

HUMPED CROSSINGS, INADEQUATE SIGHTLINES, AND VIRTUAL DIAGNOSTICS: AUTOMATED HIGHWAY RAIL GRADE CROSSING SAFETY ASSESSMENT WITH THE CROSSING-I SYSTEM



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Additional team members: Michael Billmire (web portal dev), Chris Cook (UAS data analysis), Becky Lowe (GIS support)



Rail Transportation Program
Michigan Tech Transportation Institute • Michigan Technological University



**Michigan
Technological
University**

PROBLEM BEING SOLVED

- Loss of life and of property occur too frequently at rail crossings
- 130,000 public and 209,000 total crossings in the U.S.
 - 200+ annual fatalities
 - 2000+ annual injuries



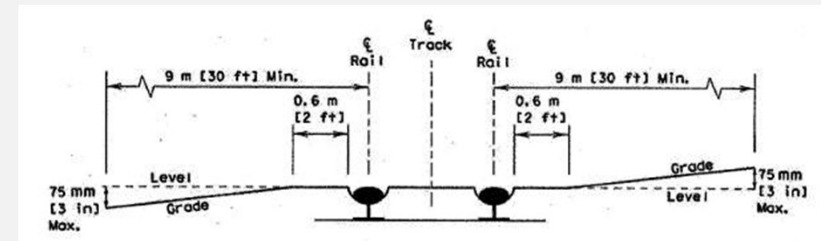
3/7/2017 Biloxi, 4 deaths, 38 injuries (50 total onboard, retirees)



10/16/21 Thackerville, OK: Amtrak train strikes semi-truck car hauler stuck on tracks; 5 injured

BEFORE MEASUREMENTS: DEFINE REQUIREMENTS

- Defined the requirements to measure grade crossings
 - Crossing profile measurement requirements: Based on AASHTO's "A Policy on Geometric Design and Streets" (Green Book) – 0.89% max grade for 30ft from ends of ties (3 inches over 28 ft; 75mm over 8.4m)
 - Rate of change critical to find locally problematic areas
 - Sight line requirements: Railroad-Highway Grade Crossing Handbook by the FHWA



Critical areas for 3D measurement of vertical highway profiles at grade crossings – 0.89% grade over 30' (9.1m) – AASHTO Green Book

	Case B: Departure from stop	Case A: Moving vehicle							
		Vehicle speed (mph)							
Train speed (mph)	0	10	20	30	40	50	60	70	80
	Distance along railroad from crossing, d_r (feet)								
10	240	146	106	99	100	105	111	118	126
20	480	293	212	198	200	209	222	236	252
30	721	439	318	297	300	314	333	355	378
40	961	585	424	396	401	419	444	473	504
50	1201	732	530	494	501	524	555	591	630
60	1441	878	636	593	601	628	666	709	756
70	1681	1024	742	692	701	733	777	828	882
80	1921	1171	848	791	801	838	885	946	1005
90	2162	1317	954	890	901	943	999	1064	1134
	Distance along highway from crossing, d_h (feet)								
		69	135	220	324	447	589	751	931

Table 32 Railroad-Highway Grade Crossing Handbook – helps determine distances needed for data collection along highways & railways

HANG-UP DETECTION VEHICLE STANDARDS



- ▶ Eck and Kang, 1991, update Clawson 2002, checked against current standards
- ▶ They also state that vehicles with ground clearance down to 2 inches have been observed
- ▶ Recommend use of 40 foot wheel base with 4 inch clearance (12.2m x 0.10m)
- ▶ We produce school bus, motorcoach, & low-boy trailer by default; can do any other, with alternative clearances & wheelbases

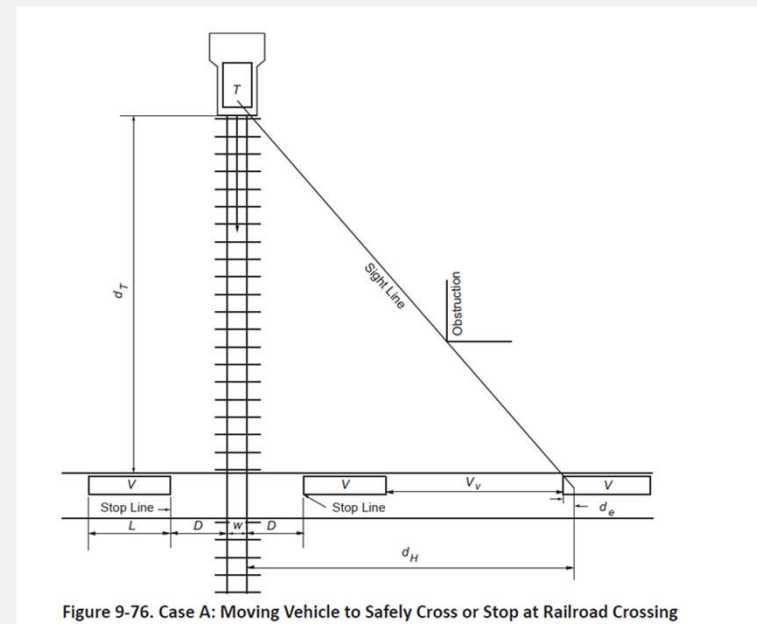
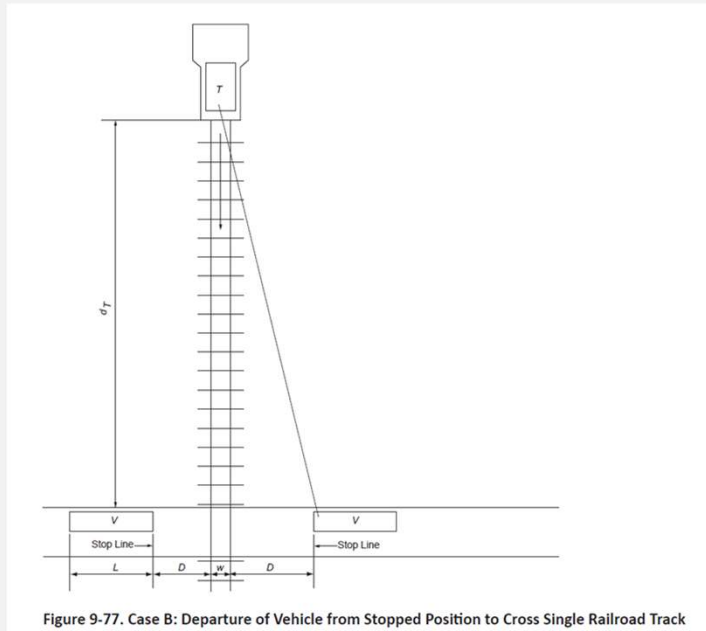
Table 4.1 – Design Vehicle Dimensions

Design Vehicles	Wheelbase (ft)	Overhang (ft)		Ground clearance (in)		
		Front	Rear	Wheelbase	Front	Rear
Single Unit Trucks –						
Single Unit Beverage Truck	24	--	10	6	--	8
Articulated Beverage Truck	30	--	--	10	--	--
Rear-Load Garbage Truck	20	--	12.5	12	--	14
Aerial Fire Truck	20	7	12	9	11	10
Pumper Fire Truck	22	8	10	7	8	10
Buses -						
Mini-Bus	15	--	16	10	--	8
School Bus	23	--	13	7	--	11
Single Unit Transit Bus	25	18	--	8	6	--
Articulated Transit Bus	22 / 26	--	10	10 / 10	--	9
Motorcoach	27	7.6	10	7	10	8
Trucks -						
Low-Boy Trailers < 53 ft	38	--	--	5	--	--
Double-Drop Trailer	40	--	--	6	--	--
Car Carrier Trailer	40	--	14	4	--	6
Belly Dump Trailer	40	--	--	11	--	--
Recreational Vehicles -						
Passenger Vehicle and Trailer – Private Use	20	--	13	5	--	5
Passenger Vehicle and Trailer – Commercial Use	27 (24 to hitch)	--	13	7	--	7
Recreation Vehicle	27	7.8	16	7	6	8

Clawson, Amy Lorraine, "Establishing design vehicles for the hang-up problem" (2002)

SIGHT DISTANCE

- Requirements from the 2018 Green Book are the same as 2011.



Need to consider vehicles starting from stopped position (left) or already moving vehicles (right)

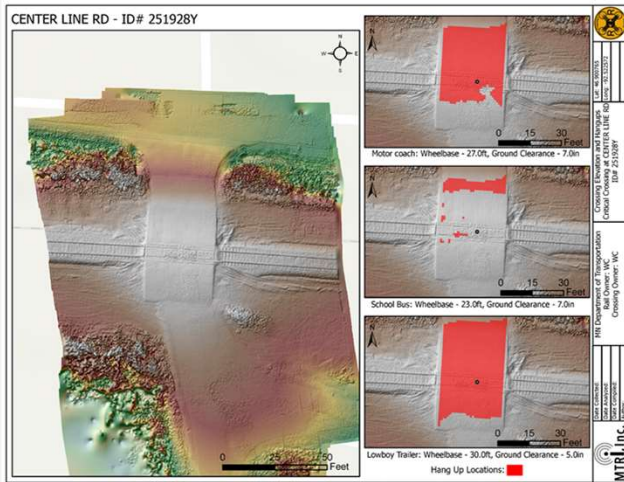
* We calculate site line adequacy for approaching vehicles *

SBIR PHASE I, II, & FOLLOW-ON RESULTS FOR CROSSING SAFETY ASSESSMENT

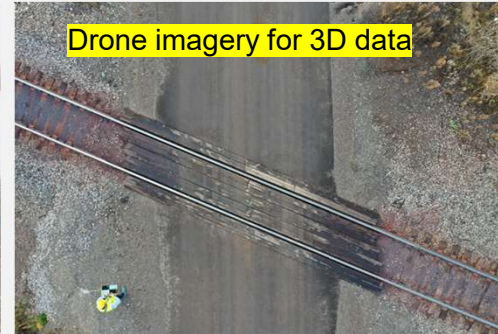
Standardized data collections



Automated humped crossing detection by vehicle type & Crossing-i reports



Drone imagery for 3D data



6 states, 51 crossings



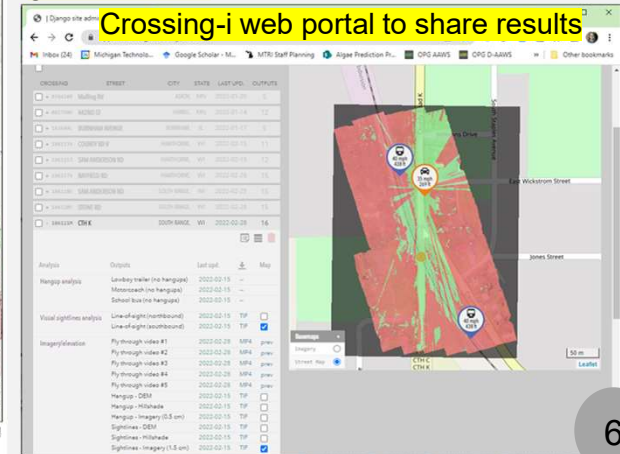
Automated sign ID



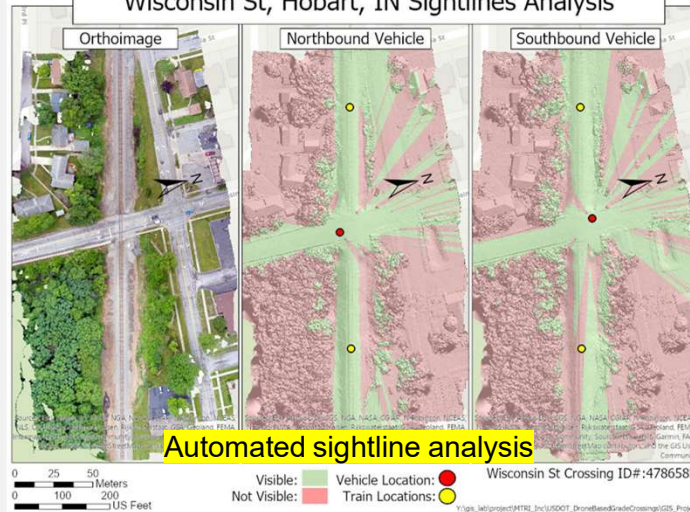
Drone & 360° ground videos



Crossing-i web portal to share results



Wisconsin St, Hobart, IN Sightlines Analysis



Automated sightline analysis

TECHNOLOGY SOLUTION: CROSSING-I

- We have developed an advanced, practical, and available drone based technology to reduce life threatening accidents at railroad crossings.
- Developed under USDOT SBIR Phase I & II funding - partnership between MTU and MTRI Inc.
- Now being made commercially available



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Photogrammetry

High resolution photogrammetry and 3D model construction



Low Clearance

Identify hang-up risk by vehicle type



Inventory

Photo documentation of crossing and sign infrastructure.



Automation

Automated imagery analysis to identify hazards



Sight Line

Identify sight line risk and potential obstacles



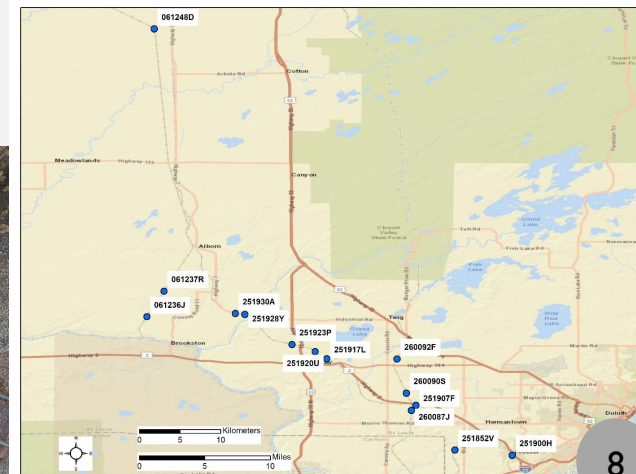
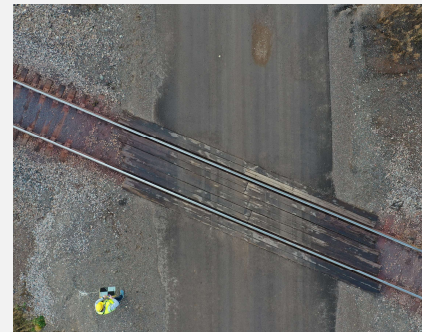
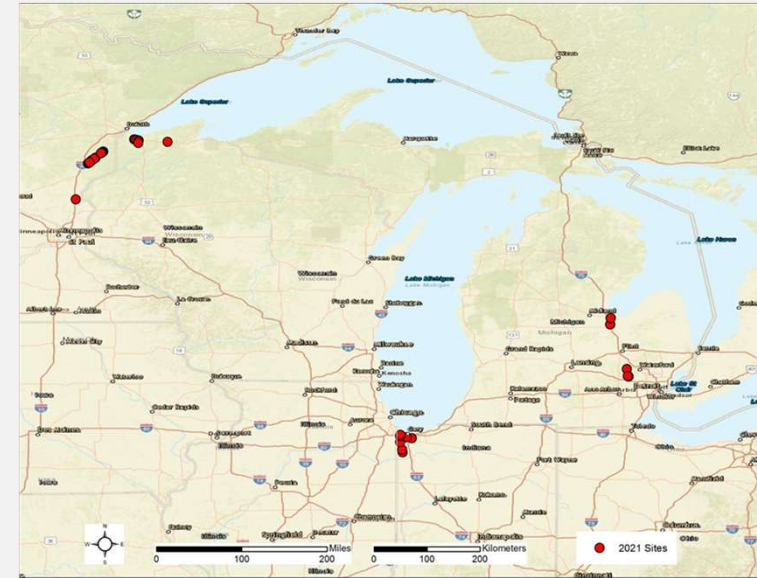
Portal

Cloud application to access reports and imagery

<https://mtriinc.com/rail-crossing-assessment/>




TECHNOLOGY SOLUTION: CROSSING-I

- Crossing-i demonstrated in 34 crossings (five states), 2019-2021 (SBIR I & II funding)
 - MnDOT, WISDOT, MDOT, INDOT, ICC
 - Crossing survey planning & execution methods are well established & efficient
- MnDOT, St. Louis County (MN), Ohio Rail Development Commission (ORDC) partners for 2022-2023 projects
 - Collected 12 crossings near Duluth last week, Oct. 2022
 - 5 Ohio crossings, May 2023
- 30 crossings in MI – worked with ENSCO to compare to train lidar system (DOTX 218)



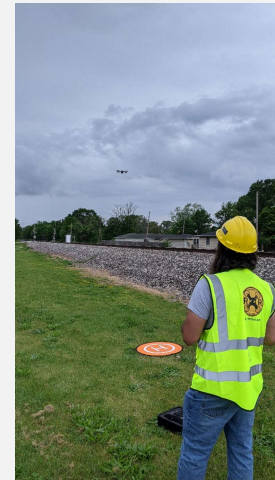
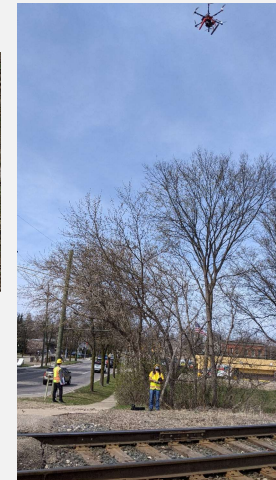
15+ CROSSING-I PRODUCTS AVAILABLE FOR EACH CROSSING:

- Hang-up analysis (low ground clearance)
 - Lowboy trailer
 - Motorcoach
 - School Bus
 - Customizable to other vehicles
- Visual sight lines - are there sightline issues for vehicles approaching the crossing?
 - Active vs. passive crossings
 - Able to create dynamic (animated) sight lines
- GIS results
- Drone video
- 360° camera video (driver's point of view)
- Crossing-i report
- 3D environment

- 251928Y Center Line Rd		BROOKSTON, MN	2023-03-29	15
		  		
Analysis	Outputs	Last upd.	↓	Map
Hangup analysis	Lowboy trailer	2023-03-28	TIF	<input type="checkbox"/>
	Motorcoach	2023-03-28	TIF	<input type="checkbox"/>
	School Bus	2023-03-28	TIF	<input type="checkbox"/>
Visual sightlines analysis	Line-of-sight (northbound)	2023-02-21	TIF	<input type="checkbox"/>
	Line-of-sight (southbound)	2023-02-21	TIF	<input type="checkbox"/>
Imagery/elevation	360 ground video	2023-03-29	LINK	
	Fly through video #1	2023-03-28	MP4	prev
	Hangup - DEM	2023-02-21	TIF	<input type="checkbox"/>
	Hangup - Hillshade	2023-02-21	TIF	<input type="checkbox"/>
	Hangup - Imagery (0.5 cm)	2023-02-21	TIF	<input type="checkbox"/>
	Sightlines - DEM	2023-02-21	TIF	<input type="checkbox"/>
	Sightlines - Hillshade	2023-02-21	TIF	<input type="checkbox"/>
	Sightlines - Imagery (1.5 cm)	2023-02-21	TIF	<input type="checkbox"/>
Full report	Full report	2023-03-29	PDF	
3D environment	3D environment	2023-03-29	LINK	

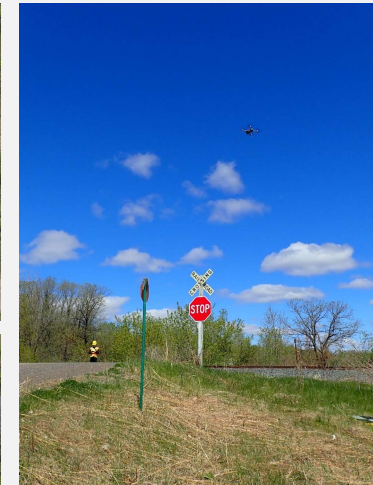
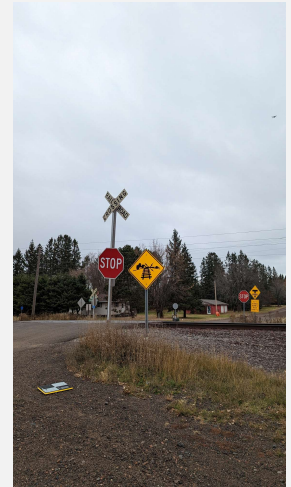
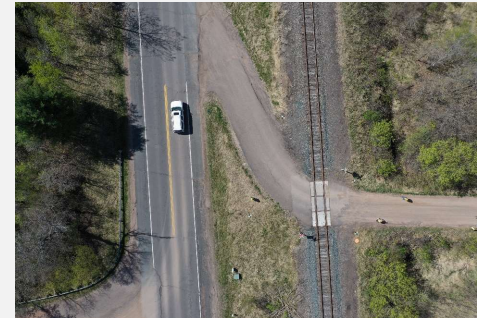
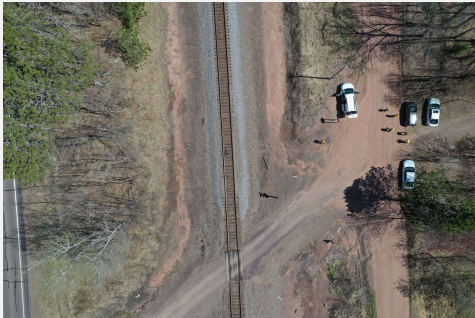
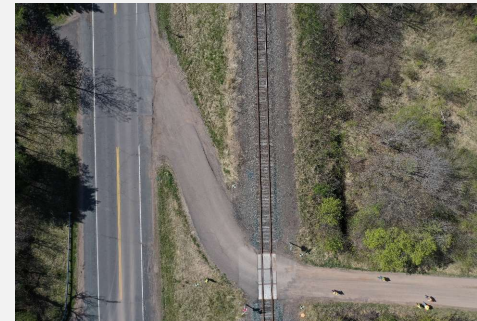
DRONE-ENABLED DATA COLLECTIONS

- ▶ Completed data collections for crossing assessments for SBIR funding
 - ▶ Completing up to 8 crossings per day, more possible (depends on proximity of crossings, FAA rules for flight operations)
 - ▶ Submitted whitepaper to FAA to enable Beyond Visual Line of Sight (BVLOS) operations for grade crossing assessment via drone
 - ▶ Crossing data typically collected within 45 minutes.
- ▶ Data collection workflow
 1. Place ground control targets (now with Aeropoints)
 - 4 at the crossing for humped crossing
 - 2 further away from crossing for visual sight lines
 - Specific distance from crossing is determined by AASHTO Green Book calculations for sight line triangles
 2. Fly larger UAS with high-res imaging for humped crossing analysis
 3. Fly smaller DJI Mavic 2 Pro (or similar system) for visual sight lines analysis; can do all with larger UAS
 4. Retrieve ground control targets

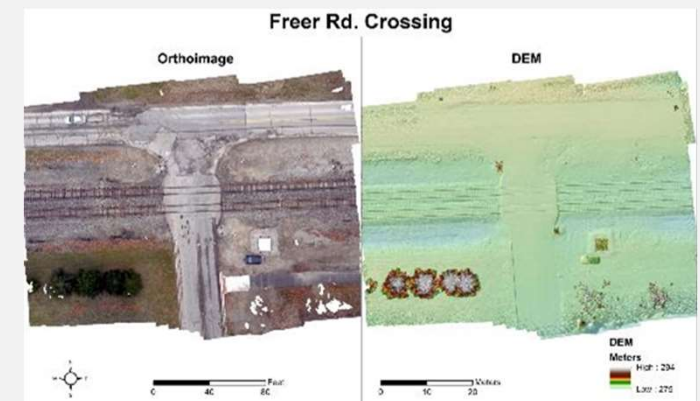
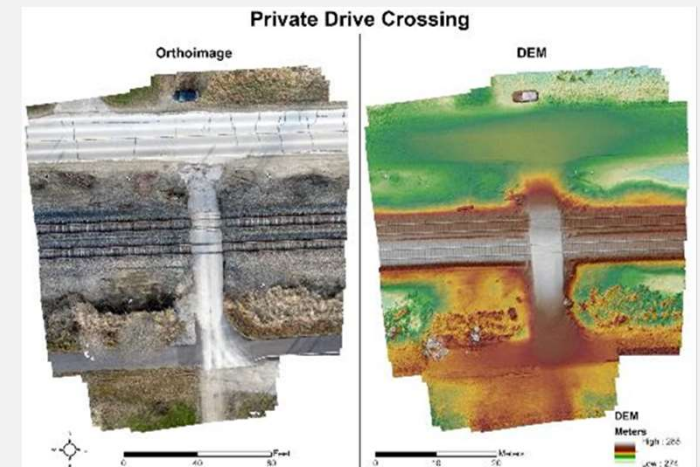
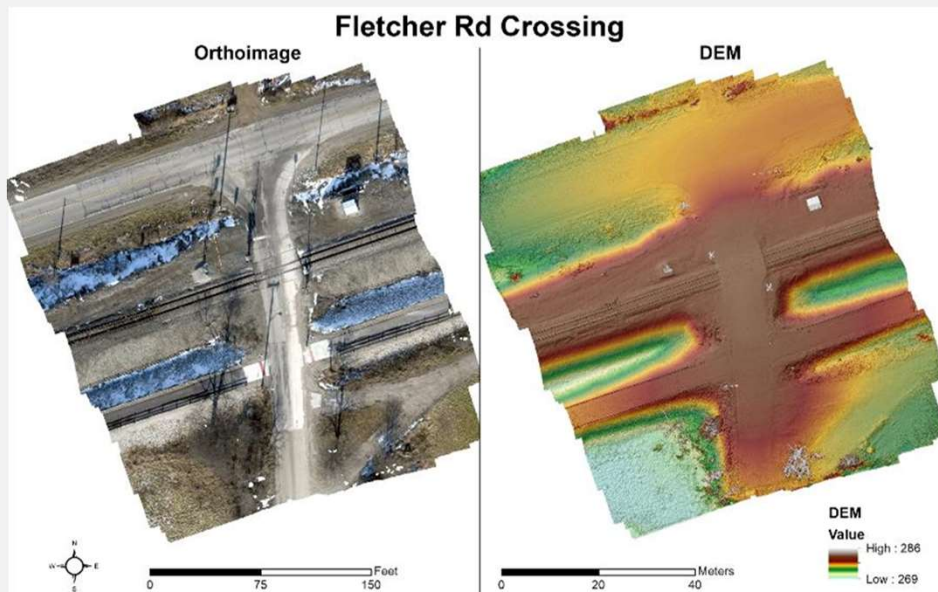


HIGH RESOLUTION IMAGES: USED FOR 3D DATA GENERATION WITH PHOTOGRAMMETRY

- Collected via drone, with flight plans
 - Higher-resolution for crossing profiles
 - Moderate resolution for larger site line analysis areas



HIGH RESOLUTION IMAGES & ORTHO OUTPUTS, INCLUDING DEMS



442ND ST, HARRIS, MN – 082750K

U. S. DOT CROSSING INVENTORY FORM
DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

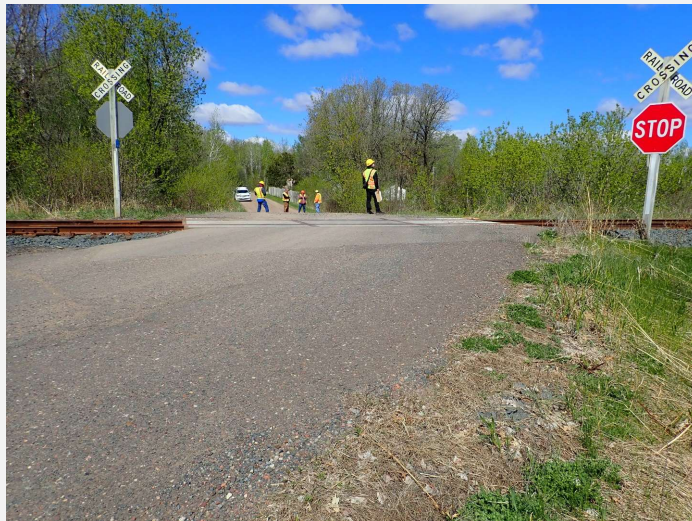
OMB No. 2130-0017

Instructions for the initial reporting of the following types of new or previously unreported crossings: For public highway-rail grade crossings, complete the entire inventory form. For private highway-rail grade crossings, complete the Header, Parts I and II, and the Submission Information section. For public pathway grade crossings (including pedestrian station grade crossings), complete the Header, Parts I and II, and the Submission Information section. For private pathway grade crossings, complete the Header, Parts I and II, and the Submission Information section. For grade-separated highway-rail or pathway crossings (including pedestrian station crossings), complete the Header, Part I, and the Submission Information section. For changes to existing data, complete the Header, Part I Items 1-3, and the Submission Information section, in addition to the updated data fields. Note: For private crossings only, Part I Item 20 and Part III Item 2.K are required unless otherwise noted. An asterisk * denotes an optional field.

A. Revision Date (MM/DD/YYYY) 02 / 20 / 2018	B. Reporting Agency <input checked="" type="checkbox"/> Railroad <input type="checkbox"/> Transit <input type="checkbox"/> State <input type="checkbox"/> Other	C. Reason for Update (Select only one) <input checked="" type="checkbox"/> Change in Data <input type="checkbox"/> New Crossing <input type="checkbox"/> Closed <input type="checkbox"/> Re-Open <input type="checkbox"/> Date <input type="checkbox"/> Change in Primary Operating RR <input type="checkbox"/> No Train Traffic <input type="checkbox"/> Quiet Zone Update <input type="checkbox"/> Admin. Correction	D. DOT Crossing Inventory Number 082750K
---	--	--	--

Part I: Location and Classification Information

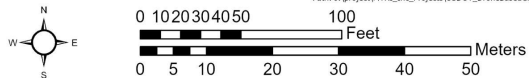
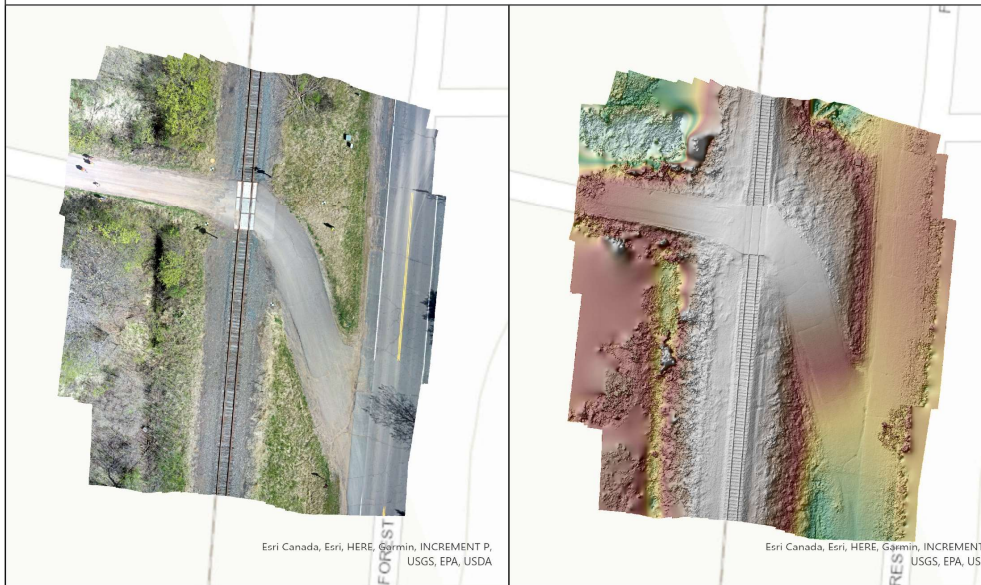
1. Primary Operating Railroad St. Croix Valley Railroad Company (SCVY)	2. State MINNESOTA	3. County CHISAGO
4. City / Municipality <input type="checkbox"/> In <input checked="" type="checkbox"/> Near HARRIS	5. Street/Road Name & Block Number 442ND ST (Street/Road Name) * (Block Number)	6. Highway Type & No. MUN 13
7. Do Other Railroads Operate a Separate Track at Crossing? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, Specify RR	8. Do Other Railroads Operate Over Your Track at Crossing? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, Specify RR	
9. Railroad Division or Region <input type="checkbox"/> None MINNESOTA	10. Railroad Subdivision or District <input type="checkbox"/> None SCVY RR	11. Branch or Line Name <input type="checkbox"/> None HINCK-FOREST LK
12. RR Milepost (prefix) 0248.09 (suffix)	13. Line Segment 0214	14. Nearest RR Timetable Station NORTH BRANCH
15. Parent RR (if applicable) <input type="checkbox"/> N/A SCVY	16. Crossing Owner (if applicable) <input type="checkbox"/> N/A SCVY	17. Crossing Type <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private
18. Crossing Purpose <input checked="" type="checkbox"/> Highway <input type="checkbox"/> Pathway, Ped. <input type="checkbox"/> Station, Ped.	19. Crossing Position <input checked="" type="checkbox"/> At Grade <input type="checkbox"/> RR Under <input type="checkbox"/> RR Over	20. Public Access (if Private Crossing) <input type="checkbox"/> Yes <input type="checkbox"/> No
21. Type of Train <input checked="" type="checkbox"/> Freight <input type="checkbox"/> Intercity Passenger <input type="checkbox"/> Commuter <input type="checkbox"/> Transit <input type="checkbox"/> Shared Use Transit <input type="checkbox"/> Tourist/Other	22. Average Passenger Train Count Per Day <input type="checkbox"/> Less Than One Per Day <input type="checkbox"/> Number Per Day 0	



442ND ST. ORTHOS & DEMS

442nd St, Harris, MN – 082750K

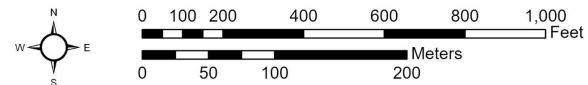
Orthophoto and hillshaded DEM results from 80ft (24.4m) crossing profile flights



Crossing profile ortho resolution = 4.9mm pixel GSD (0.19"),

442nd St, Harris, MN – 082750K

Orthophoto and hillshaded DEM results from 200ft (61.0m) sight line flights



Crossing profile ortho resolution = 14.4mm pixel GSD (0.57"),

TECHNOLOGY SOLUTION – “HUMPED” CROSSINGS

Automated Profile Assessment Tool – specifies specific hangup locations for multiple vehicle types

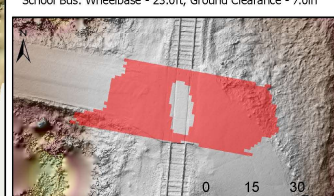
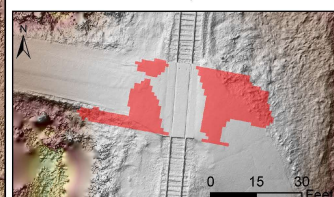
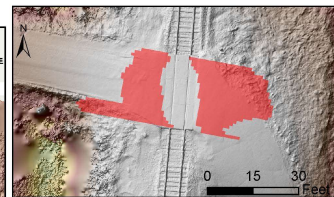
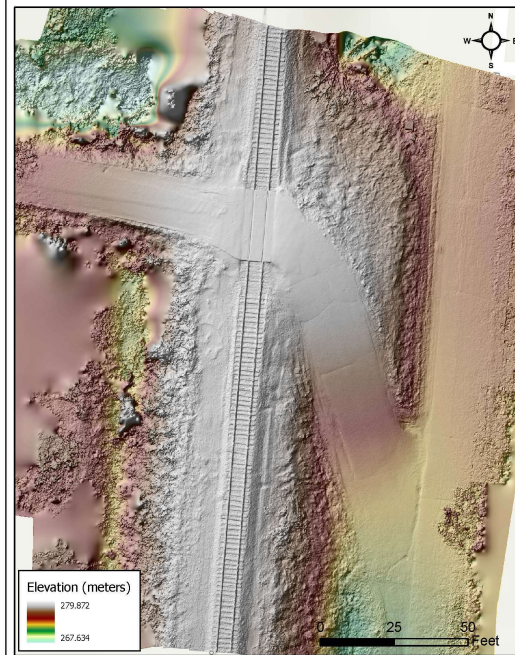
Wisconsin St, Hobart, IN Humped Crossing Analysis

Motorcoach

School Bus

Low-Boy Trailer

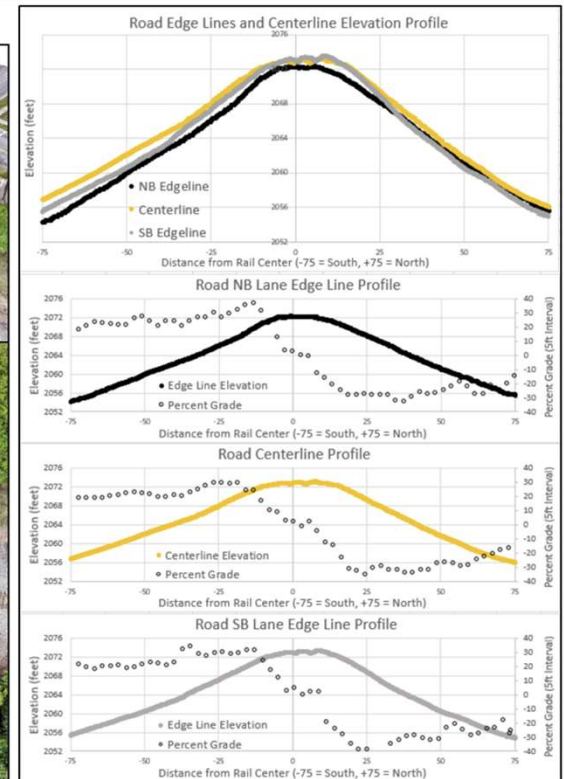
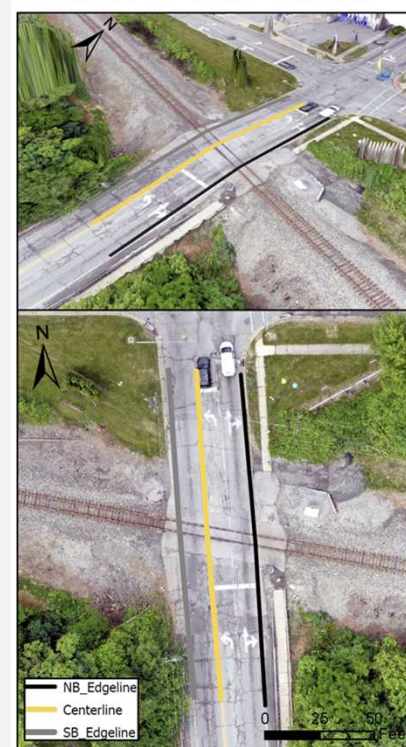
442nd Street - DOT# 082750K



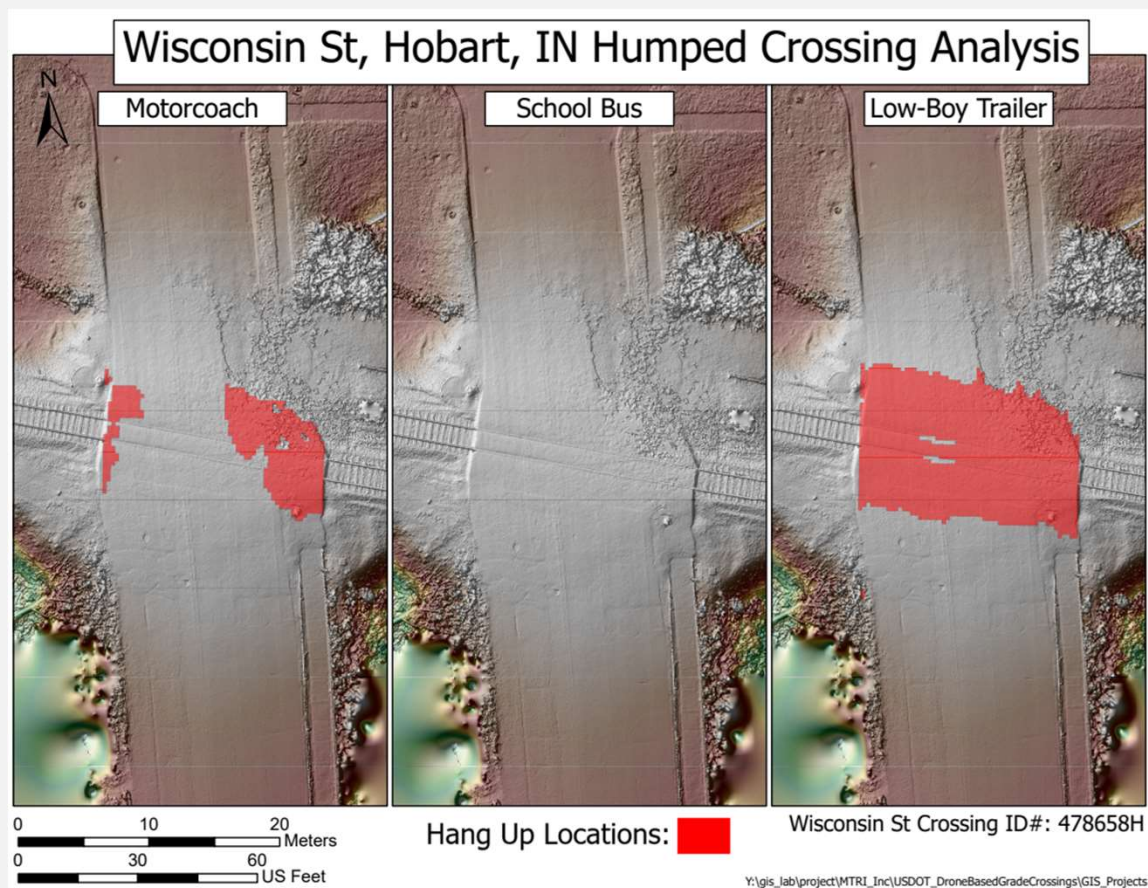
Hang Up Locations: ■

DOT# 082750K
Crossing Elevation and Hangup Location
Critical Crossing at 442nd Street
DOT# 082750K
Minnesota Department of Transportation
St. Croix Valley Railroad
MTRI, Inc.
Folder: Y:\gis_lab\project\MTRI_Inc\USDOT_DroneBasedGradeCrossings\GIS_Projects\

Wisconsin St - DOT# 478658H



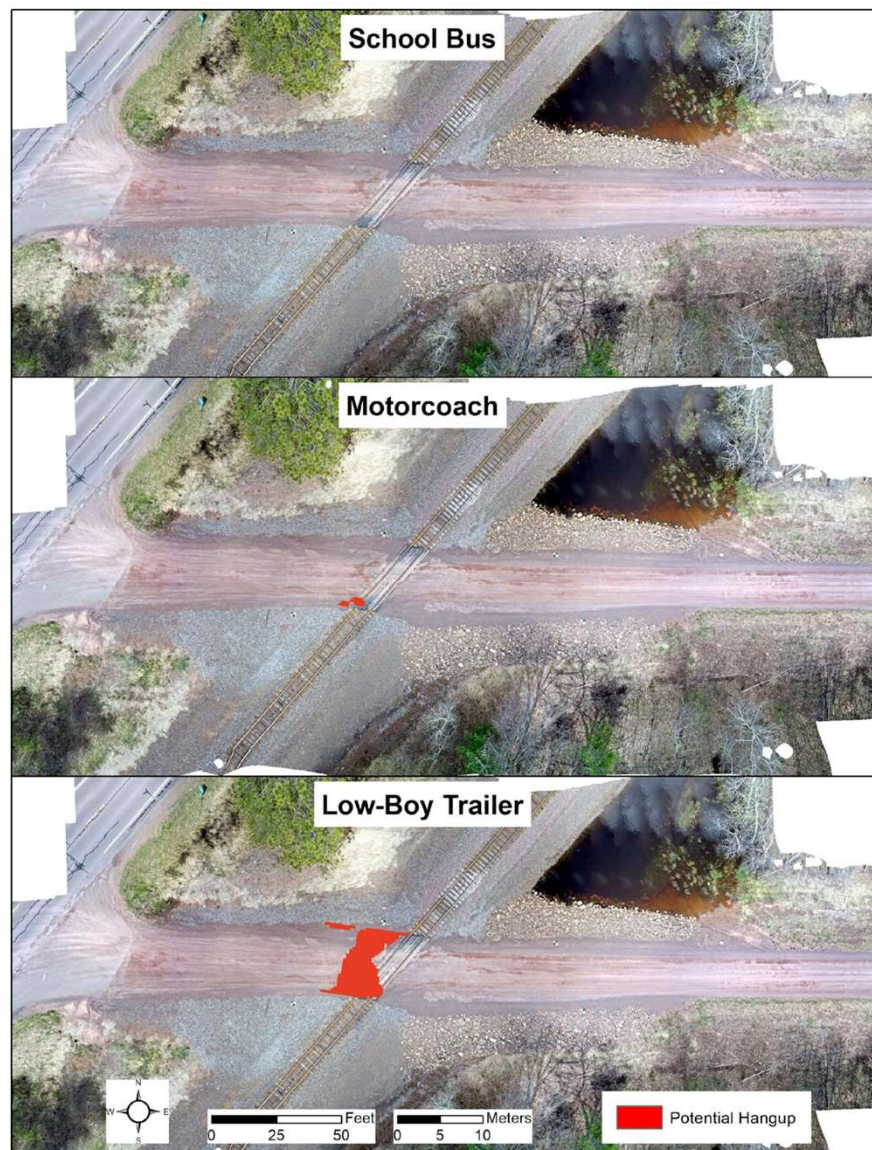
WISCONSIN ST (478658H) HUMPED CROSSING ANALYSIS



16

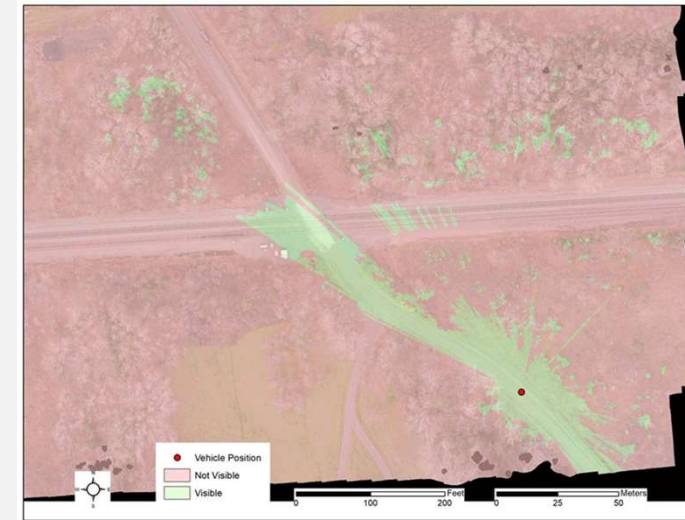
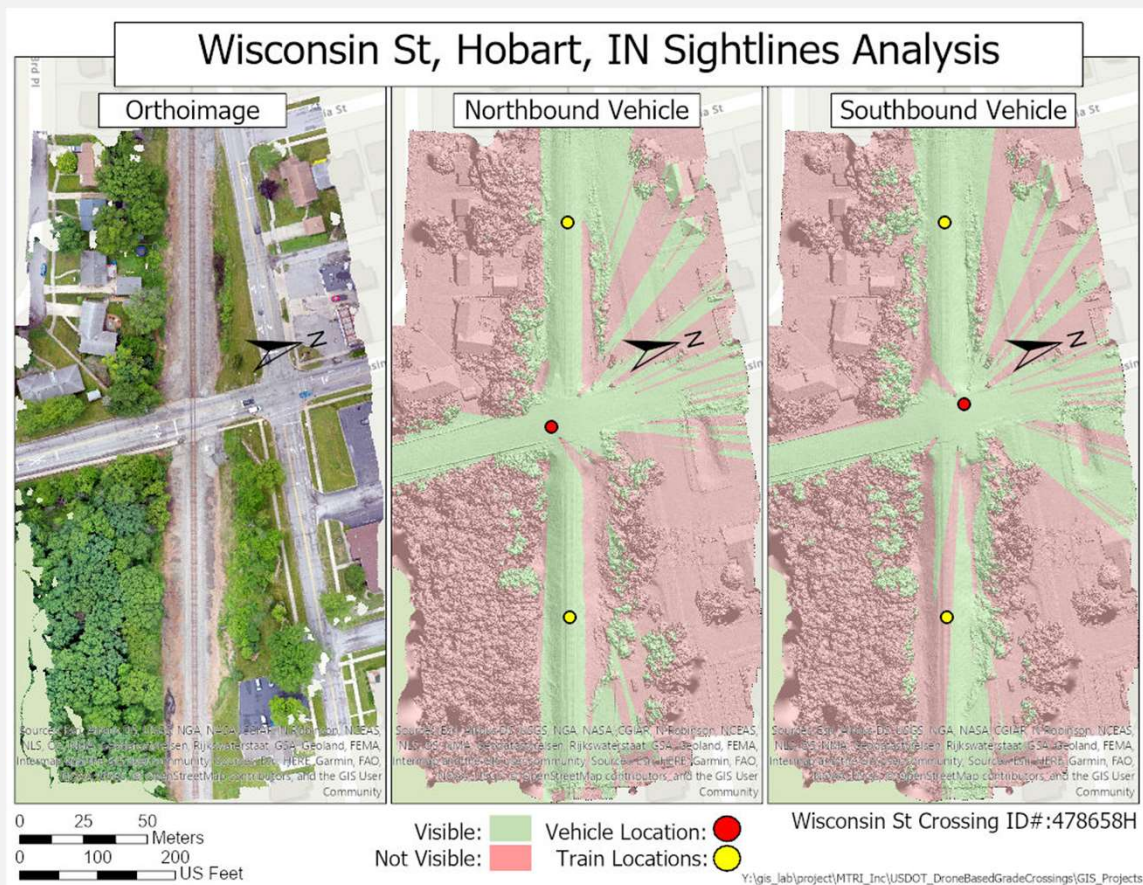


ROOT RD.
MN
(#076421X)
HUMPED
CROSSING
ANALYSIS
RESULTS
EXAMPLE



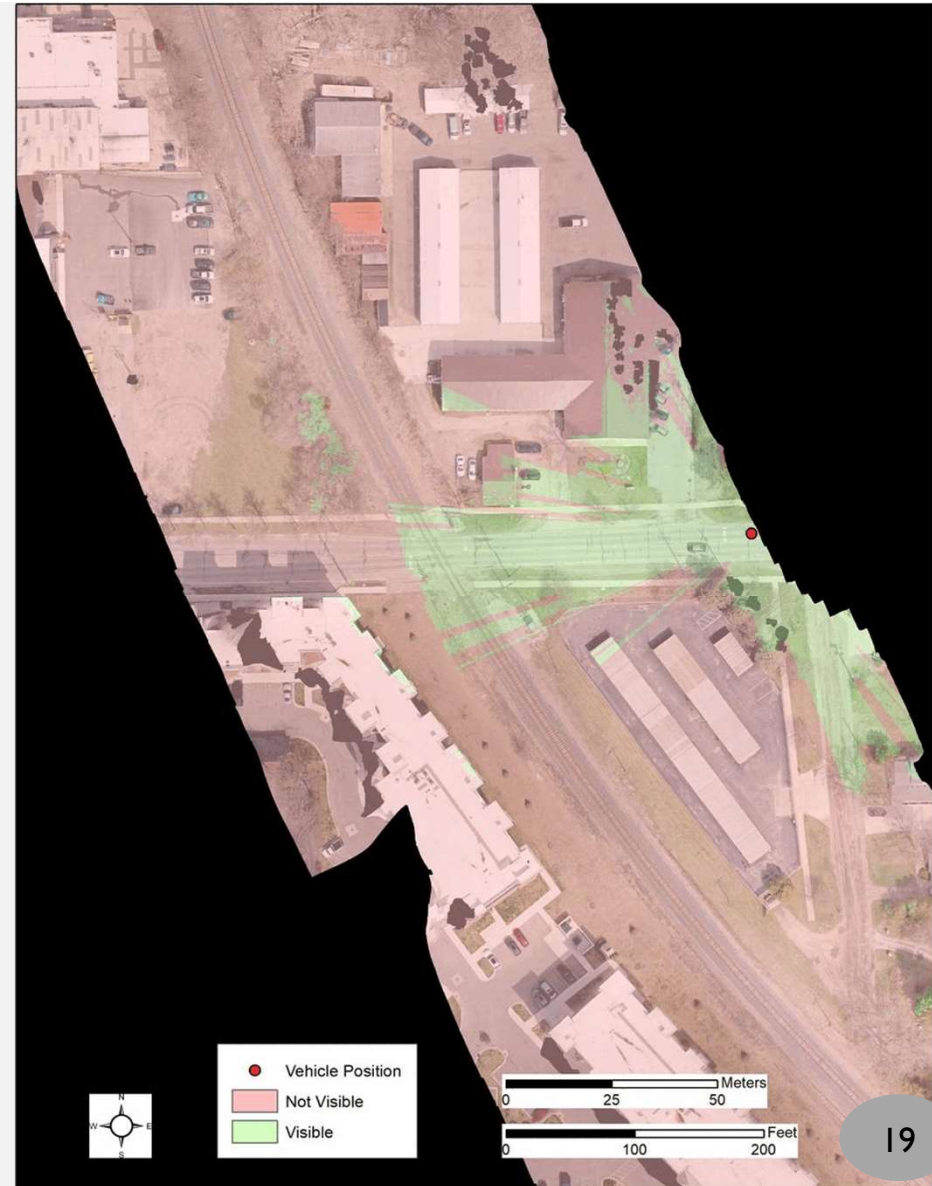
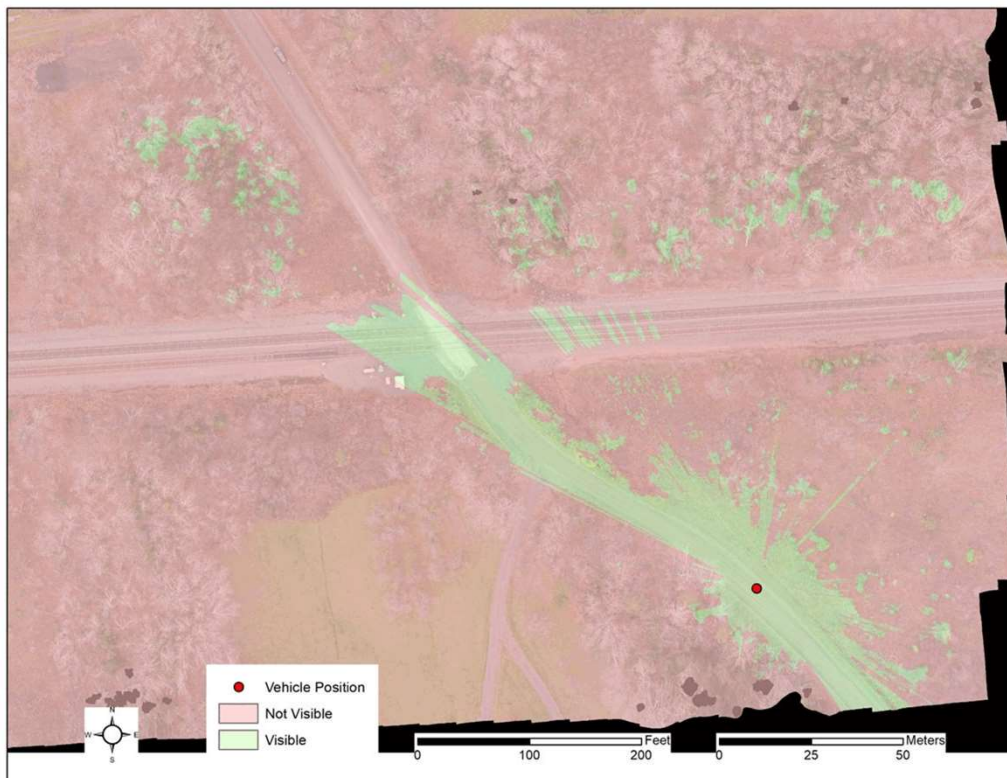
TECHNOLOGY SOLUTION – VISUAL SIGHT LINES

Railroad Grade Crossing Viewshed Tool Results – with dynamic results available



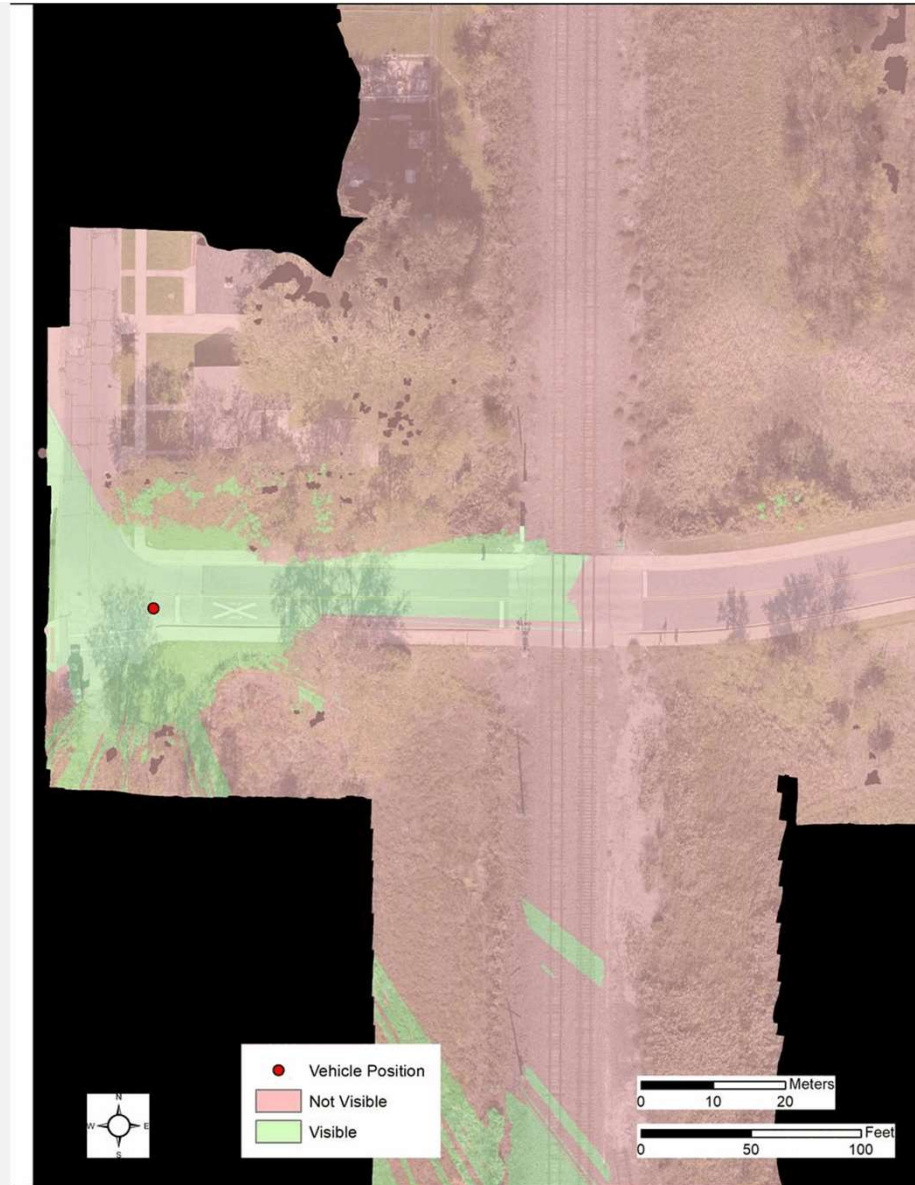
TECHNOLOGY SOLUTION

Dynamic Viewshed Tool Results



GRAND BLVD, 546322Y

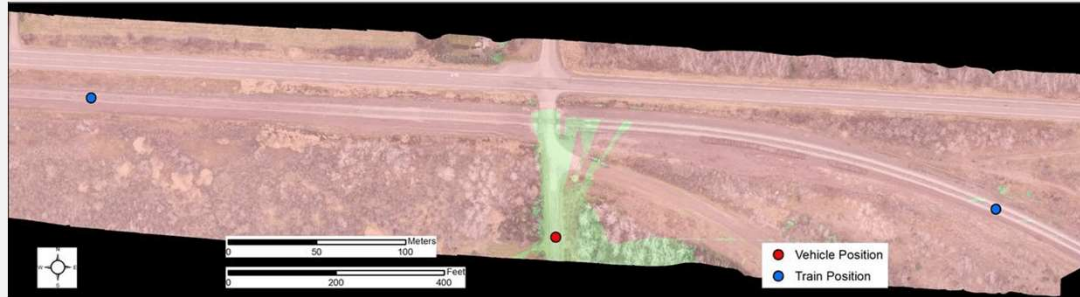
Dynamic Sight
Lines



20



DYNAMIC SIGHTLINE RESULTS

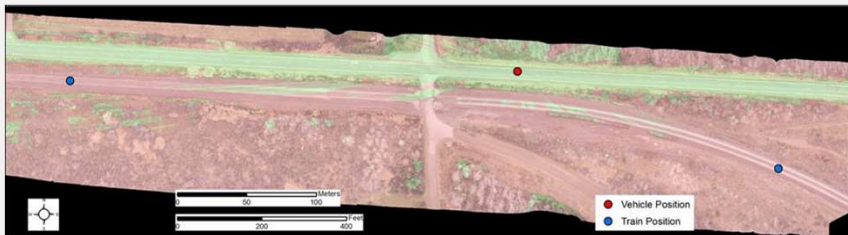


Northbound, from Fairbanks Rd

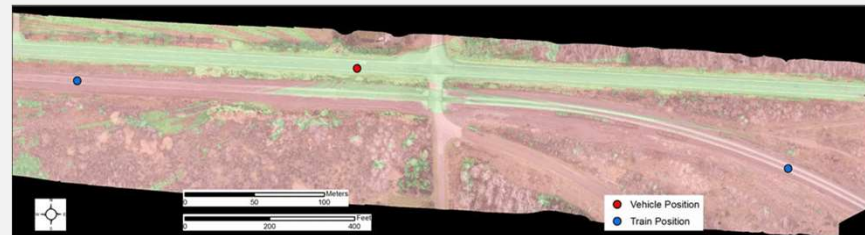


Northwest bound,
from Center Line Rd

Center Line Rd, 251928Y



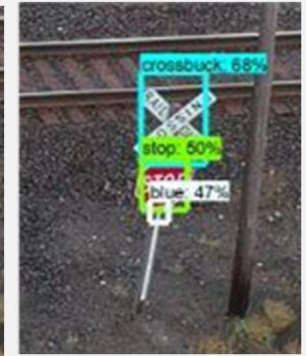
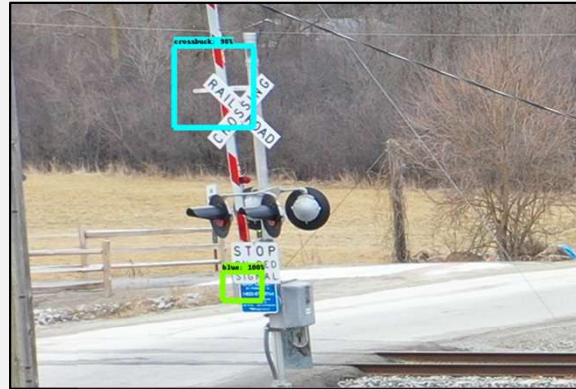
Southbound, left turn from CH7



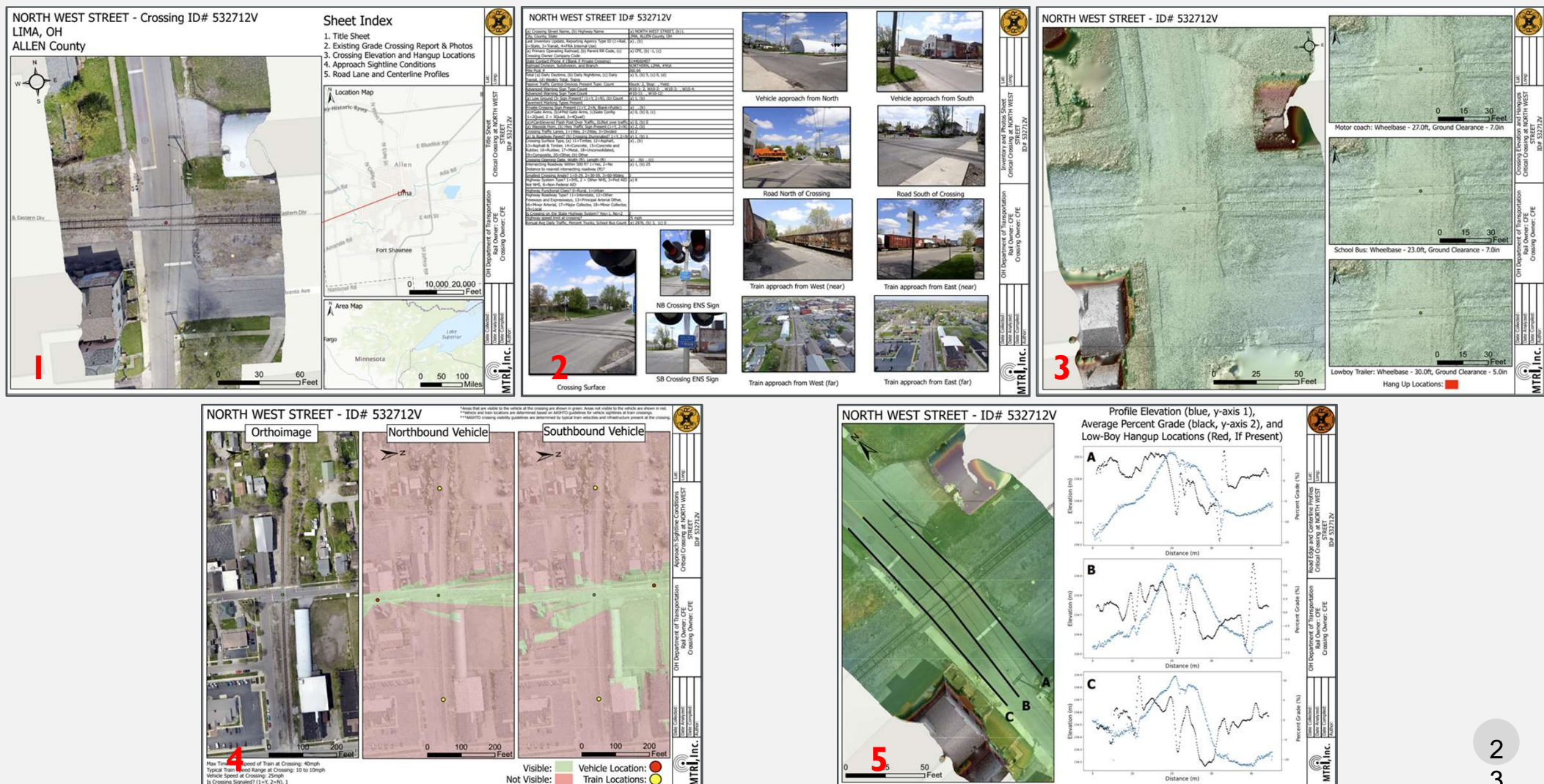
Southbound, right turn from
CH7

AUTOMATED SIGN IDENTIFICATION

Automated Sign Identification Using Machine Learning Tool Results



CROSSING-I REPORTS – 5-PAGE PDF FOR EACH SITE



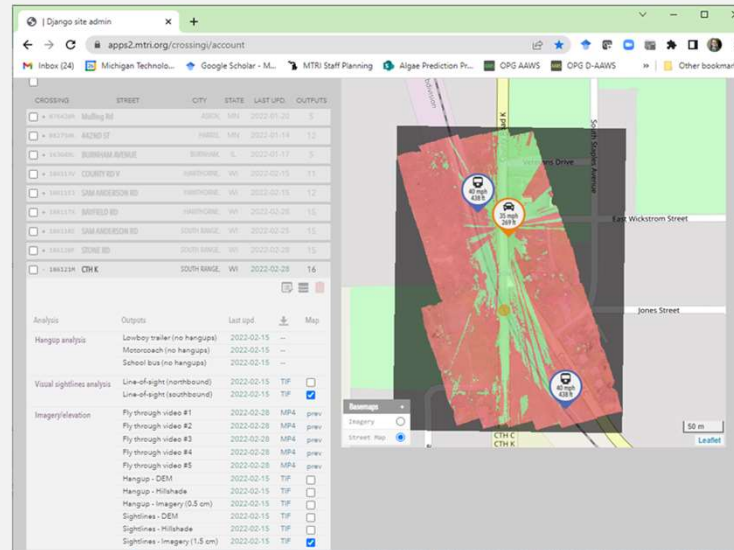
CROSSING-I PORTAL

- Customer Access Point
- Crossing-i Analytics Reports
- Fly-Through Videos
- 360° ground videos
- Crossing-i GIS Outputs
- Recording of standard crossing survey data

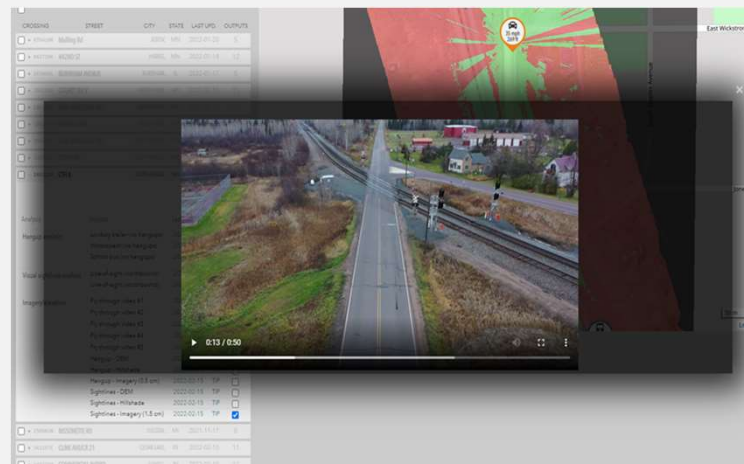
Added examples of 3D panoramic viewing of results to help with Virtual Diagnostic surveys

* Upgrades completed under Michigan Economic Development Corporation MTRAC program

- Helpful for virtual diagnostics



GIS data viewing



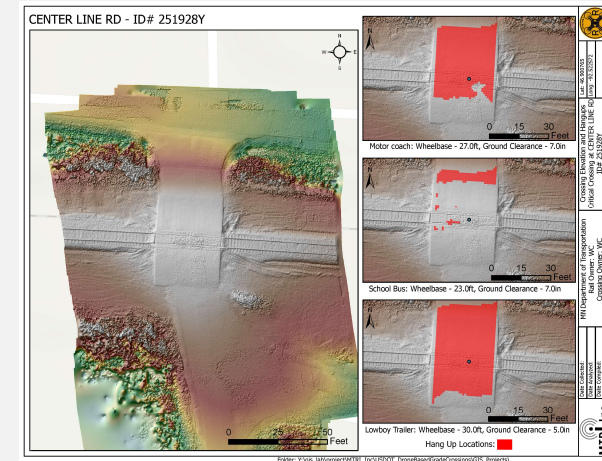
Video viewing



Crossing Inventory database information for ID: 186115J

CrossingHeader	Field	Description	Value
BlockNum	Block number
DeviceType	DeviceTypeID	11=Open space, 12=Residential, 13=Commercial, 14=Industrial, 15=Institutional, 16=Farm, 17=Recreational, 18=High way	11
LocationAndClassification	Highway	Highway type & No.	RD
OperatingRailroad	HsrrConductorID	Hsrr conductor ID	-1
PhysicalCharacteristics	HayCont	State contact (telephone No.)	6882661168
PublicHighway	Latitude	Latitude	46.576563
ReportBase	Longitude	Longitude	-91.91878
	LLSource	Lat/long source: 1=Actual, 2=Estimated	2
	MultiformLED	Do other railroads operate a separate track at crossing? 1=Yes, 1=No	2
	Nearest	Intersect, 0=No, 1=Yes	1
	OpenPub	Public access (if private crossing): 1=Yes, 2=No	1
	PolCont	Emergency notification telephone No.	8884659239
	PosXing	Crossing position: 1=At grade, 2=At grade, 3=At grade	1
	Railroad	The code associated with the primary operating railroad	WC

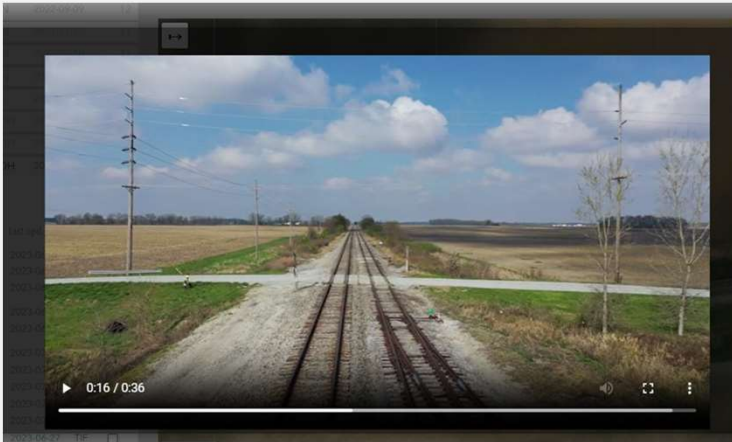
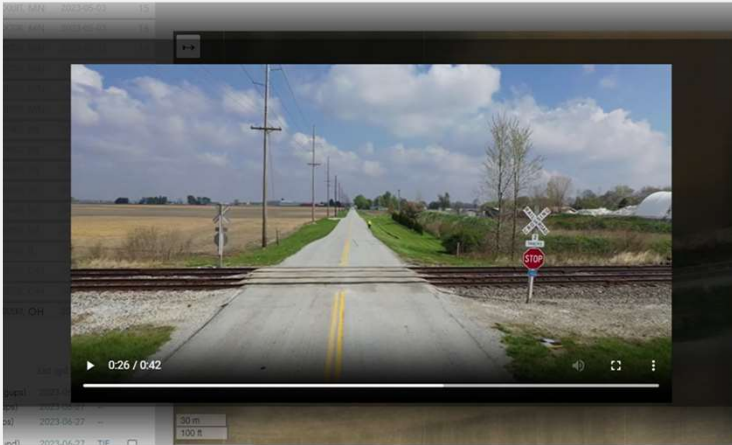
Standard FRA report updating



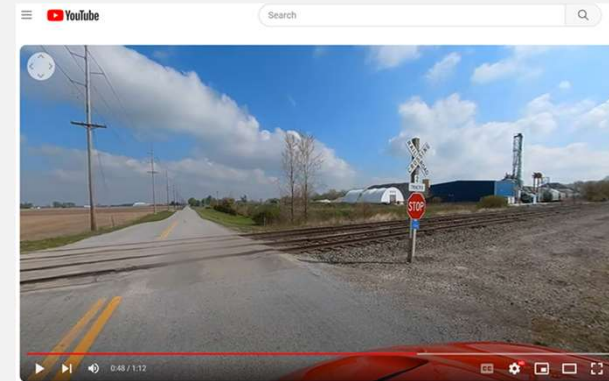
Access Crossing-i PDF reports

DRONE FLY-THROUGH VIDEOS AND 360° GROUND VIDEOS

CR-110B (532625S) - Upper Sandusky, OH

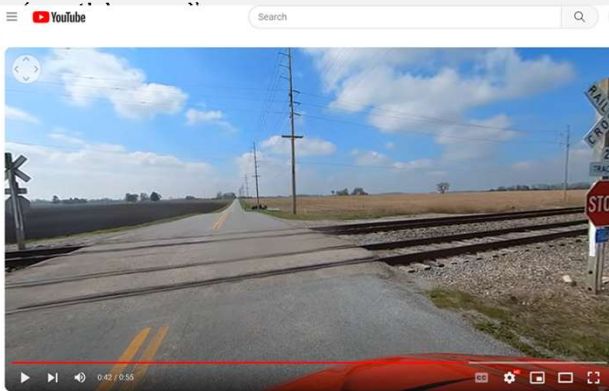


Drone videos - road, track; can be viewed on site & downloaded



CR-110B Road-Rail Grade Crossing (1), Wyandot County, OH (April 2023)

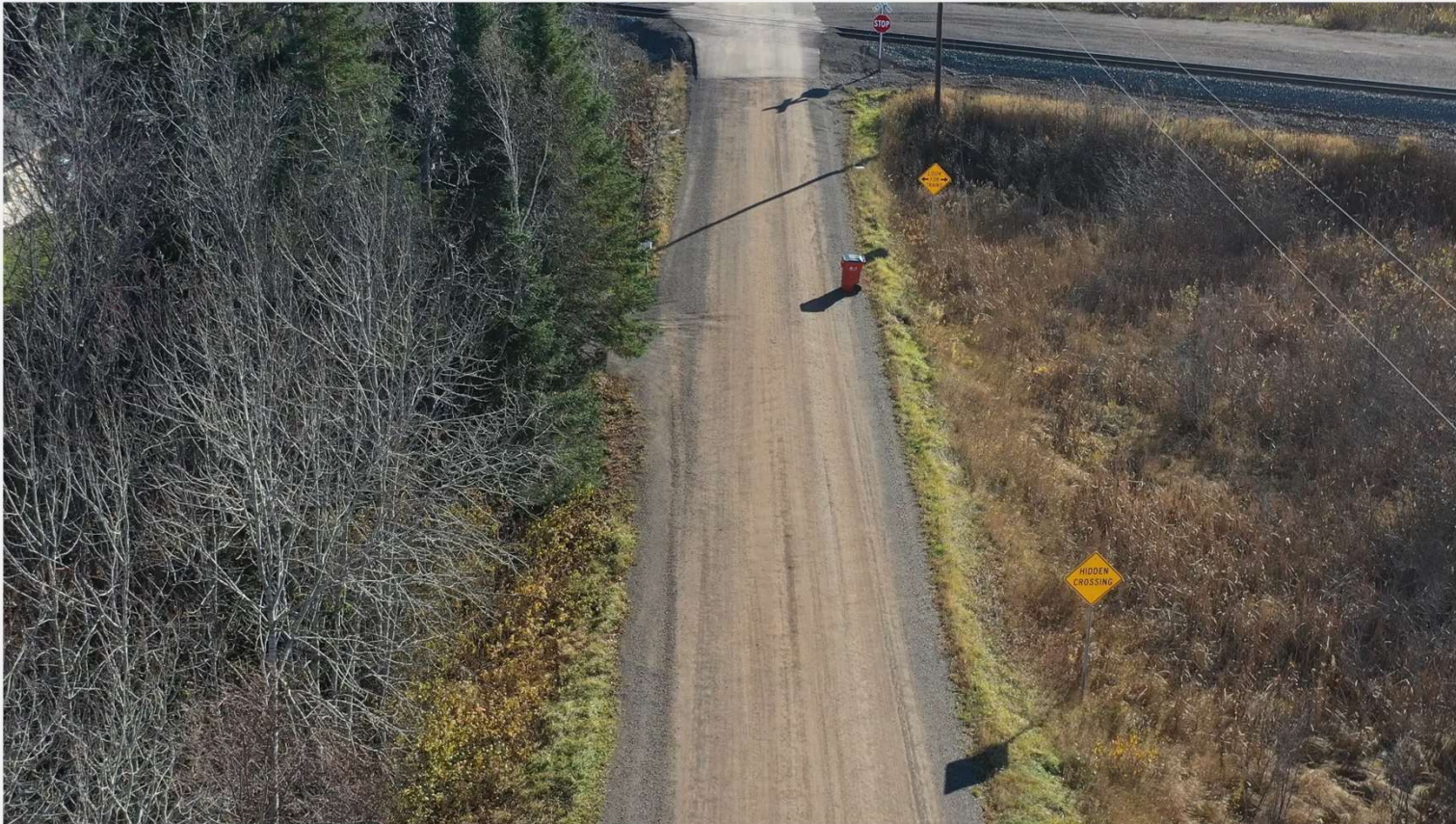
<https://www.youtube.com/watch?v=K9VPWWRtWgE>



<https://www.youtube.com/watch?v=fir3JpkE4E> (southbound)

Insta360 ground videos from moving car - can be rotated, paused

MN CROSSING DRONE VIDEO SEGMENT



POTENTIAL IMMEDIATE ROI - “VIRTUAL DIAGNOSTICS”

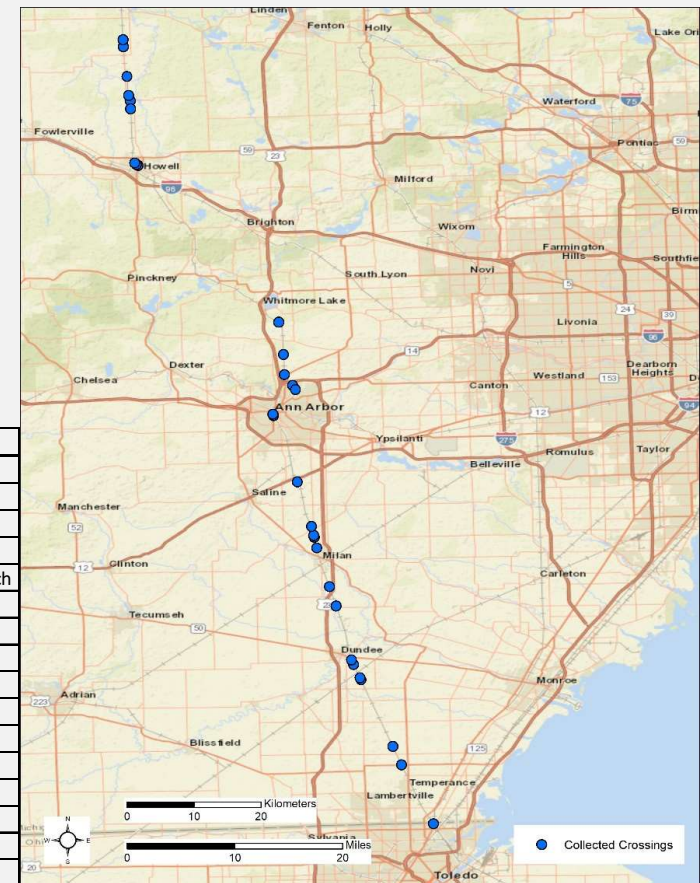
- Based on inquiry/suggestion from DOTs
- To reduce complexities and resources needed for diagnostics meetings
- Use resources demonstrated today
- Quantifying the true value/benefits

Parameter	Virtual Diagnostics	Traditional Diagnostics
Time Commitment	Low and consistent	High and variable
Coordination Complexity	Medium (no travel)	High (travel and meeting time)
Meeting Cost	Low (only time cost)	High (travel, lodging, time)
Stakeholder absence	Later review of recordings	Requires new time
Documentation	Reports (Crossing-i) & Recording	Create after meeting
Safety	High (office)	Low (live traffic)
Access to data	Any time (portal)	Meeting only (marked)

EVALUATION OF 30 MICHIGAN CROSSINGS

- 6 month project to compare results from the Crossing-i system to the ENSCO ATIP LiDAR system
- 30 crossings collected from Toledo, OH to Howell, MI
- Comparison was based on planer deviation of the crossing
 - Single value for the greatest deviation from an idealized plane
- Modified humped crossing tool to generate planer deviation values

Crossing ID	Street	Crossing ID	Street
000114M	State Line Rd.	000220V	William St.
000126G	Samaria Rd.	000239M	Traver Rd.
000129C	Jackman Rd.	000240G	Dhu Varren Rd.
000148G	Gloff Rd.	000243C	Warren Rd.
000149N	Dunbar Rd.	000245R	Northfield Church
000151P	Dixon Rd.	000250M	6 Mile Rd.
000152W	Roosevelt Rd.	000286V	West St.
000165X	Dundee Azalia Rd.	000287C	Alger St.
000170U	Crowe Rd.	000288J	Riddle St.
000177S	Arkona St.	000295U	Allen Rd.
000181G	Willow Rd.	000296B	Oak Grove Rd.
000182N	Platt Rd.	000297H	Sanford Rd.
000184C	Begole Rd.	000303J	Seltzer Rd.
000190F	Warner Rd.	000308T	Richards Rd.
000218U	W. Jefferson Ave.	000310U	Lovejoy Rd.
000219B	Ashley St.		

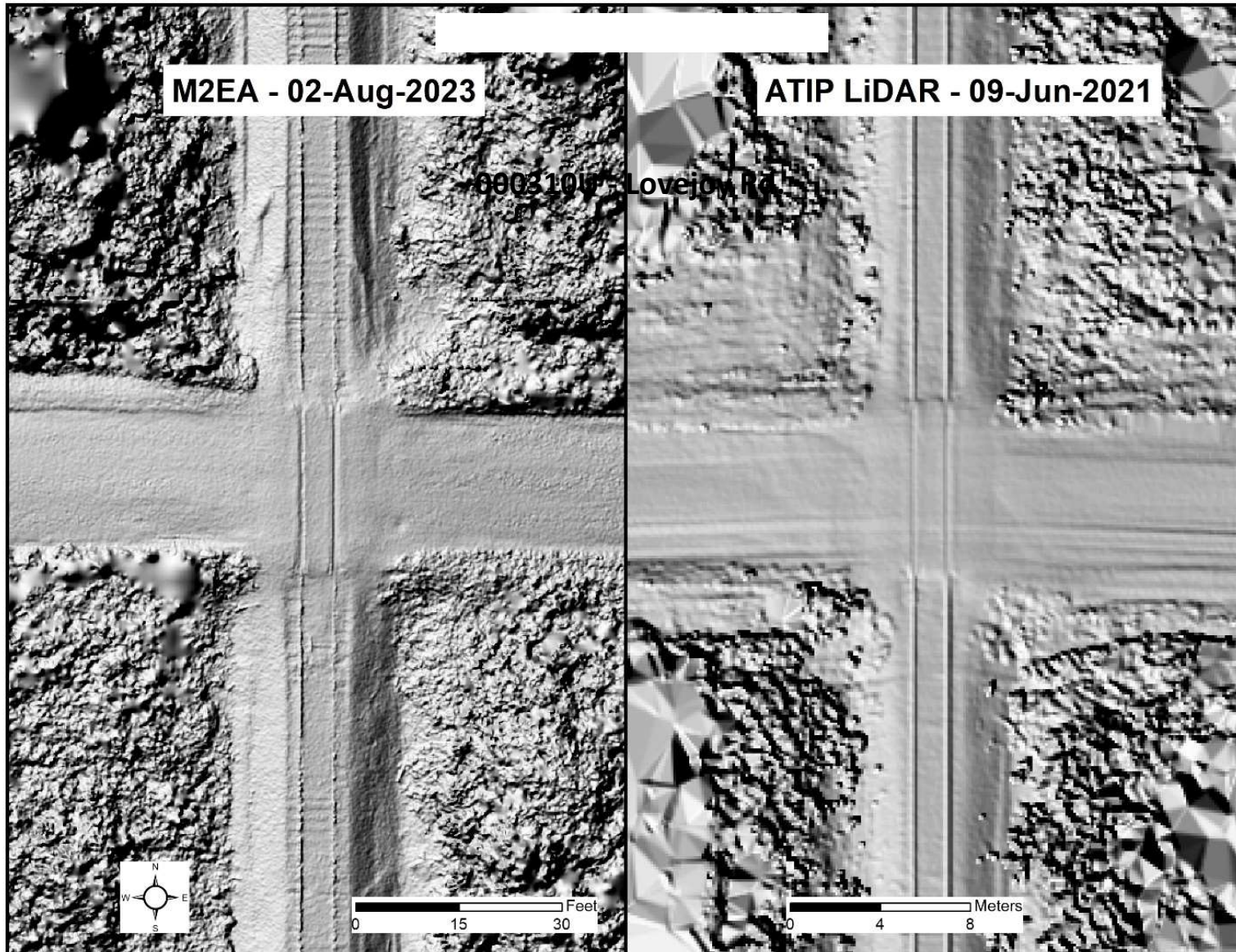


COMPARISON OF SYSTEMS

- Data collected from the Mavic 2 Enterprise Advanced (M2EA) produced results closer to the ENSCO system
- Most of the crossings with larger differences tended to be at unpaved road crossings where the road surface has changed between data collections
- The modified tool needs further improvement to account for a variety of crossing geometries
- The next two slides show comparisons between 3D models derived from drone based photogrammetry and the ATIP LiDAR system
 - These two crossings had the greatest difference and are over unpaved roads where the surface characteristics are highly dynamic compared to paved roads.
 - 3D data was collected 2 years apart

Planer Deviation Values From all Methods

Crossing_ID	Street	ATIP LiDAR (m)	M2EA Manual (m)	Mavic2 Manual (m)	MTRI Tool (m)
000114M	State Line Rd.	0.588	0.540	0.900	0.366
000126G	Samaria Rd.	0.210	0.270	0.280	0.161
000129C	Jackman Rd.	0.200	0.220	0.210	0.433
000148G	Gloff Rd.	0.163	0.160	0.120	0.282
000149N	Dunbar Rd.	0.164	0.350	0.250	0.201
000151P	Dixon Rd.	0.085	0.080	0.230	0.271
000152W	Roosevelt Rd.	0.450	0.530	1.130	0.303
000165X	Dundee Azalia Rd.	0.360	0.410	0.360	2.289
000170U	Crowe Rd.	0.061	0.060	0.030	0.259
000177S	Arkona St.	0.247	0.130	0.180	0.430
000181G	Willow Rd.	0.113	0.200		
000182N	Platt Rd.	0.020	0.050		
000184C	Begole Rd.	0.387	0.370	0.370	0.284
000190F	Warner Rd.	0.299	0.140	0.390	0.233
000218U	W. Jefferson Ave.	0.113	0.110	0.330	0.387
000219B	Ashley St.	0.036	0.090	0.220	0.387
000220V	William St.	0.359	0.430	0.840	0.745
000239M	Traver Rd.	0.330	0.550	0.930	0.393
000240G	Dhu Varren Rd.	0.145	0.150	0.170	0.244
000243C	Warren Rd.	0.164	0.120	0.130	0.129
000245R	Northfield Church	0.790	0.810	0.820	0.316
000250M	6 Mile Rd.	0.088	0.040	0.040	0.054
000286V	West St.	0.172	0.190	0.270	0.124
000287C	Alger St.	0.259	0.340	0.340	0.486
000288J	Riddle St.	0.096	0.210	0.210	0.238
000295U	Allen Rd.	0.330	0.330	0.330	0.132
000296B	Oak Grove Rd.	0.174	0.040	0.080	0.310
000297H	Sanford Rd.	0.226	0.400	0.520	0.248
000308T	Richards Rd.	0.350	0.310	0.340	0.144
000310U	Lovejoy Rd.	0.511	0.780	0.950	0.543



M2EA - 02-Aug-2023

ATIP LiDAR - 09-Jun-2021

0003100 - Lovejoy Rd

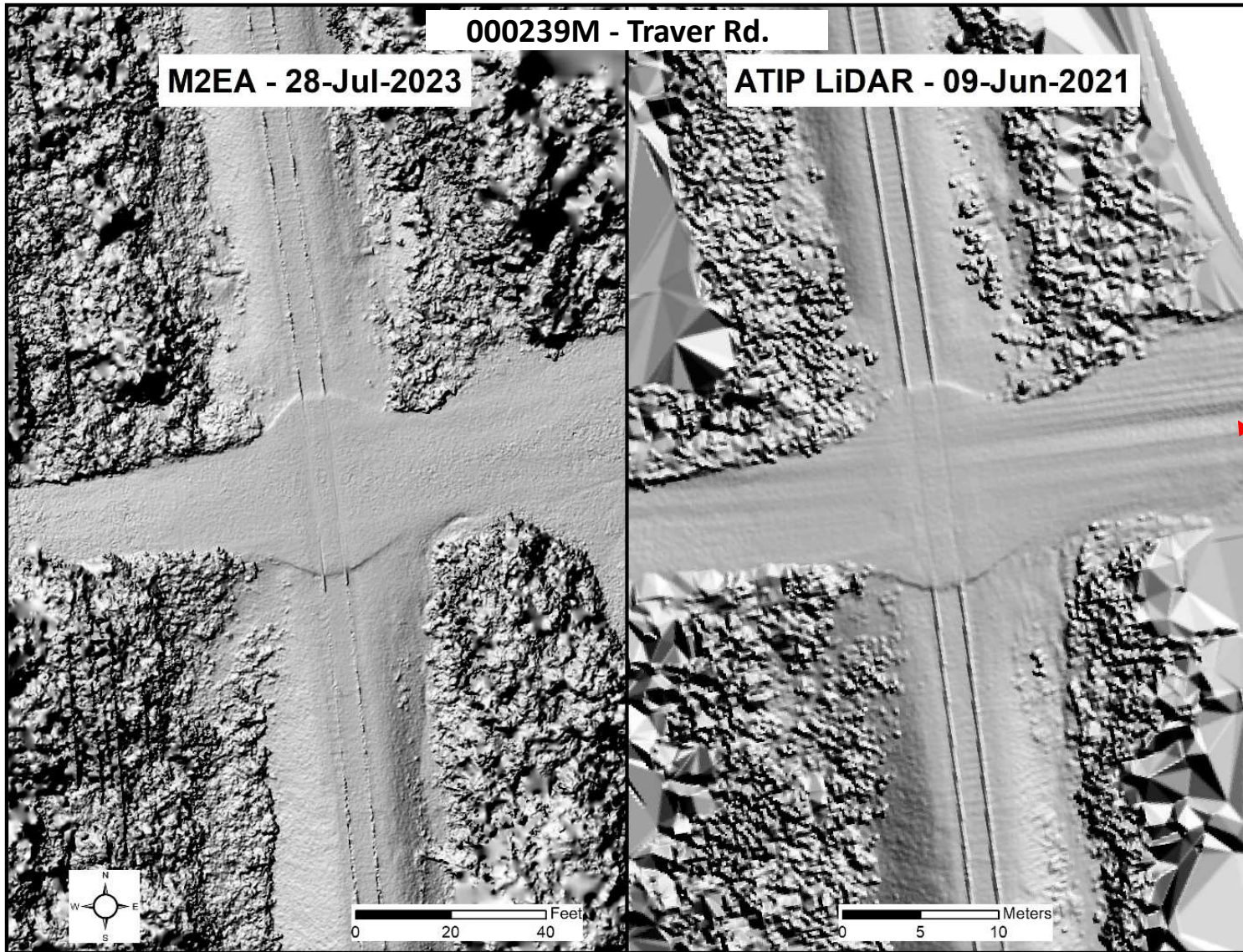
Deep Ruts

Recently Graded

000239M - Traver Rd.

M2EA - 28-Jul-2023

ATIP LiDAR - 09-Jun-2021



Most Likely an Error
in the LiDAR Data

Recently Graded

CROSSING-I PORTAL DEMO (TIME PERMITTING)

Django site admin x +

apps2.mtri.org/crossingi/crossings

Inbox (24) Michigan Technolog... Google Scholar - M... MTRI Staff Planning Algae Prediction Pr... OPG P-AAWS OPG D-AAWS Crossing-i site All Bookmarks

Crossing-I

Home | Log out

Welcome, **Demo user!**

Click on a table header to sort.
Click again to reverse order.

Filter by state: **All** v

☐ Add crossing +
Bulk add from CSV +

	CROSSING	STREET	CITY	STATE	LAST UPD.	OUTPUTS
<input type="checkbox"/>	+ 000114M	STATE LINE RD	TOLEDO, OH	2024-04-02	3	
<input type="checkbox"/>	+ 000126G	SAMARIA RDCO RD	SAMARIA, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000129C	JACKMAN ROAD	SAMARIA, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000148G	GLOFF RD	DUNDEE, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000149N	DUNBAR RD	DUNDEE, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000151P	DIXON RD	DUNDEE, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000152W	ROOSEVELT ROAD	DUNDEE, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000165X	DUNDEE AZALIA RD	AZALIA, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000170U	CROWE RD	AZALIA, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000177S	ARKONA RD	MILAN, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000181G	WILLOW RD PLATT	MILAN, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000182N	PLATT RD	MILAN, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000184C	BEGOLE RD	MILAN, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000190F	WARNER ROAD	ANN ARBOR, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000218U	W JEFFERSON AVE	ANN ARBOR, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000219B	ASHLEY ST	ANN ARBOR, MI	2024-04-02	3	
<input type="checkbox"/>	+ 000220V	WILLIAMS ST	ANN ARBOR, MI	2024-04-02	3	

● <https://apps2.mtri.org/crossingi/account>

NEXT STEPS FOR DRONE-ENABLED RAIL GRADE CROSSING ASSESSMENT WITH CROSSING-I:

- Technology exists to assess all or nearly all crossings in the U.S. that might have low-ground clearance / humped problems – airborne (Crossing-i), complements train-mounted LiDAR systems as well (DOTX 218)
 - Crossing-i is useful for crossings that train-mounted LiDAR systems cannot easily be deployed at
 - Can be deployed at will unless near towered airports
- Discussing options with companies & agencies on providing training – they collect data, MTRI Inc. processes, makes results available quickly
- Technology is now available & ready for use
 - Currently for line-of-sight high resolution 3D assessment
 - Improved for 360° virtual crossing diagnostics, newest data for MN, OH, & MI
 - Can work with local drone data collection teams (rail companies, transportation agencies, drone services & engineering firms)
 - Able to create cost estimates for end-users

Crossing-i ready for commercial use

*Interested in working with engineering & drone firms as well
Colin Brooks, Ph.D.*

*cbrooksmtriinc@gmail.com & cnbrooks@mtu.edu
734-604-4196 (mobile)*

