The TPIMS Journey

ACEC
American Council of Engineering Companies of Iowa

September 11, 2019

IOWADOT

Iowa State University
Institute for Transportation

HNTB

Project concept

- Focus on key Midwest freight corridors
- Collect real-time parking data
- Monitor 139 public and private sites
- Aggregate and analyze data
- Share parking availability data through multiple channels
- Measure impact on parking, truck-related safety

Goals and success measures

Create and distribute truck parking information that:

- Enhances highway safety and efficiency
- Provides sustainable and scalable solution
- Offers a secure solution for user privacy and data
- Promotes greater TPIMS use

Deployment schedule

Why is TPIMS needed now?

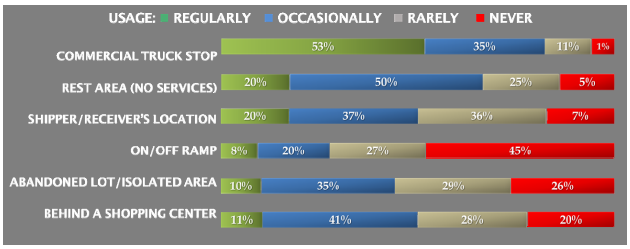
Source: Survey data presented by Desiree Wood, Andrew Warcaba Associates and Hope Rivenburg

Regulation impacts

- Hours-of-service rule (July 1, 2013)
- Electronic logging device (ELD) rule (April 1, 2018)

Source: Trucker.com article March 26, 2018 by Clarissa Hawes / PeopleNet

Unsafe choices often made



Source: Survey data presented by Desiree Wood, Andrew Warcaba Associates and Hope Rivenburg

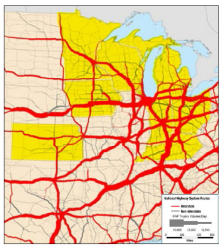
Driver safety and fatigue

"How often have you found yourself fatigued and left with an unsafe feeling because you were not able to find a safe place to park your vehicle?"

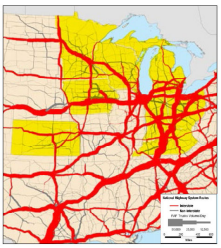
Source: Survey data presented by Desiree Wood, Andrew Warcaba Associates and Hope Rivenburg

Increasing truck volume

2011



2040



What is the solution?

Create a system that:

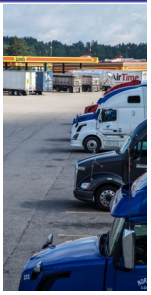
- Collects usage data from public and private parking sites
- Aggregates the data based on a common format and set of criteria
- Shares the data in a useful, convenient format with users

Seamless system challenge

Functions	Type	Iowa	Ohio	Michigan	Kentucky	Wisconsin	Indiana	Kansas	Minnesota
Procurement	Public	DBOM	DBOM	DBB	DBB	DBB	DBB	DBB	DBB
	Private		N/A	DBOM		N/A	N/A	N/A	N/A
Data Collection Method	Public	Functional Requirements	Functional Requirements	In/Out	In/Out	In/Out	In/Out	Space-by-Space	Space-by-Space
	Private		N/A			N/A	N/A	N/A	N/A
Data Collection Technology[1]	Public	Functional Requirements	Functional Requirements[12]	Video	Magnetometer	Magnetometer	Magnetometer	Video[2]	Magnetometer
	Private		N/A	Video		N/A	N/A	N/A	N/A
Operations & Maintenance	Public	Third Party	Third Party	Internal[3]	Third Party[4]	Third Party	Internal	Third Party	Internal
	Private		N/A	Third Party		N/A	N/A	N/A	N/A
	Sign Operations	N/A	Internal	Internal	Internal	Internal	Internal	Internal	Internal
Data Analytics & Sharing	Processing	Third Party	Third Party	In-House ATMS[5]	In-House ATMS	Third Party	In-House ATMS	In-House[6]	In-House ATMS
	Software	Not Developed	Not Developed	Current	Not Developed	Current	Not Developed	Not Developed	Needs Additional Development
	Sharing Format	XML Data Feed	XML Data Feed	XML Data Feed	XML Data Feed	XML Data Feed	XML Data Feed	XML Data Feed	XML Data Feed
Information Dissemination	Signs	No Signs	DTPS	DTPS	DTPS	DTPS	DTPS	DTPS	Full-Matrix Color DMS
	Website	State and Third Party[7]	State and Third Party[8]	State and Third Party[9]	State and Third Party[10]	State and Third Party[11]	State and Third Party[12]	State and Third Party[13]	State and Third Party[14]
	Mobile Website/ Mobile App	State and Third Party[15]	State and Third Party[16]	State and Third Party[17]	State and Third Party[18]	State and Third Party[19]	State and Third Party[20]	State and Third Party[21]	State and Third Party[22]

Core TPIMS concepts

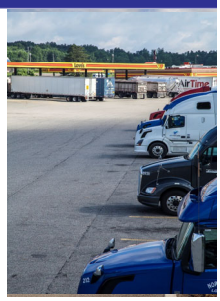
- Data Collection
  - Entrance and exit or individual space counts
- Data Aggregation
  - Integrated with ATMS or separate
  - Local or cloud
- Information Dissemination
  - Types of signs
  - Types of apps
  - Types of websites



Facility type

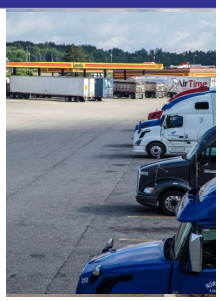
Public sites
- Owned, maintained and operated by state agencies
- Rest areas, weigh stations
- Direct access

Private sites
- Owned and operated by private truck stop operators
- Indirect access



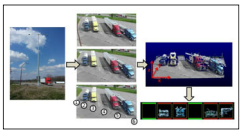
Facility type

State	No. of Sites	Public	Private
Indiana	19	X	
Iowa	44	X	X
Kansas	18	X	
Kentucky	13	X	X
Michigan	8	X	X
Minnesota	7	X	
Ohio	18	X	
Wisconsin	10	X	

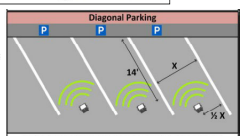


Data collection technology

Entrance and Exit Counts
- In-pavement magnetometer
- Video cameras
- Laser technology
- Radar

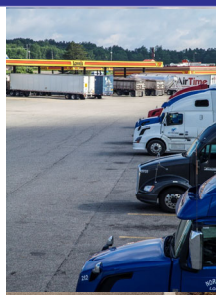


Space Occupancy Counts
- Infrared/magnetometers
- Microwave/magnetometers
- Video cameras



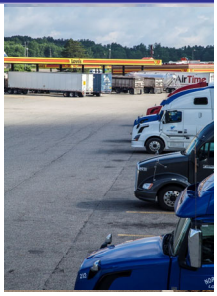
Data collection methodology

State	In/Out Counts	Occupancy
Indiana	X	
Iowa	X	X
Kansas		X
Kentucky	X	
Michigan	X	
Minnesota		X
Ohio	X	X
Wisconsin	X	



Data collection technology

State	Technology
Indiana	Magnetometers
Iowa	Magnetometers and Video
Kansas	Video
Kentucky	Side-Fire Radar
Michigan	Video
Minnesota	Magnetometers
Ohio	Magnetometers/IR puck
Wisconsin	Magnetometers



What is the right choice?

Methodology/Technology considerations:
- Formal or informal parking
- Diagonal or parallel parking
- Number of parking spaces
- Driveway/ramp configuration
- Truck only or mixed traffic

Takeaways

- Currently no “silver bullet” technology
- With in/out counting technology, manual resets will be required
- Do not let less than 100% accuracy stop you from implementing

Dynamic messaging signs

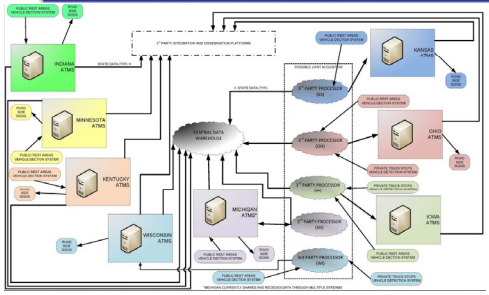
- Dedicated truck parking signs
- Two or three locations per sign
- Hybrid static/dynamic message signs

Data communication

Data communication

TSPS
Smart Truck Route
Mile On
TruckMap
NACFE
Trucker Tools
American Truck Parking
Road Hunter
Truck Parking USA

Data sharing – data warehouse



Public Data Feed

Element	Type	Description
siteId	string	Unique fixed-length identifier including state, route number, route type, reference post, side of road and unique location number or name abbreviation. See more detailed description in appendix.
timeStamp	string	Provides the date and time that the site record was last updated. See more detailed data and time representation description in appendix.
timeStampStatic	String	Provides the date and time that the site static record was last updated. See more detailed data and time representation description in appendix.
reportedAvailable	string	Number of available spots shared through the data feed. The number is capped at the total number of parking spots at the site and “Low” is reported if the low threshold is reached.
		Optional. Reports whether the site is emptying, steady or filling. Accepted values. **“CLEARING”** / **“STEADY”** / **“FILLING”** / **null**. See more detailed description in appendix.
		Will report open unless the parking site is closed to parking for maintenance or another situation. Possible values: **true / false / null**
		This flag will report that the site is operating normally. Possible reasons for a “false” value include periods where the site is under construction while open to traffic, IT maintenance windows, or equipment failures. Possible values: **true / false / null**

Dynamic Public Feed - example

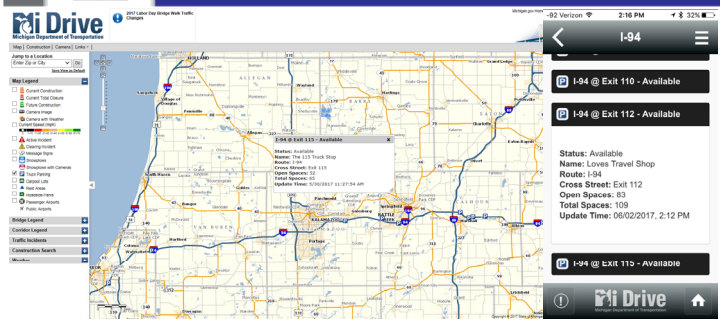
JSON format


```
[{"siteId":"WI00094IS0012400ERSTARE53","timeStamp":"2016-08-15T20:35:15Z","timeStampStatic":"2015-05-03T12:24:19Z","reportedAvailable":"25","trend":"FILLING","open":true,"trustData":"true"}]
```

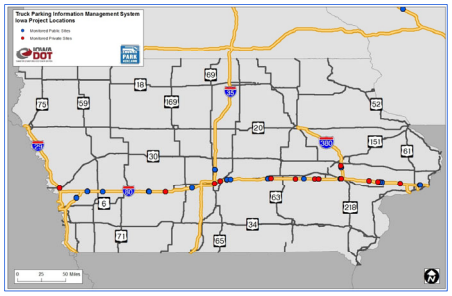

Dynamic Public Feed - live URL

https://transportal.cee.wisc.edu/TPIMS/dynamic

State traveler information - Michigan



Iowa deployment



Iowa TPIMS Sites			
Corridor	DOT	Private	Total
I-80	23	11	34
I-29		1	1
I-35	4		
I-235		1	1
I-380	2	2	4
Total	29	15	44

Dynamic messaging signs

- Moratorium on new signs in ROW
- Expensive
  - Ability to deploy more sites
- Rely on Technology to make data publicly available
  - Smartphone apps, in-cab navigation, 511
- Iowa State effectiveness assessment

IOWA STATE UNIVERSITY
Institute for Transportation

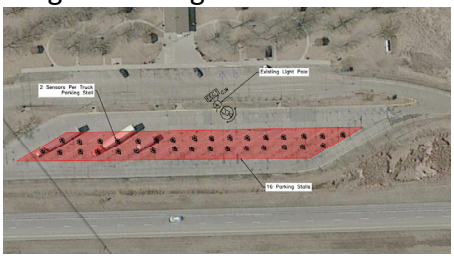
Types of sites

- Public Rest Areas
- Truck Weigh Stations
- Private Truck Stops
- Prairie Meadows Racetrack and Casino
- Kum&Go Stores
- Casey's General Stores
- Kwik Star
- Taylor Quick Pick
- McDonalds

- No participation by most Pilot and Travel America
- Interest in own reservation system

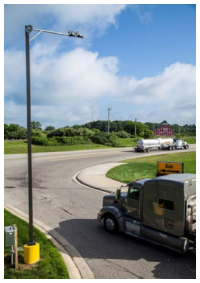
Technology solution

- In-ground Magnetometer Puck



Technology solution

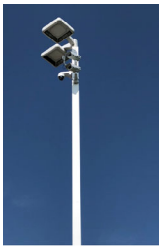
- Entrance/Exit Counting
- Camera with Built In Video Analytics



Technology solution

- System Validation with Fish Eye and Pan/Tilt/Zoom Cameras





Contracting approach

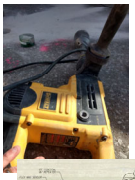
- Hire contractor to provide truck parking availability data
- Contractor deployed their own equipment
- Contractor operates/monitors/resets the system
- Contractor provides data feed
- DOT obtains data for 511 through data feed

Deployment schedule/process

- Developed high level system requirement with 8-state group
- Developed detail functional requirements for RFP
- Worked with DOT purchasing to develop full RFP
- Evaluated proposals
- Selected contractor
- Rolled RFP requirements into a contract
- Phase 1 Construction – Public rest areas
- Phase 2 Construction – Private truck stops

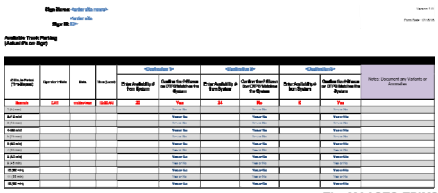
Construction schedule

- All sites fully constructed by mid-October 2018



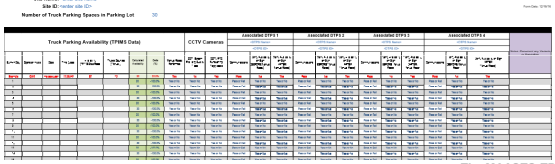

Self evaluation process

- Contractor individually evaluates all sites are in working order.
- 24-hours of verified data.
- Done remotely with cameras.



Burn in period

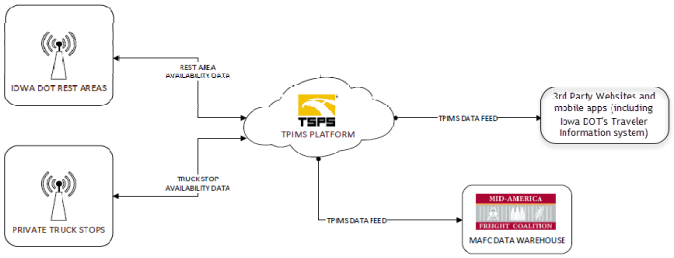
- Entire System Evaluation
- 60 Day Review Period Nov- Dec 2018
- 30 Days Documentation
- Require 7 Consecutive Days of Data



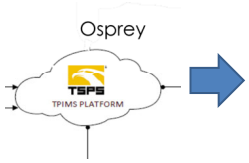
System operation

- Go Live = January 4, 2019
- Runs for 3 years per Grant Requirements

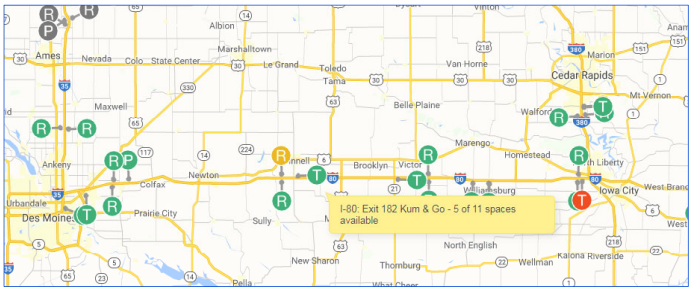
Information dissemination



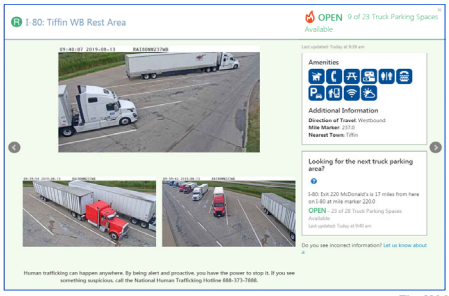
511 traveler website



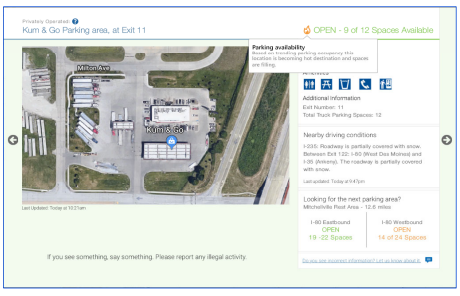
511 map



511 traveler website



511 traveler website



Traveler Information Integration: Privately Owned Truck Stops (no pictures due to privacy considerations)

511 map legend

Icon	Meaning	Configuration
P	Open	Parking area is 0-70% full *OR* at least 5 available spaces
P	Open, but busy	TPIMS feed ≠ LOW Parking area is 70-95% full ***AND*** Only 4 spaces available
P	Low Availability	TPIMS feed = LOW OR (Less than 5% of capacity remains open *OR* 0-3 spots are available) *CARS-Park shall never report a site as "Full." Instead, it shall always use the phrase "Low Availability."*

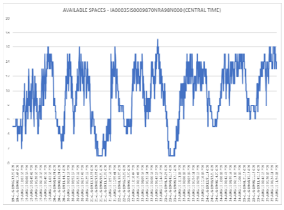
Icon	Meaning	Configuration
X	Closed	If the site is closed either per TPIMS data are the Rest Area Update tool, the Closed icon shall be displayed.
P	No real-time data	Real-time data for parking area isn't currently available; only static information is available. *This shall also be used if a "null" value is returned in the TPIMS Open data element.*

Grant performance measures

- Parking Utilization and Demand Cycles
  - ATRI baseline and post-implementation truck parking surveys
  - ATRI analysis of truck Global Positioning System (GPS) location data
  - Available truck parking studies or data
- Corridor Safety
  - Change in Hours-of-Service violations
- Reliability
  - System downtime
  - User complaints
  - Accuracy

Contractor monitoring

- Evaluating frequency and magnitude of rests
- Graphing availability over time
  - High baseline of trucks parked
  - Lots that do not fill
- Visual verification of data feed
  - Utilizing static images from 511



Outreach

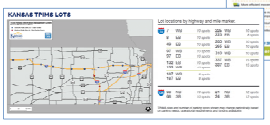
Billboards

TrucksParkHere.com Website

Truck driver outreach

Marketing efforts targeting drivers

- Truck Freight Conferences
  - Mid-America Trucking Show
  - Truckers Jamboree
  - Great American Trucking Show
- Siriux XM – Road Dog Radio interview
- TrucksParkHere.com
- Marketing Collateral
  - Social Media
  - Post cards
  - State specific rack cards



Third-party vendor outreach

Marketing efforts targeting application developers and in-cab navigation systems

- Truck Freight Conferences
  - National Private Truck Council
  - Institute for Trade and Transportation Studies
  - Great American Trucking Show
  - National Association of Small Trucking Companies
- One-on-one conference calls
- Third-party Vendor Forum – November 2019

Measuring success

Parking Utilization

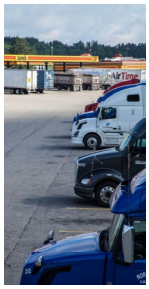
- Are drivers utilizing TPIMS to inform their parking decisions?
- Have driver-perceived parking shortages declined?

Safety and Security

- Are truck parking facilities more safe and secure?
- Is there a reduction in illegal or informal parking?
- Is there a reduction in fatigue-related crashes?

System Reliability

- Is there a decline in the average time spent looking for parking?
- Is the system meeting its performance requirements for accuracy?



The TPIMS vision

Freight network users will experience:

Regional Consistency for Trucking Industry

- Seamless regional look and feel for trucking industry users
- Flexibility for state-specific concepts

Safety, Productivity & Economic Competitiveness

- Safer for truck drivers and general public roadway users
- Drivers & carriers more efficient and profitable
- New economic opportunities attracted to regional corridors

National Model for Deployment

- Consistent concepts, messaging and technologies
- Expand pilot project to other NHS corridors and states

TPIMS questions?

www.TrucksParkHere.com

Iowa TPIMS Project Manager

Phil Mescher

Iowa Department of Transportation
Project Management Bureau
Tel 515-233-7969
Phil.Mescher@iowadot.us

HNTB Technical Lead

Chuck Miller

HNTB Corporation
Kansas City Office
Tel 816-527-2696
cmiller@hntb.com