Michigan Department of Transportation

Traffic Counting, Equipment, Setup and Best Practices

Frank Benavidez

Field Operations Supervisor

&

Ed Potter

Non-Trunkline & Local Road Program Coordinator

Travel Information Unit

Operates under the Data Collection & Reporting Section

Core responsibilities include:

1. Monitoring and reporting of trunkline (motorized and non-motorized), ramps and federal aid roadway traffic data that is used by MDOT and others for planning and project decisions
2. Maintenance, data quality, and the reporting of traffic from the Continuous Count Station (CCS) program
3. Management of traffic data

Field Operations

Main Responsibilities

- Collect statewide traffic count program
  - Approximately 3500 counts a year
  - Classification, Volume, and Ramps
- Monitor Park and Rides
  - 242 lots collected 4x a year
- Rest Area's
  - Varies year to year (22 classification counts in 2018)
- Airports
  - Varies year to year. Collected 3x a year.
- Turning Movements
  - 250 are requested yearly

Traffic Counting Equipment

JAMAR BOARD (Manual Count)

MIOVISION (Video recording unit)

OMEGA X3 (Traffic Counter)

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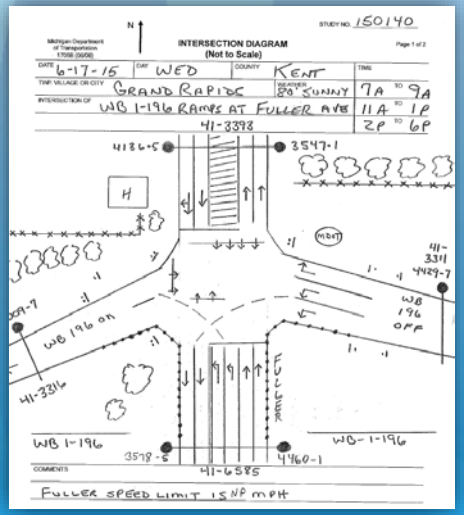
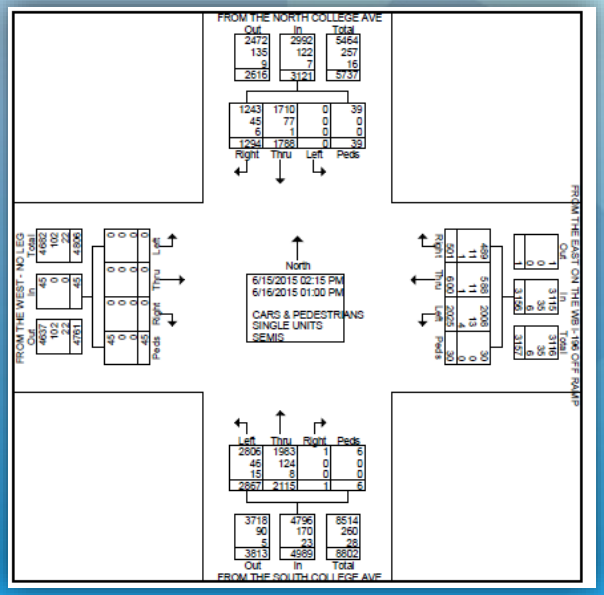
Types of counts and duration

Turning Movement (TM)

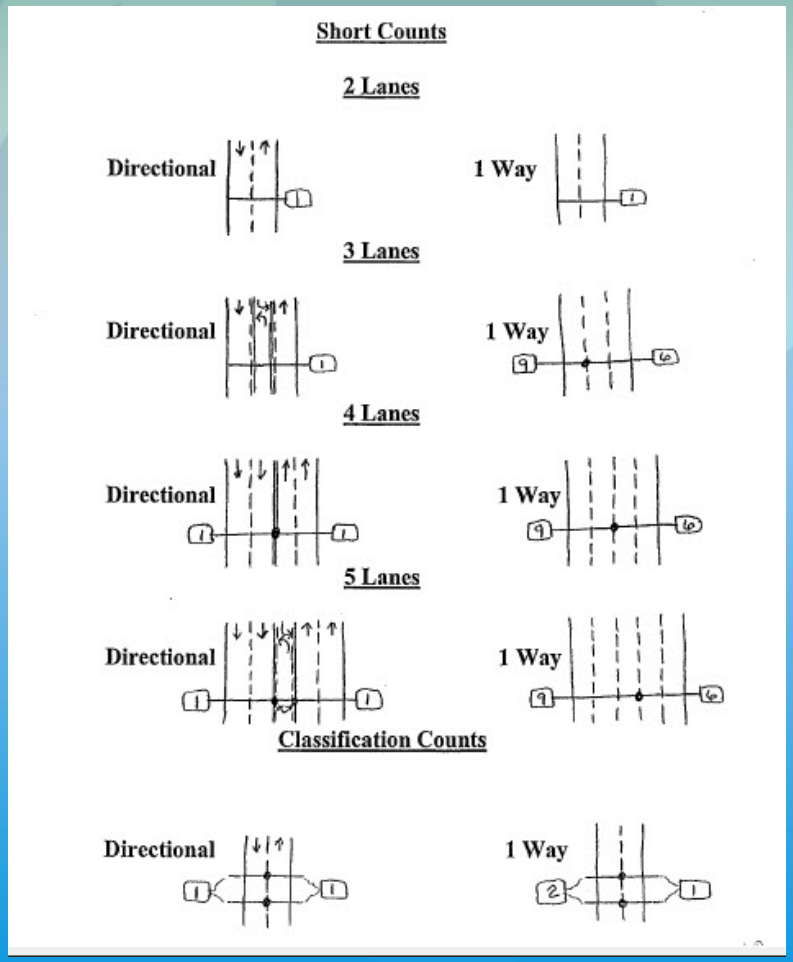
- These studies are special request
- Directional Volume counts on all four legs
- 24 or 48 hour counts
- Gaps
- Delays
- Pedestrians





Statewide Counts
Class vs Volume (short)

- 48 hour
- 7 day
- 3x a year



Manual Counts

- Turning Movements
  - 7am-9am
  - 11am-1pm
  - 2pm-6pm
- 14 hours counts
  - 6am-8pm

JAMAR BOARD

Software

Centurion

- Omega files are downloaded
- Raw data
- Cut in to 24/48 hour blocks
- Downloaded using the FHWA format

Miovision

- Uploaded to Traffic Data (TDO) online website
- Downloaded to CSV format

Both uploaded to Transportation Data Management System (TDMS)

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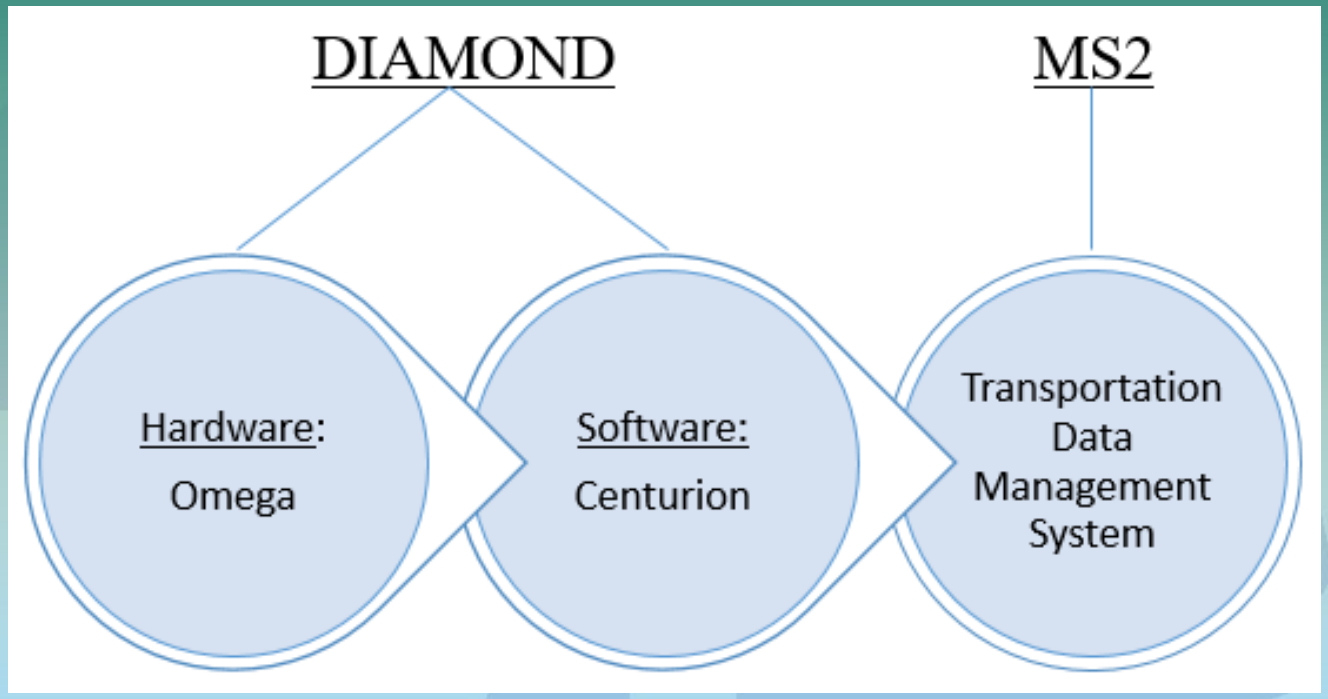
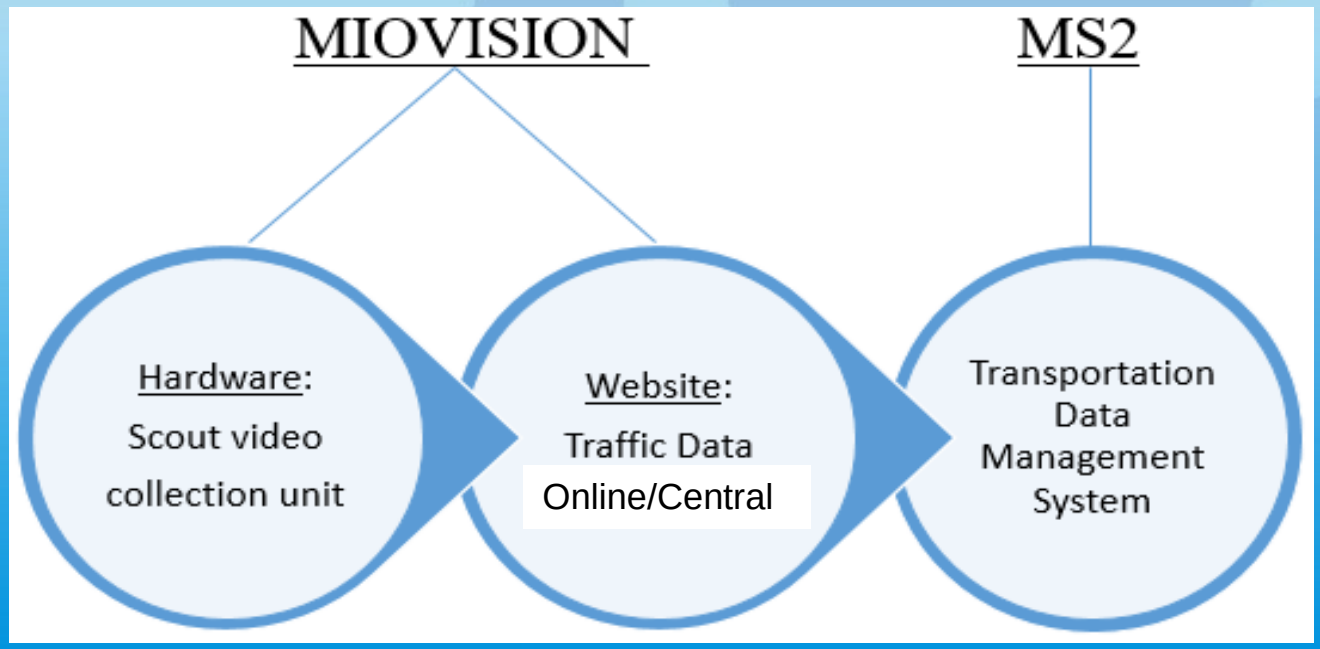
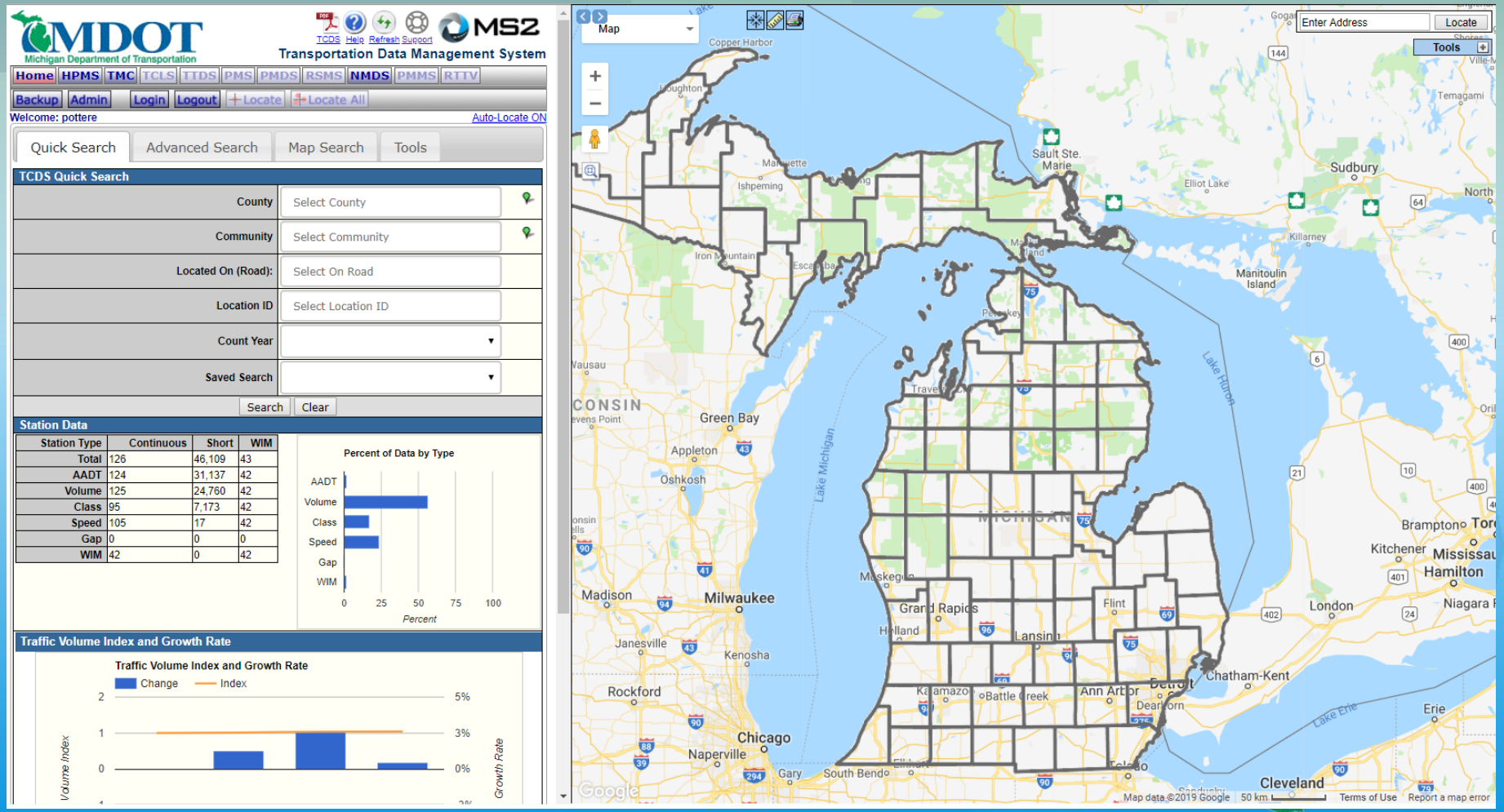

DIAMOND
MS2
Hardware:
Omega
Software:
Centurion
Transportation
Data
Management
System


MIOVISION
MS2
Hardware:
Scout video
collection unit
Website:
Traffic Data
Online/Central
Transportation
Data
Management
System

Traffic Count Database System (TCDS)



www.Michigan.gov/trafficdata

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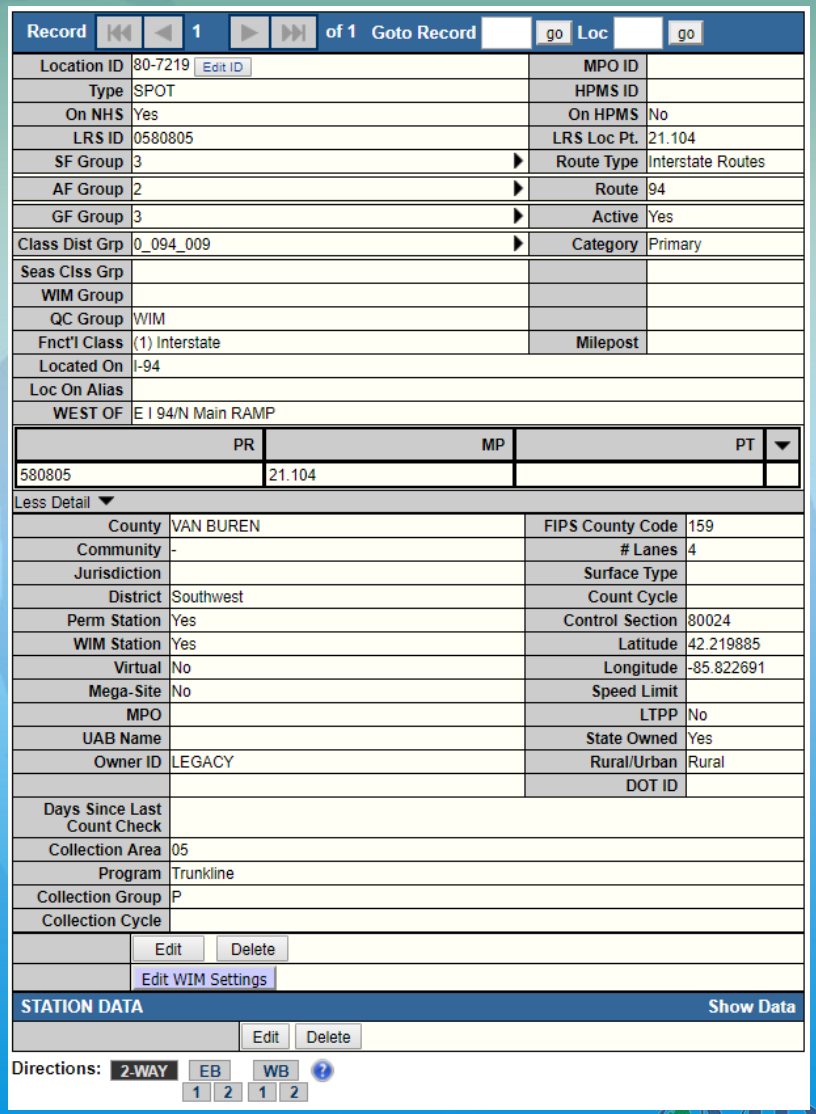
Count Station Data

- ~40,000 MDOT stations
- Over 120 CCS

- Spatial component creates a more efficient means request, set, and validate count data

- Linked to ESRI Roads & Highways



Record 1 of 1 Goto Record go Loc go

Location ID	80-7219 Edit ID	MPO ID	
Type	SPOT	HPMS ID	
On NHS	Yes	On HPMS	No
LRS ID	0580805	LRS Loc Pt.	21.104
SF Group	3	Route Type	Interstate Routes
AF Group	2	Route	94
GF Group	3	Active	Yes
Class Dist Grp	0_094_009	Category	Primary
Seas Clss Grp			
WIM Group			
QC Group	WIM		
Fnct'l Class	(1) Interstate	Milepost	
Located On	I-94		
Loc On Alias			
WEST OF	E I 94/N Main RAMP		

PR	MP	PT
580805	21.104	

Less Detail

County	VAN BUREN	FIPS County Code	159
Community	-	# Lanes	4
Jurisdiction		Surface Type	
District	Southwest	Count Cycle	
Perm Station	Yes	Control Section	80024
WIM Station	Yes	Latitude	42.219885
Virtual	No	Longitude	-85.822691
Mega-Site	No	Speed Limit	
MPO		LTPP	No
UAB Name		State Owned	Yes
Owner ID	LEGACY	Rural/Urban	Rural
		DOT ID	

Days Since Last Count Check	
Collection Area	05
Program	Trunkline
Collection Group	P
Collection Cycle	

Edit Delete

Edit WIM Settings

STATION DATA Show Data

Edit Delete

Directions: 2-WAY EB 1 2 WB 1 2

QA/QC Data

- Avg amount of data submitted daily?
  - ➢ Over 32 QC rules implemented
    - ➢ Automated rules
      - AADT Tolerance
      - Consecutive 0's
    - ➢ Manual checks
      - Visual comparison

Check Parameters

Check Type:	AADT - Out of Tolerance
Percentage Increase Warning:	20
Percentage Increase Critical:	30
Min Volume:	6000
Max Volume:	
Location Type:	1
Percentage Decrease Warning:	20
Percentage Decrease Critical:	40
Use Holidays:	
AADT Look Back (Years):	
Auto-Assign Action on Warning:	Auto-Assign as Accepted
Auto-Assign Action on Critical:	Auto-Assign as Pending Review - QC Fail

Save Changes

STATION DATA Show Data

Edit | Delete

Directions: 2-WAY | EB 1 | WB 1

AADT Graph

	Year	AADT	DHV-30	K %	D %	PA	BC	Src
☑ ☒	2015	3,302	522	16	52			MDOT
☑ ☒	2014	3,174	501	16	52			PTR
☑ ☒	2013	3,189	482	15	54			PTR
☑ ☒	2012	3,296	498	15	54			PTR
☑ ☒	2011	3,246	487	15	55			PTR
⊞	Edit Multiple							

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Travel Demand Model

Model Year	Model AADT	AM PHV	AM PV	MD PHV	MD PV	PM PHV	PM PV	NT PHV	NT PV
⊞									

VOLUME COUNT Graphs/Rpts

	Date	Int	Total	Status
👁	Tue 5/2/2017	60	2,944	✔
👁	Mon 5/1/2017	60	3,155	✔
👁	Sun 4/30/2017	60	3,720	⊗
👁	Sat 4/29/2017	60	3,206	✔
👁	Fri 4/28/2017	60	4,883	⊗
👁	Thu 4/27/2017	60	3,630	✔
👁	Wed 4/26/2017	60	3,056	✔
👁	Tue 4/25/2017	60	2,906	✔
👁	Mon 4/24/2017	60	2,811	✔
👁	Sun 4/23/2017	60	2,555	✔

|<< < > >>| 1-10 of 7736

mm/dd/yyyy To Date

Create | Flag/Unflag | Edit Multiple

VOLUME TREND Graph

Year	Annual Growth
2016	-11%
2015	4%
2014	0%
2013	-3%
2012	2%
2011	-3%
2010	96%
2009	-45%
2008	1%
2007	-9%

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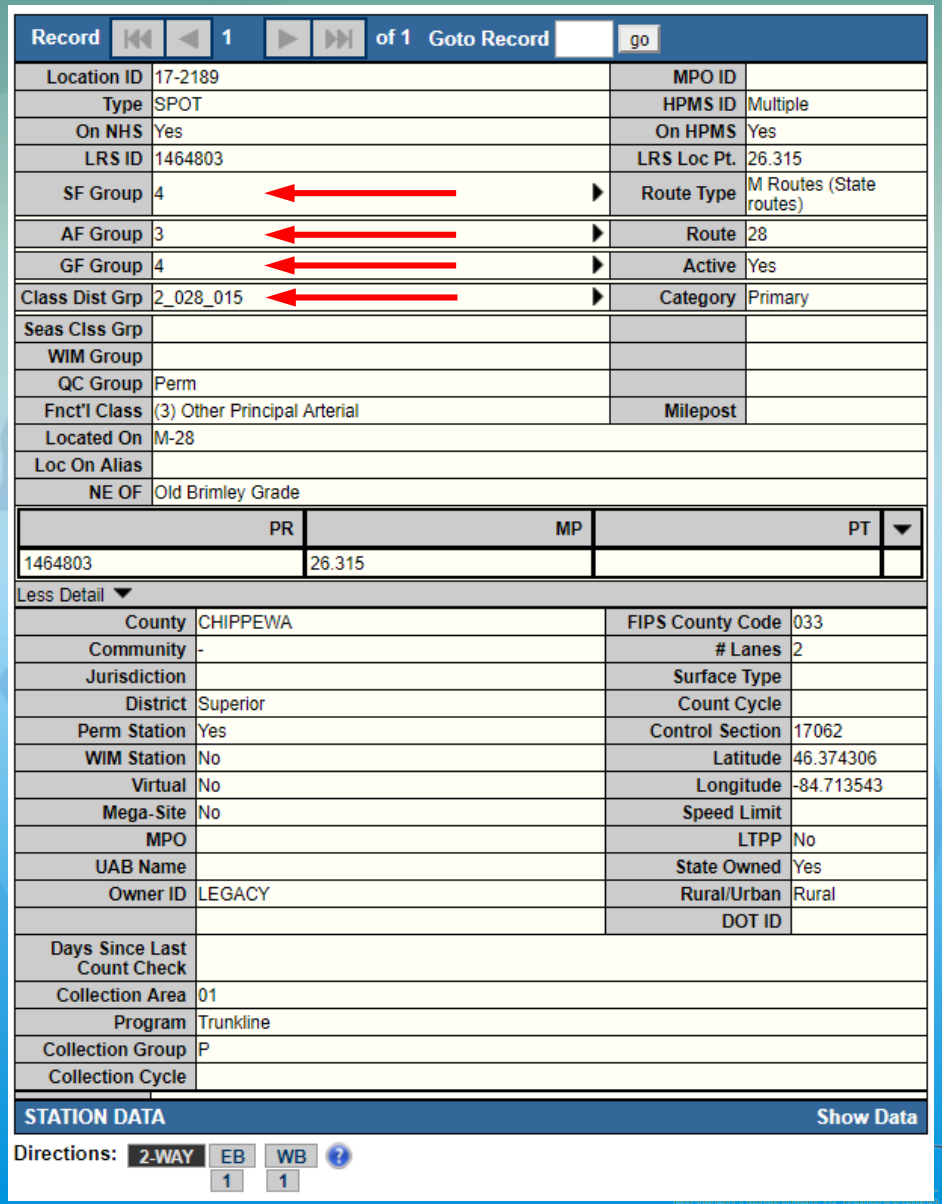
Factors

- <u>4 Distinct factors</u>
  1. Seasonal
  2. Axle
  3. Growth Rate
  4. Class Distribution
- Factors need to be applied to all '*Primary*' stations in TCDS



Record 1 of 1 Goto Record go

Location ID	17-2189	MPO ID	
Type	SPOT	HPMS ID	Multiple
On NHS	Yes	On HPMS	Yes
LRS ID	1464803	LRS Loc Pt.	26.315
SF Group	4	Route Type	M Routes (State routes)
AF Group	3	Route	28
GF Group	4	Active	Yes
Class Dist Grp	2_028_015	Category	Primary
Seas Clss Grp			
WIM Group			
QC Group	Perm		
Fnct'l Class	(3) Other Principal Arterial	Milepost	
Located On	M-28		
Loc On Alias			
NE OF	Old Brimley Grade		

PR	MP	PT
1464803	26.315	

Less Detail

County	CHIPPEWA	FIPS County Code	033
Community	-	# Lanes	2
Jurisdiction		Surface Type	
District	Superior	Count Cycle	
Perm Station	Yes	Control Section	17062
WIM Station	No	Latitude	46.374306
Virtual	No	Longitude	-84.713543
Mega-Site	No	Speed Limit	
MPO		LTPP	No
UAB Name		State Owned	Yes
Owner ID	LEGACY	Rural/Urban	Rural
		DOT ID	
Days Since Last Count Check			
Collection Area	01		
Program	Trunkline		
Collection Group	P		
Collection Cycle			

STATION DATA Show Data

Directions: 2-WAY EB WB
1 1

Seasonal Factors

9 Seasonal Factor Groupings

- Annually generated from CCS data using cluster analysis
- Groups 1-6 classified as Trunkline
- Groups 7-9 classified as Non-Trunkline

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1. Urban
2. Urban Rural
3. Rural
4. Rural North
5. Recreational
6. Recreational Corridor

7 – 9. Non-Trunkline

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Seasonal Factors

Group 1 - Urban Trunkline												
Group 1 2017 Seasonal Factors	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sunday	1.656	1.541	1.448	1.424	1.421	1.331	1.365	1.335	1.374	1.373	1.47	1.579
Monday	1.103	0.983	0.996	0.964	1.016	0.929	0.97	0.945	1.026	0.946	0.945	1.139
Tuesday	1.028	0.956	0.942	0.936	0.923	0.904	1.01	0.918	0.92	0.927	0.916	1.018
Wednesday	0.968	0.952	0.93	0.922	0.901	0.887	0.912	0.896	0.903	0.919	0.907	1.025
Thursday	0.968	0.933	0.92	0.924	0.903	0.88	0.892	0.886	0.89	0.886	0.972	0.99
Friday	0.919	0.899	0.886	0.89	0.865	0.858	0.871	0.86	0.854	0.857	0.932	0.937
Saturday	1.284	1.216	1.184	1.166	1.152	1.117	1.167	1.136	1.15	1.162	1.221	1.257

Group 2 - Urban Rural Trunkline												
Group 2 2017 Seasonal Factors	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sunday	1.642	1.549	1.407	1.288	1.19	1.1	1.061	1.019	1.136	1.161	1.295	1.523
Monday	1.218	1.092	1.106	1.02	1.01	0.932	0.934	0.914	0.983	0.976	1.004	1.183
Tuesday	1.196	1.088	1.07	1.009	0.967	0.933	0.98	0.914	0.948	0.986	0.974	1.073
Wednesday	1.113	1.08	1.057	0.984	0.941	0.901	0.889	0.883	0.934	0.951	0.959	1.082
Thursday	1.106	1.038	1.007	0.963	0.908	0.875	0.864	0.85	0.891	0.897	1.002	1.029
Friday	1.006	0.952	0.922	0.882	0.816	0.799	0.792	0.781	0.789	0.809	0.914	0.956
Saturday	1.353	1.271	1.213	1.129	1.057	1.012	0.988	0.967	1.003	1.068	1.143	1.241

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Axle Factors

4 Axle Factor Groupings

- Automated process in TCDS using a cluster analysis
- Groups 1-3 are reserved for trunkline stations
- 4 group is labeled – NoFactor with a value = 1
  - ➢ Place holder in TCDS

Month	Day of Week	Value
January	Sunday	0.936
January	Monday	0.848
January	Tuesday	0.82
January	Wednesday	0.819
January	Thursday	0.823
January	Friday	0.855
January	Saturday	0.92

1 2 3 4 5 6 7 8 9 10 11 12

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Growth Factors

- Align with the seasonal factor groupings (1-9)
  - Groups 7-9 differ:
    7. Urban Non-State
    8. Rural Non-State
    9. Recreational Non-State
- Growth rate is annually calculated from CCS's for State trunkline routes **only**
- Non-trunkline factors are produced using MDOT's Statewide and urban models

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Class Distribution Factors

- MDOT utilizes >1200 class distribution factor (CDF) groups
  - Inherently more accurate extrapolations
  - Partially derived from legacy process
- CDF extrapolations provide commercial values for locations not calculated during current count year
- Groups use cluster analysis of current year classification data to create % distribution for a 13-bin schema (per [1]FHWA regulations)

[1]https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/13091/002.cfm

Class Distribution Factors

Class	Value
1	0.009
2	0.629
3	0.283
4	0.001
5	0.012
6	0.007
7	0.001
8	0.008
9	0.032
10	0.006
11	0.001
12	0.001
13	0.009

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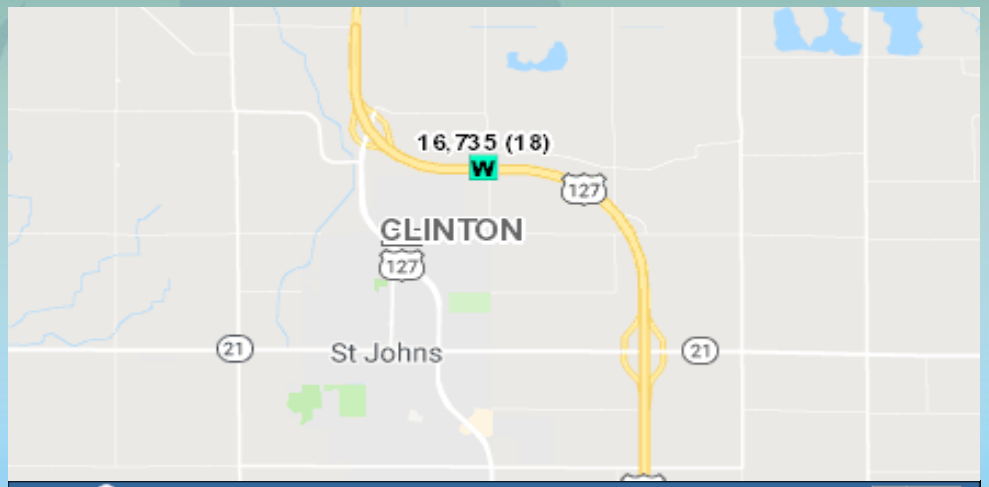
Traffic Monitoring Data

Year-End Processing in TCDS

- Begin processing in Feb.
- Multi-week process
- Collaborative within TIU
- More efficient

Outputs

- Factors
- *AADT
- *CAADT
- *K-Factor
- *D-Factor
- *Summary Tables



AADT

Graph

	Year	AADT	DHV-30	K %	D %	PA	BC	Src
☑ ☒	2018	16,735				15,159 (91%)	1,575 (9%)	
☑ ☒	2017	21,149	3,182	15	80	19,203 (91%)	1,945 (9%)	
☑ ☒	2016	20,142		14	67	18,508 (92%)	1,634 (8%)	MDOT
☑ ☒	2015	19,542		15	73			MDOT
⊞	Edit Multiple							

*Output used for HPMS reporting

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HPMS Reporting

Reporting requirements:

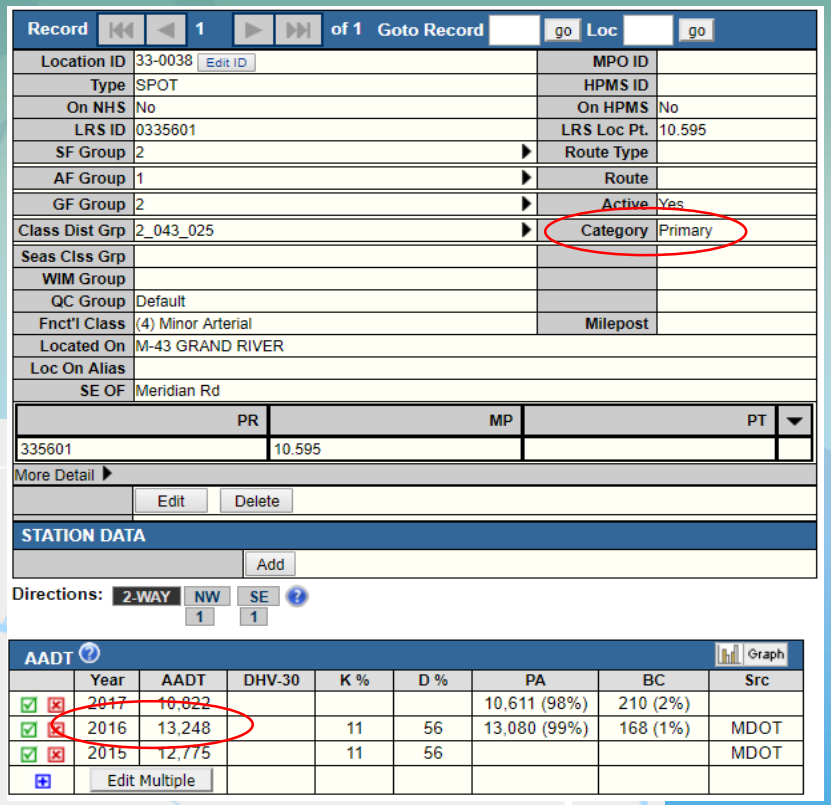
"Each State is to include, as part of the annual submittal, their Linear Reference System (LRS), which enables the attribute data to be represented in a geospatial format." (HPMS Field Manual, Updated March 12, 2018)

- HPMS requires a segment-based file
- TCDS is a point-based system

How do we go from points to segments?!

HPMS Reporting

Critical attribution on *primary* stations are mapped to traffic segmentation



Record	1 of 1	Goto Record	go	Loc	go
Location ID	33-0038 Edit ID		MPO ID		
Type	SPOT		HPMS ID		
On NHS	No		On HPMS	No	
LRS ID	0335601		LRS Loc Pt.	10.595	
SF Group	2		Route Type		
AF Group	1		Route		
GF Group	2		Active	Yes	
Class Dist Grp	2_043_025		Category	Primary	
Seas Clss Grp					
WIM Group					
QC Group	Default				
Fnct'l Class	(4) Minor Arterial		Milepost		
Located On	M-43 GRAND RIVER				
Loc On Alias					
SE OF	Meridian Rd				

PR	MP	PT
335601	10.595	

More Detail ▶

Edit | Delete

STATION DATA

Add

Directions: 2-WAY | NW 1 | SE 1

AADT Graph

	Year	AADT	DHV-30	K %	D %	PA	BC	Src
☑ ☒	~~2017~~	~~10,822~~				10,611 (98%)	210 (2%)	
☑ ☒	2016	13,248		11	56	13,080 (99%)	168 (1%)	MDOT
☑ ☒	2015	12,775		11	56			MDOT
⊞	Edit Multiple							

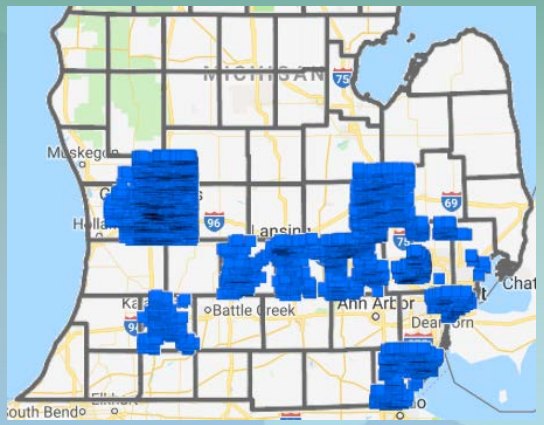
Future Enhancements

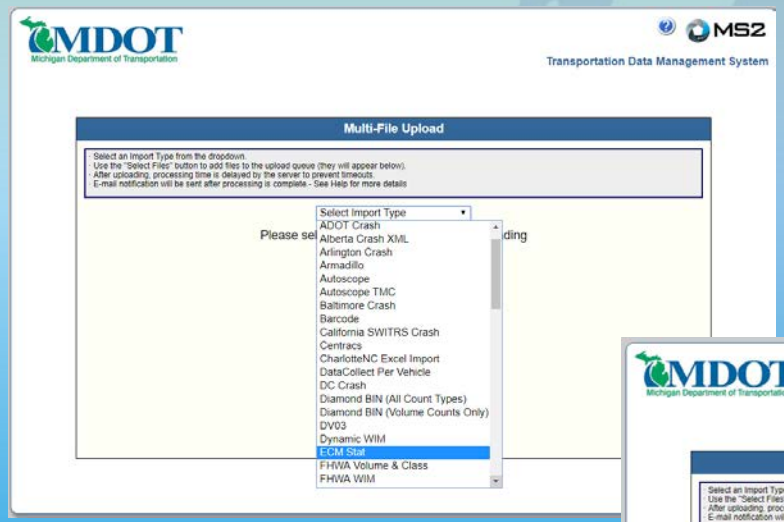
- Full integration with ESRI Roads & Highways (LRS solution)
  - Powerful user experience in TCDS
  - Increased efficiency in reporting
  - Dynamic LRS and asset management
  - Integrated validation checks
  - Multi-user editing environments (versioning)

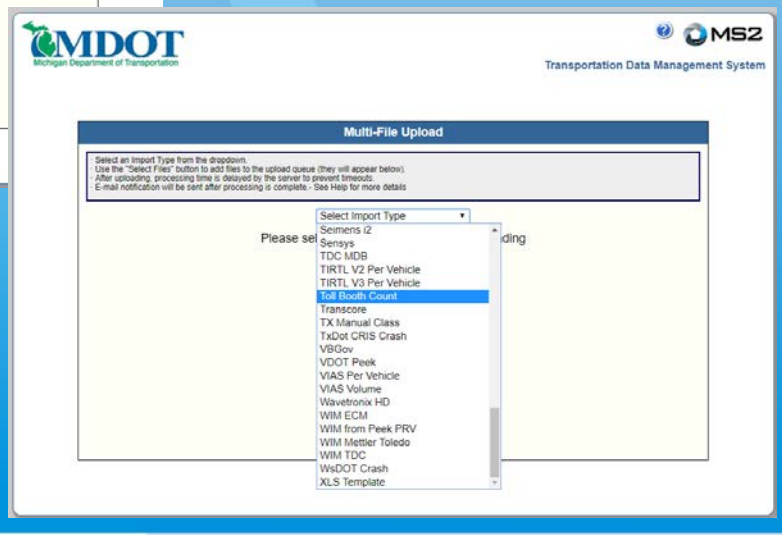
Image: http://desktop.arcgis.com/en/arcmap/latest/extensions/roads-and-highways/what-is-roads-and-highways.htm

Future Enhancements

- MS2-to-MS2 data exchange
  - Seamless data exchange with other MS2 users
  - Data processing for HPMS will be streamlined







- Local Agency Data Uploader
  - Local agencies (non-MS2 users) can upload their traffic data directly into corresponding MDOT traffic stations

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Shameless Plug(s)

Non-Trunkline Federal Aid Program NEEDS you!

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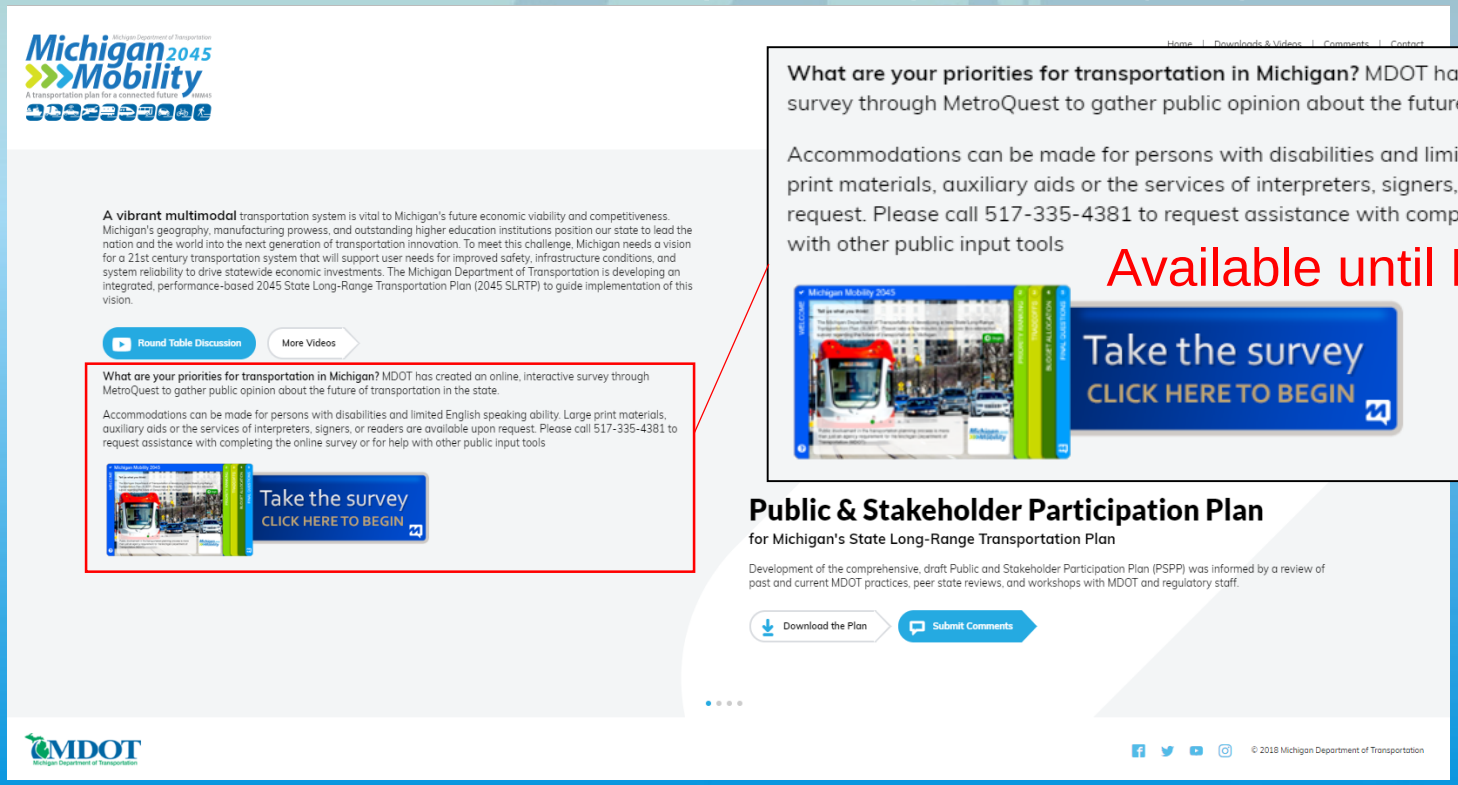
Shameless Plug(s)

Michigan Department of Transportation
Michigan 2045 Mobility
A transportation plan for a connected future #MM45

http://michiganmobility.org/



Available until March 31,2019

Contact Brad Sharlow for questions (517)335-4593

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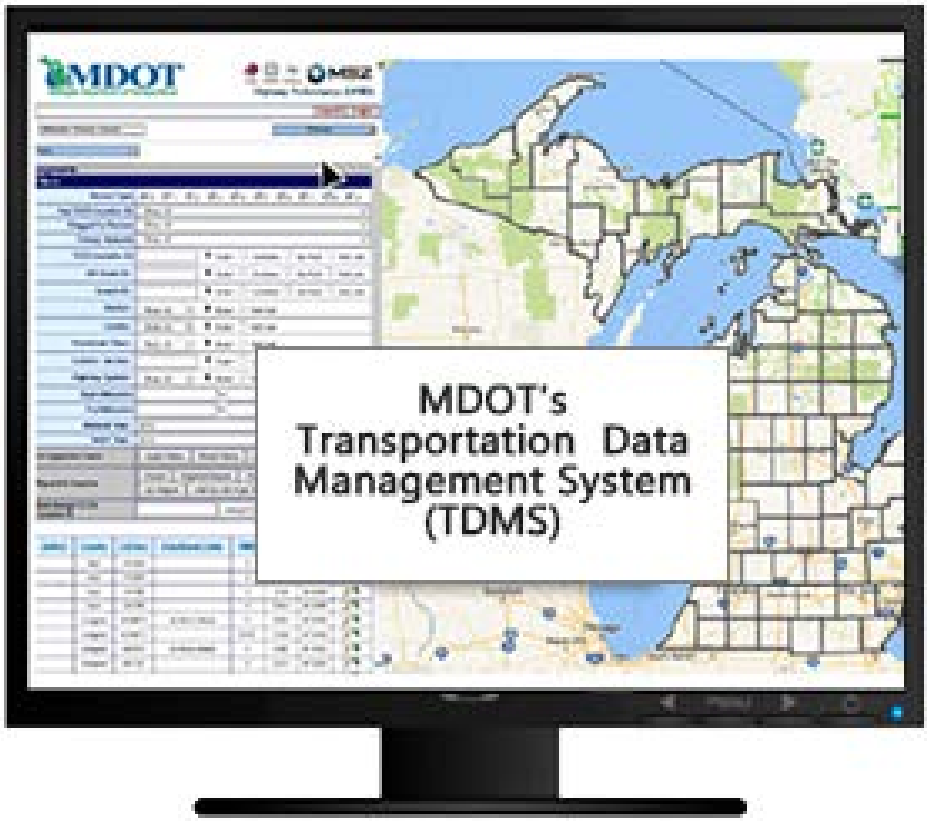
Sources of Travel Information



www.Michigan.gov/trafficdata

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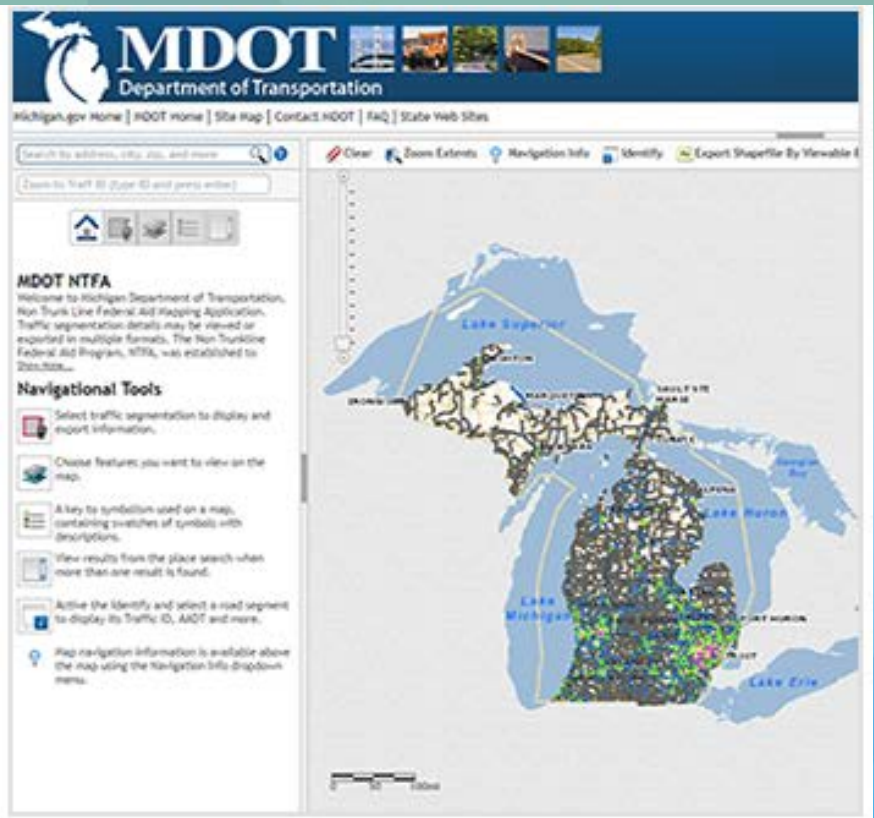
AADT Maps

Click to view interactive Trunkline AADT map



Click to view interactive Non-trunkline AADT map

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Questions?

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