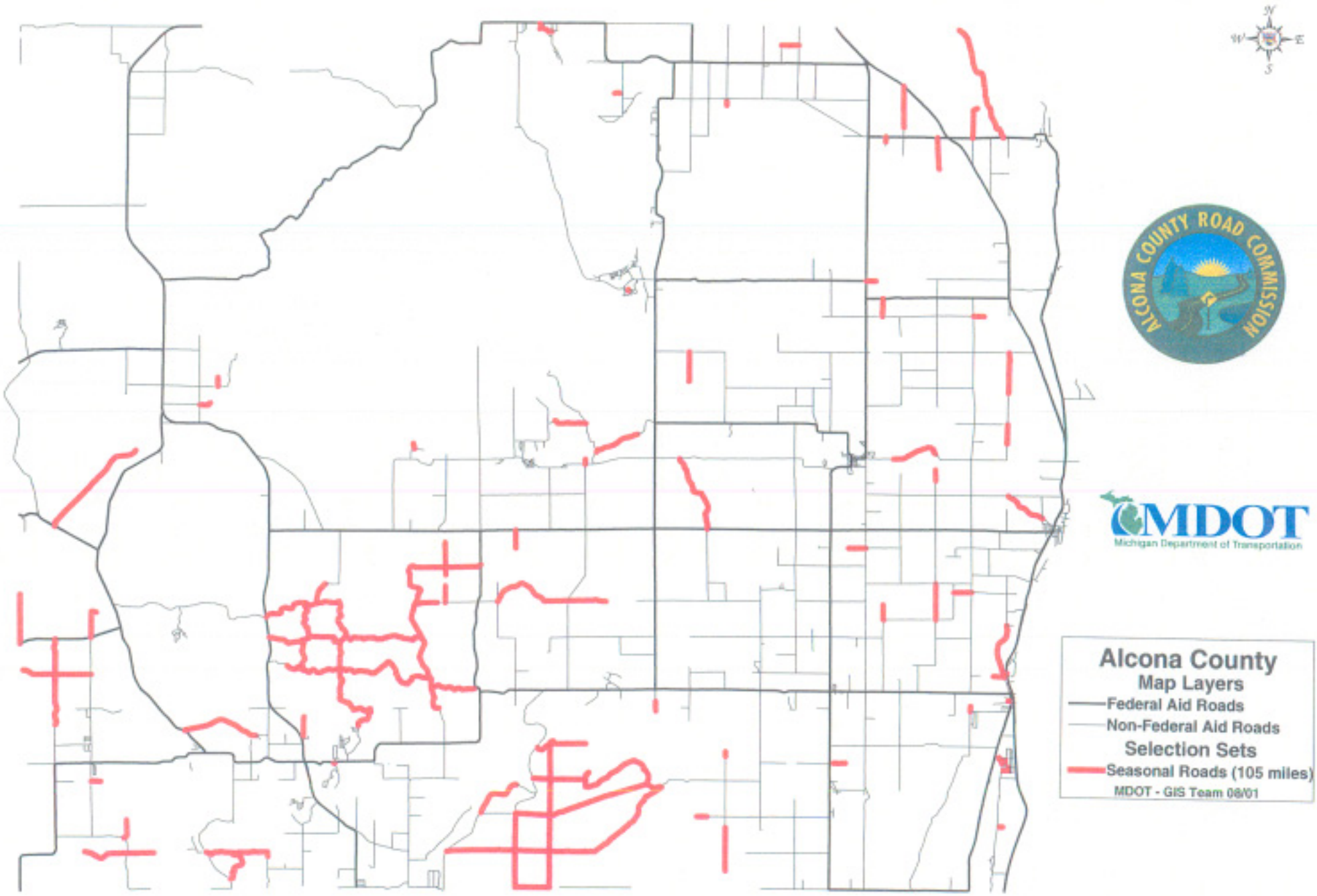
Rating 2 - Reconstruction
Rating 4 - Structural Improvement
Rating 6 - Preservative Maintenance
Rating 8 - Routine Maintenance
Rating 10 - No Maintenance

Alcona County
Unpaved Roads PASER Ratings

- 2 (28.8 miles - 7.0%)
- 4 (255.4 miles - 62.3%)
- 6 (98.4 miles - 24.0%)
- 8 (24.5 miles - 6.0%)
- 10 (3.0 miles - 0.7%)

MDOT - GIS Team 08/01

Map 18


N
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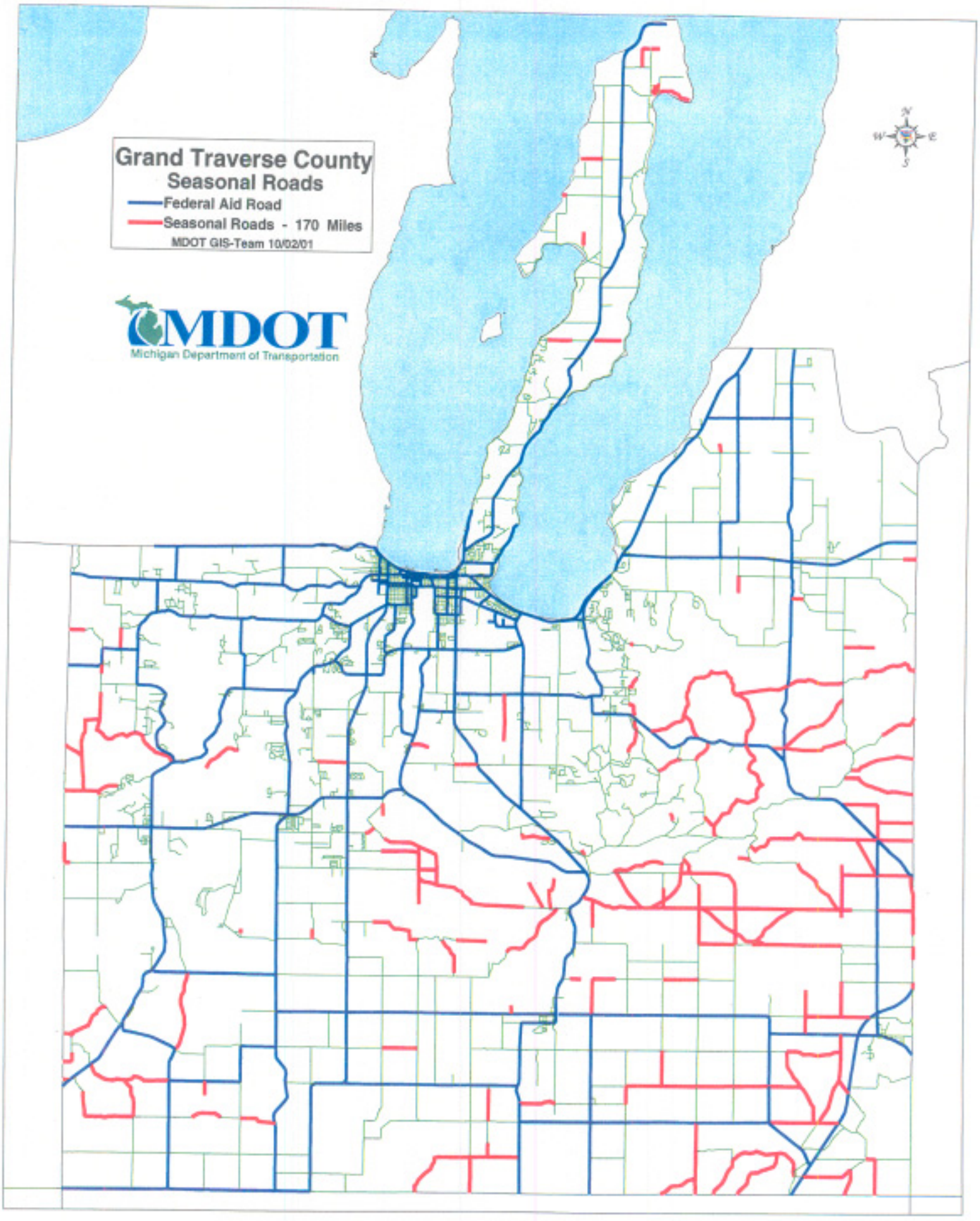
ALCONA COUNTY ROAD COMMISSION
MDOT
Michigan Department of Transportation
Alcona County
Map Layers
Federal Aid Roads
Non-Federal Aid Roads
Selection Sets
Seasonal Roads (105 miles)
MDOT - GIS Team 08/01

Map 19


Grand Traverse County
Seasonal Roads
Federal Aid Road
Seasonal Roads - 170 Miles
MDOT GIS-Team 10/02/01
MDOT
Michigan Department of Transportation
N
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E
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Map 20

Estimate of Time to Collect PASER Surface Condition Ratings

All Federal Aid and Rural Minor Collectors

COUNTY	Rural Miles	Rural Days	Urban Miles	Urban Days	Total Miles	Total Working Days
ALCONA	297.25	2.1	0.00	0.0	297.25	2.1
ALGER	297.18	2.1	0.00	0.0	297.18	2.1
ALLEGAN	617.04	4.3	25.15	0.5	642.19	4.8
ALPENA	262.72	1.8	38.92	0.8	301.64	2.6
ANTRIM	326.58	2.3	0.00	0.0	326.58	2.3
ARENAC	260.33	1.8	0.00	0.0	260.33	1.8
BARAGA	200.19	1.4	0.00	0.0	200.19	1.4
BARRY	445.62	3.1	21.43	0.4	467.04	3.5
BAY	340.16	2.4	157.24	3.3	497.40	5.6
BENZIE	252.10	1.8	0.00	0.0	252.10	1.8
BERRIEN	556.74	3.9	169.28	3.5	726.02	7.4
BRANCH	414.46	2.9	41.19	0.9	455.65	3.7
CALHOUN	549.07	3.8	225.13	4.7	774.20	8.5
CASS	365.91	2.5	32.47	0.7	398.38	3.2
CHARLEVOIX	255.30	1.8	0.00	0.0	255.30	1.8
CHEBOYGAN	381.44	2.6	0.00	0.0	381.44	2.6
CHIPPEWA	572.08	4.0	40.78	0.8	612.86	4.8
CLARE	340.43	2.4	0.00	0.0	340.43	2.4
CLINTON	385.08	2.7	82.22	1.7	467.30	4.4
CRAWFORD	263.12	1.8	0.00	0.0	263.12	1.8
DELTA	431.48	3.0	69.89	1.5	501.37	4.5
DICKINSON	236.82	1.6	44.91	0.9	281.73	2.6
EATON	419.10	2.9	114.42	2.4	533.52	5.3
EMMET	291.86	2.0	19.98	0.4	311.85	2.4
GD TRAVERSE	304.18	2.1	67.23	1.4	371.42	3.5
GENESEE	275.19	1.9	576.96	12.0	852.15	13.9
GLADWIN	303.22	2.1	0.00	0.0	303.22	2.1
GOGEBIC	336.29	2.3	26.55	0.6	362.84	2.9
GRATIOT	430.11	3.0	48.85	1.0	478.96	4.0
HILLSDALE	478.32	3.3	26.44	0.6	504.76	3.9
HOUGHTON	414.14	2.9	32.60	0.7	446.75	3.6
HURON	506.65	3.5	0.00	0.0	506.65	3.5
INGHAM	358.84	2.5	289.71	6.0	648.54	8.5
IONIA	479.71	3.3	44.03	0.9	523.74	4.2
IOSCO	299.77	2.1	24.19	0.5	323.96	2.6
IRON	376.78	2.6	0.00	0.0	376.78	2.6
ISABELLA	412.22	2.9	40.50	0.8	452.73	3.7
JACKSON	542.27	3.8	175.52	3.7	717.78	7.4
KALAMAZOO	356.41	2.5	305.11	6.4	661.52	8.8
KALASKA	285.51	2.0	0.00	0.0	285.51	2.0
KENT	528.59	3.7	616.45	12.8	1143.03	16.5
KEWEENAW	151.29	1.1	0.00	0.0	151.29	1.1
LAKE	295.17	2.0	0.00	0.0	295.17	2.0
LAPEER	454.98	3.2	25.05	0.5	480.02	3.7
LEELANAU	270.02	1.9	5.03	0.1	275.05	2.0
LENAWEE	609.74	4.2	86.81	1.8	696.55	6.0
LIVINGSTON	422.30	2.9	77.80	1.6	500.10	4.6
LUCE	204.30	1.4	0.00	0.0	204.30	1.4
MACKINAC	406.19	2.8	0.00	0.0	406.19	2.8
MACOMB	184.11	1.3	539.63	11.2	723.74	12.5
MANISTEE	326.99	2.3	38.35	0.8	365.34	3.1
MARQUETTE	385.01	2.7	83.34	1.7	468.35	4.4
MASON	274.30	1.9	27.24	0.6	301.53	2.5
MECOSTA	368.27	2.6	26.43	0.6	394.70	3.1
MENOMINEE	538.77	3.7	33.21	0.7	571.99	4.4
MIDLAND	330.07	2.5	91.70	1.9	421.77	4.2
MISSAUKEE	280.41	1.9	0.00	0.0	280.41	1.9
MONROE	393.17	2.7	145.32	3.0	538.49	5.8
MONTCALM	495.19	3.4	23.46	0.5	518.65	3.9
MONTMORENCY	234.22	1.6	0.00	0.0	234.22	1.6
MUSKEGON	387.27	2.7	207.21	4.3	594.48	7.0
NEWAYGO	440.90	3.1	0.00	0.0	440.90	3.1
OAKLAND	296.52	2.1	1114.90	23.2	1411.41	25.3
OCEANA	357.25	2.5	0.00	0.0	357.25	2.5
OGEMAW	305.98	2.1	0.00	0.0	305.98	2.1
ONTONAGON	374.92	2.6	0.00	0.0	374.92	2.6
OSCEOLA	361.42	2.5	0.00	0.0	361.42	2.5
OSCODA	229.80	1.6	0.00	0.0	229.80	1.6
OTSEGO	289.79	2.0	0.00	0.0	289.79	2.0
OTTAWA	337.33	2.3	266.53	5.6	603.86	7.9
PRESQUE ISLE	347.37	2.4	0.00	0.0	347.37	2.4
ROSCOMMON	277.00	1.9	0.00	0.0	277.00	1.9
SAGINAW	555.98	3.9	204.45	4.3	760.43	8.1
SANILAC	539.76	3.7	0.00	0.0	539.76	3.7
SCHOOLCRAFT	356.92	2.5	0.00	0.0	356.92	2.5
SHIAWASEE	411.41	2.9	45.66	1.0	457.08	3.8
ST CLAIR	532.37	3.7	174.09	3.6	706.45	7.3
ST JOSEPH	417.82	2.9	59.68	1.2	477.50	4.1
TUSCOLA	517.27	3.6	0.00	0.0	517.27	3.6
VAN BUREN	481.52	3.3	21.45	0.4	502.96	3.8
WASHTENAW	506.19	3.5	345.17	7.2	851.36	10.7
WAYNE	70.69	0.5	1541.35	32.1	1612.04	32.6
WEXFORD	303.95	2.1	35.42	0.7	339.37	2.8
TOTAL STATE	**30774.15**	**213.7**	**8576.40**	**178.7**	**39350.54**	**392.4**

NOTES

The above times are estimates for field data collection and are based on driving speeds of 18 mph for rural miles and 8 mph for urban miles.

It is estimated that 25 days would be necessary for preparation and training, and 30 days would be necessary for post-processing and statistical analysis.

GIS Team 12.04.01

Table 2