Midwest Bridge Preservation Partnership

Agenda – Monthly Teleconference
Tuesday, September 5th, 2023
Business Meeting: 12:30 pm – 1:00 pm Central
Technical Session 1:00 – 2:00 pm Central

12:30 pm – Business Meeting. (10 participants)

1. Annual MWBPP Conference 2023 South Dakota
   - **a.)** Registration is OPEN! Please **Register Online at 2023 MWBPP**. Online registration by **September 17th , 2023** is requested. Reminder – each state member is allotted two attendees to be paid for by AASHTO. Anyone receiving travel from AASHTO should register and fill out the Travel Request form at this link and submit it as soon as possible- https://www.tsp2.org/files/2016/07/Travel-Request-Form-Fill-in.pdf
   - **b.)** Travel clarifications – if AASHTO is arranging your travel, they will coordinate with the Hotel to arrange for the airport shuttle to pick you up. If you are arranging your own air travel, please let the Hotel know a week ahead of time that you will need shuttle service.
   - **c.)** Full Scholarships (including Travel) – (in addition to the two per state listed above): During the August meeting we approved 2 requests (MnDOT, and Presenter Dwayne Rogers Clare Co MI.), over the past month two other Full scholarships were approved by the Officers – Wisconsin DOT, and Kevin Stack with Barrien County, Michigan presenting on using ArcGIS for preservation management.
   - **d.)** Questions?
   - **e.)** Saeed Babanajad had been approved for a presentation on Performance Evaluation of Elastomeric Bearing Pads through Extensive Laboratory Full Scale Testing… But is now offering a presentation…
     i. Decided to drop the presentation and consider it for the next year's meeting.
2. Officers… Looking for a few good Officers. Consider stepping up at the Conference to help out the Partnership, during the Business meeting we will hold elections for the 2023-2024 year. Let me know if you have any questions about the positions.
     i. Looking to find and nominate a new academic director to replace Glenn. See who is interested at the annual meeting.
3. National Bridge Preservation Meeting – dates – September 10th – 13th 2024 – Salt Lake City, Utah.
4. Future Partnership meetings 2025 - (States – Illinois, Kansas, Nebraska, Ohio, Oklahoma)
     i. Ohio is prepared officially to volunteer to host the 2025 meeting at our upcoming annual meeting in Deadwood, South Dakota.
5. Looking for topics for the October 3rd, 2023 Teleconference. Any suggestions?
     i. Possibly updates regarding the "Buy America" policy.

6. With the Annual meeting happening in October, just a couple of weeks before the November 7th, monthly teleconference, I am recommending that we skip the November teleconference. Discussion?
7. Other Business?

1:00 pm – Technical Session.

1. Roll Call (as per the web-ex list, please put your name in the chat if you called in only)
2. Approval of Minutes -
   - August 1st , 2023 (Motioned to approve, seconded, & approved with no opposition)
3. Phil Meinel – TPF Midewest Element Deterioration Study. Considering a nominations to the newly created TPF Excellence Awards and the deadline for submittal is 9/12 – looking for input from States using the study.
   i. Review/feedback might be limited with the release of the SNBI.
   ii. Suggest a follow-iup meeting the participating states
4. Technical Session – Review of the Draft MWBPP Annual Meeting Agenda – seeking volunteers for all highlighted roles – Moderators / Note Takers / Panel Members / Etc. Please consider sharing your expertise.
   i. Nancy recorded the volunteers and updated the agenda. Other vacancies will be filled upon request.
5. Technical Session – **Blake Liberati, Hughes Group.** "Using vertical hydrodemolition to remove fire damaged concrete from abutment faces in Philadelphia on I95 as part of an emergency project"
   i. Also mentioned work done in Franklin County, OH for bridge parapet refacing.
      1. Request to provide Franklin County contact.
6. Technical Session - **Kristian Fontanilla, from Lumina Lidar** - Digital Twins in Bridge Inspection: Harnessing LiDAR, Photogrammetry, and AI for Accuracy. This informative talk explores the pivotal role of LiDAR (Light Detection and Ranging) technology, high-resolution cameras, and AI in revolutionizing bridge inspections. By generating accurate digital twins of bridges, engineers can conduct thorough assessments, detect minuscule defects, and efficiently plan maintenance and repairs. Attendees will gain insights into the principles of LiDAR and photogrammetry, understanding their significance in creating a detailed digital asset of the bridge, and the integration of Fujifilm's AI crack detection software. This talk will highlight real-world examples of successful implementations, emphasizing the cost-effectiveness, enhanced safety, and data-driven reporting that LiDAR, photogrammetry, and AI bring to bridge inspection and management.
7. General Interest Items:
   - **In case you missed it, FHWA did release the updated Bridge Inspector's Reference Manual (BIRM) in March 2023.** The BIRM is a revision and upgrade of the previous manual conforming with ***FHWA Specifications for the National Bridge***

Inventory (SNBI). Improved bridge inspection techniques are presented, and state-of-the-art inspection equipment is included. New or expanded coverage is provided on culverts, nonredundant members, fatigue-prone details, redundancy, cable stayed bridges, prestressed segmental bridges, movable bridge inspection, underwater inspection, and nondestructive evaluation, critical findings, and inspection intervals. You can download the manual at https://www.fhwa.dot.gov/bridge/nbis/pubs/nhi23024.pdf

- **Others?**

MWBPP Monthly Meeting Attendees Summary

GoToMeeting

Meeting Date	Meeting Duration
September 5, 2023 12:15 PM CDT	117 minutes

Details

Name	Email Address
A Jones	
A Jones	
A Jones	
Aaron Kober	ACKober@modjeski.com
Al Kenz	akenz@hughesgrp.com
Amir	
Angelo Santos	
Arisa Prapaisilp (MoDOT)	arisa.prapaisilp@modot.mo.gov
Blake Liberati	bliberati13@gmail.com
Bobby Scarpitto	
Bobby Scarpitto	
Bobby Scarpitto	
Bradley Noll	Bradley.Noll@dot.ohio.gov
Brian Johnson	brian.johnson@iowadot.us
Dave B	
David Coley	david.coley@state.sd.us
David Juntunen	
Derrick Castle	
Diana Hellman	diana.hellman@fujifilm.com
Dick Dunne	rdunne@gpinet.com
Dora Alexander	
Drew Garceau (Collins Engineers)	dgarceau@collinsengr.com
Drew Storey	
Ed Liberati	eliberati@hughesgrp.com
Fouad Jaber	fouad.jaber@nebraska.gov
Gregg Freeman	Gregg@kwikbondpolymers.com
Holly Winston	Holly.M.Winston@odot.oregon.gov
Ida Narbuvoll	
J Brooks	julie.brooks@dot.wi.gov
James Hauber	James.Hauber@iowadot.us
Jared Backs	jared.backs@dot.ohio.gov
Jason DeRuyver	jason.deruyver@hdrinc.com
Jerry Goodman	Jerry.Goodman@modot.mo.gov
Joe Stanisz	joseph.stanisz@iowadot.us
Joseph Heger	jheger@cmtengr.com
Katrina Davidson	

Kent Miller - Nebraska DOT	kent.miller@nebraska.gov
Kristian Fontanilla (Lumina Lidar L	kbf@luminalidar.com
Lawrence Kirchner	llkirchner@transystems.com
Lindsay Bossert	lbossert@nd.gov
Mark Bendok	mbendok@benesch.com
Mark Swiderski (INDOT)	
Nancy Huether	ncpp@msu.edu
Nick Lombardi	
Nick Reboux	
Patrick Martens	patrickmartens161@gmail.com
Paul Pilarski	paul.pilarski@state.mn.us
Peter Seibert	peter.seibert@uhpcsolutions.com
Philip Meinel	
Ping	
Post, Adam	
Raj Ailaney	
Rich Bagenstose	
Rob Connor	rconnor@purdue.edu
Ryan Bowers	
Sarah Sondag, MnDOT	sarah.sondag@state.mn.us
Sarah Sondag, MnDOT	sarah.sondag@state.mn.us
Sarah Wilson	sarah.wilson@illinois.gov
Scott Neubauer	scott.neubauer@iowadot.us
Scott Stotlemeyer	scott.stotlemeyer@dot.gov
Todd Thompson	todd.thompson@state.sd.us
Tom Ahneman	tga@luminalidar.com
Tom Collins (Collins Engineers)	tmcollins@collinsengr.com
Walter Peters	wpeters@odot.org
William Dunn	William.Dunn@modot.mo.gov
ping lu	ping.lu@dot.gov

Chat Log C:\Users\Nancy Huether\OneDrive - Michigan State University\Documents\ChatLog MWBPP Monthly Meeting 2023_09_05 14_13.rtf

Scott Stotlemeyer (to Everyone): 12:45 PM: Academic Members- One (1) Director will be selected by participating representatives of
Colleges and Universities.
Nancy Huether (to Everyone): 12:48 PM: Thank you Scott. Not sure how to do that if we have only one - guess that would be simply "volunteering" :)
Scott Stotlemeyer (to Everyone): 12:56 PM: That's pretty much how we got Glen involved.
Nancy Huether (to Everyone): 1:11 PM: If anyone wants to volunteer and are too shy to speak up, you can put your name in the chat.
Sarah Sondag, MnDOT (to Everyone): 1:20 PM: I will ask some of the others that are attending from MnDOT to see if they would be willing to be moderators or note takers.
Katrina Davidson (to Everyone): 1:22 PM: Hadleyu Eisenbiez is planning to moderate Deck Sealers in place of Todd Thompson
Katrina Davidson (to Everyone): 1:22 PM: Hadley Eisenbeisz
Nancy Huether (to Everyone): 1:23 PM: Thanks, Sarah!
Nancy Huether (to Everyone): 1:24 PM: Thanks, Katrina!
Will he be attending and presenting with you?
Paul Pilarski (to Everyone): 1:40 PM: do you know the cost of repairing the barrier with hydrodemolition versus replacement?
Kent Miller - Nebraska DOT (to Everyone): 2:04 PM: NDOT has made multiple attempts with IR detection of bridge deck delaminations. None have correlated well with actual repaired area found by sounding.
Amir (to Everyone): 2:04 PM: Kristian, thank you for the great information. So to capture cracks as small as 0.004" you need the drone camera to go up to 100 Megamixel. The data set size will be huge especially for large bridges or bridge decks, more complex on deck because you have moving vehicles so you should take even more pictures. How do you manage these complexities ?
Amir (to Everyone): 2:06 PM: My question is more for data collection and capturing such images on the drone.
Walter Peters (to Everyone): 2:12 PM: Walt Peters - ODOT: Do you get different results when temperatures vary?

2023 Robotic Vertical Hydrodemolition Projects

Project 1 = I-95 Fired Damaged Abutment Repairs – Philadelphia, PA

Project 2 = Hayden Run over Griggs Reservoir Parapet Refacing – Columbus, OH

Midwest Bridge Preservation Partnership Meeting

September 5, 2023

Blake Liberati - Hydro-Technologies, Inc.

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Project 1
PennDOT – I -95 Fire Damaged Abutment Repairs Philadelphia, PA

- A tanker truck carrying gasoline lost control on an I-95 exit ramp in Philadelphia, PA. The truck exploded into flames directly under the I-95 overpass. I-95 was closed in both directions – an emergency was declared.
- The bridge received extensive fire damage.
- I-95 was temporarily opened about a week later using a lightweight fill.
- PennDOT made the decision to reface the abutments and to rebuild the beam seats to save time and costs. This would be done in two phases.
- Vertical Robotic Hydrodemolition was used to remove fire damaged concrete at specified depths from the face of the abutments and beam seats.
- 7" depth removal for Abutment 3 (worst one) – other three abutments = 4" depth removal. 30" depth removal for the beam seats.
- Phase 1 vertical hydrodemolition took just under 2 weeks to complete about 8,000 sf.
  - Phase 2 will be completed later this Summer.

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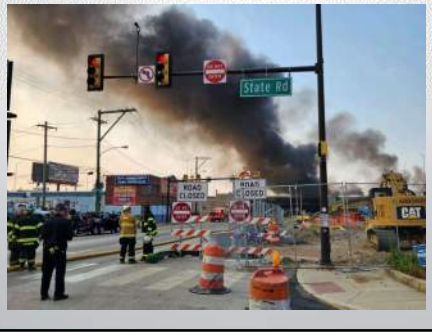
Sunday June 11, 2023 – just after the 6:30 am accident



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Bridge after the flames were extinguished.

6

Temporary Fill

Installed in just 7 days

7

Fire Damaged Abutment 1

8

Fire Damaged Abutment 2

9

Fire Damaged Abutment 3

Worst one = 7" Removal

10

Fire Damaged Abutment 3

11

Fire Damaged Abutment 3

12

Fire Damaged Abutment 4

13

30" Beam Seat Removals

14

30" Beam Seat Removals

15

4" to 7" Fascia Removals

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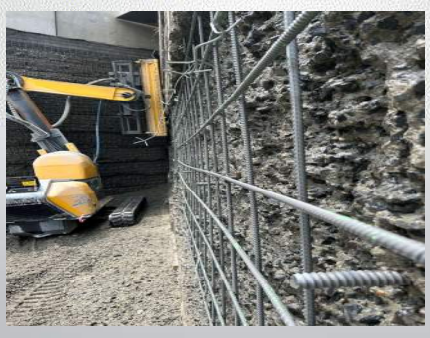
4" to 7" Fascia Removals

17

4" to 7" Fascia Removals



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4" to 7" Fascia Removals

19

4" to 7" Fascia Removals

20

Water Control

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Completed Abutment 1

22

Almost Completed Abutment 3

23

Additional Removals Abutment 3

24

Video 1 – Abutment 1 Removals

25

Video 2 – Abutment 1 Removals

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Project 2
Franklin County Parapet Refacing
Columbus, Ohio

- Franklin County Engineers in Ohio needed to repair a chloride damaged parapet wall on a heavily traveled bridge located over a reservoir.
- To do the work quickly and with the least amount of impact to the environment, FCE made the decision to reface the 810' of parapet wall instead of removing and replacing the wall.
- Vertical Robotic Hydrodemolition was used to prepare the surface by providing a rough and bondable surface while selectively removing deteriorated concrete from the face of the parapet.
- The vertical robotic hydrodemolition took 2 days to prepare 810' of wall.

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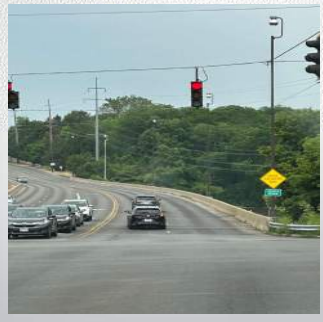
Existing Bridge



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Existing Parapet Wall

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Existing Parapet Wall

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Vertical Robotic Hydrodemolition

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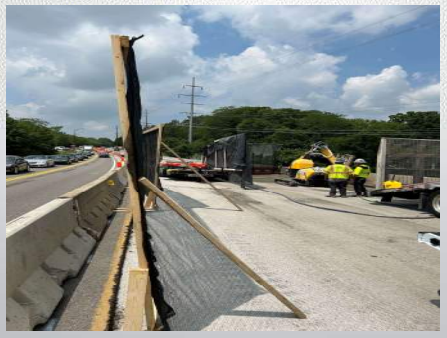
Vertical Robotic Hydrodemolition



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Vertical Robotic Hydrodemolition Video 1

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Vertical Robotic Hydrodemolition Video 2

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Hydrodemolished Wall

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Hydrodemolished Wall

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Hydrodemolished Wall

37

Hydrodemolished Wall

38

Hydrodemolished Wall

39

Dowel/Rebar Installation

40

Dowel/Rebar Installation

41

Refaced Parapet Wall

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Questions / Contact Info

Blake Liberati, MS

- Cell – (614)561-0212
- bliberati@hughesgrp.com

- We are experts in Hydrodemolition and Latex Modified Concrete Overlays. We have 50+ years experience. Call anytime with questions or if you need information.

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DIGITAL TWINS IN BRIDGE INSPECTION: HARNESSING LIDAR, PHOTOGRAMMETRY, AND AI FOR ACCURACY

Presented by Lumina Lidar LLC
In cooperation with FUJIFILM North America Corporation

PRESENTERS

KRISTIAN B. FONTANILLA

Project Engineer / CTO

As project engineer, I manage fieldwork and processing of point cloud data collected and analyze the data collected to ensure accuracy and precision. As a part of our team, I organize the workflow of a project, deliver sufficient information and perform 2D and 3D modeling of an existing point cloud. I research the latest software and hardware available in the market to reach the full potential of our cutting-edge equipment. I develop methods to integrate different resources to expedite the process of delivering to clients.

kbf@luminalidar.com 203-900-7162

THOMAS G. AHNEMAN

Chief Engineer / COO

With 40 years of experience, I have seen it all and been apart of remarkable projects. I provide oversight and coordinate the management of all projects, including architects, engineers, and construction professionals. Lumina's in-house team of engineers, architects, project managers, technicians, and BIM/CAD designers are like no other. They work with each client to develop an accurate understanding of the existing conditions, capture precision point clouds and create custom deliverables, ranging from raw data to 2D drawings and 3D models.

tga@luminalidar.com 203-900-7162

THE OUTLINE

WHAT WE'LL DISCUSS

About Us

LiDAR & Photogrammetry

AI: Fujifilm's FIPAS

Integration

Deliverable

Contact Us

ABOUT LUMINA LIDAR LLC

Lumina Lidar, LLC is a woman-owned small business (WOSB), founded on 2019 as an outgrowth of engineering and land surveying services with expertise includes infrastructure, roads and bridges, sites, structures, 3D mapping and modeling, geospatial analysis, existing conditions and as-built depiction delivered to clients.

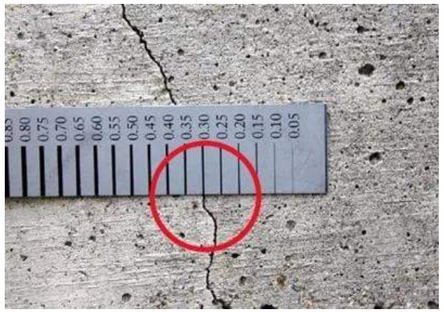
Modeling your world at the speed of light – LiDAR (Light Detection and Ranging) is our principal reconnaissance tool that uses remote-sensing technology in terrestrial, mobile, and aerial (drones, aircraft) forms. It provides large or small commercial, industrial, residential and government clients highly detailed and accurate 3D models of surface conditions, buildings and facilities, terrain and agriculture, transportation (air, rail and highway).

COMMON BRIDGE INSPECTION METHODS

CRACKS, DELAMINATION, SPALLING, ETC.

Tap Testing

Chain-dragging



Manual measurement

COMMON METHODS

The common and accepted methods of bridge inspections are manual measurement, tap testing, and chain-dragging. These methods take a lot of manpower and hours to cover the entire area of interest due to getting the information of all major defects on the bridge.

It involves riding a snooper, man-lift, barge, or personnel climbing along steel beams. This requires a lot of manual physical work with high risks of accident.

(c) McClain & Co. Inc.

(c) Gannett Fleming, Inc.

MAJOR ISSUES

The following are the major issues that comes with the common methods:

- Long hours of inspection
- Requires a lot of manpower
- High risk of accident
- High cost of equipment rental
- Some areas cannot be covered due to inaccessibility (too high for the equipment to reach or too risky for the equipment).
- Slight change in weather conditions will increase the danger.
- Measurement inaccuracies with manual measurements.

(c) Gold Coast Barges

INTEGRATING LIDAR & PHOTOGRAMMETRY

THE INDUSTRY'S "DEUS EX MACHINA"

(LATIN: "GOD FROM THE MACHINE") A PERSON OR THING THAT APPEARS OR IS INTRODUCED INTO A SITUATION SUDDENLY AND UNEXPECTEDLY AND PROVIDES AN ARTIFICIAL OR CONTRIVED SOLUTION TO AN APPARENTLY INSOLUBLE DIFFICULTY.

-MIRRIAM-WEBSTER DICTIONARY

LIGHT DETECTION & RANGING (LIDAR)

LiDAR measures anything within line of sight, accumulating 100 millions of points within a couple of minutes to give detailed 3D measurements. Most common LiDAR equipment can measure up to 400m (1312 ft).

PHOTOGRAMMETRY

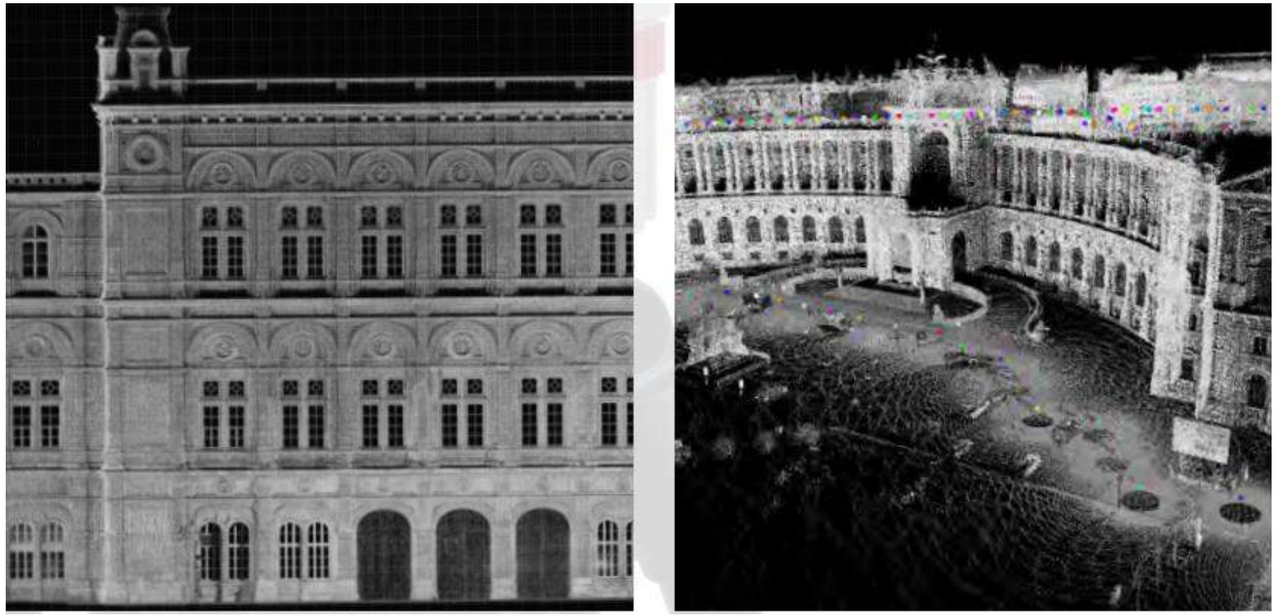
Cameras has been a major payload of almost every drone in the market. The competition made these cameras more high-quality, with some companies selling up to 100 Megapixel with different focal lengths.

TERRESTRIAL LIDAR

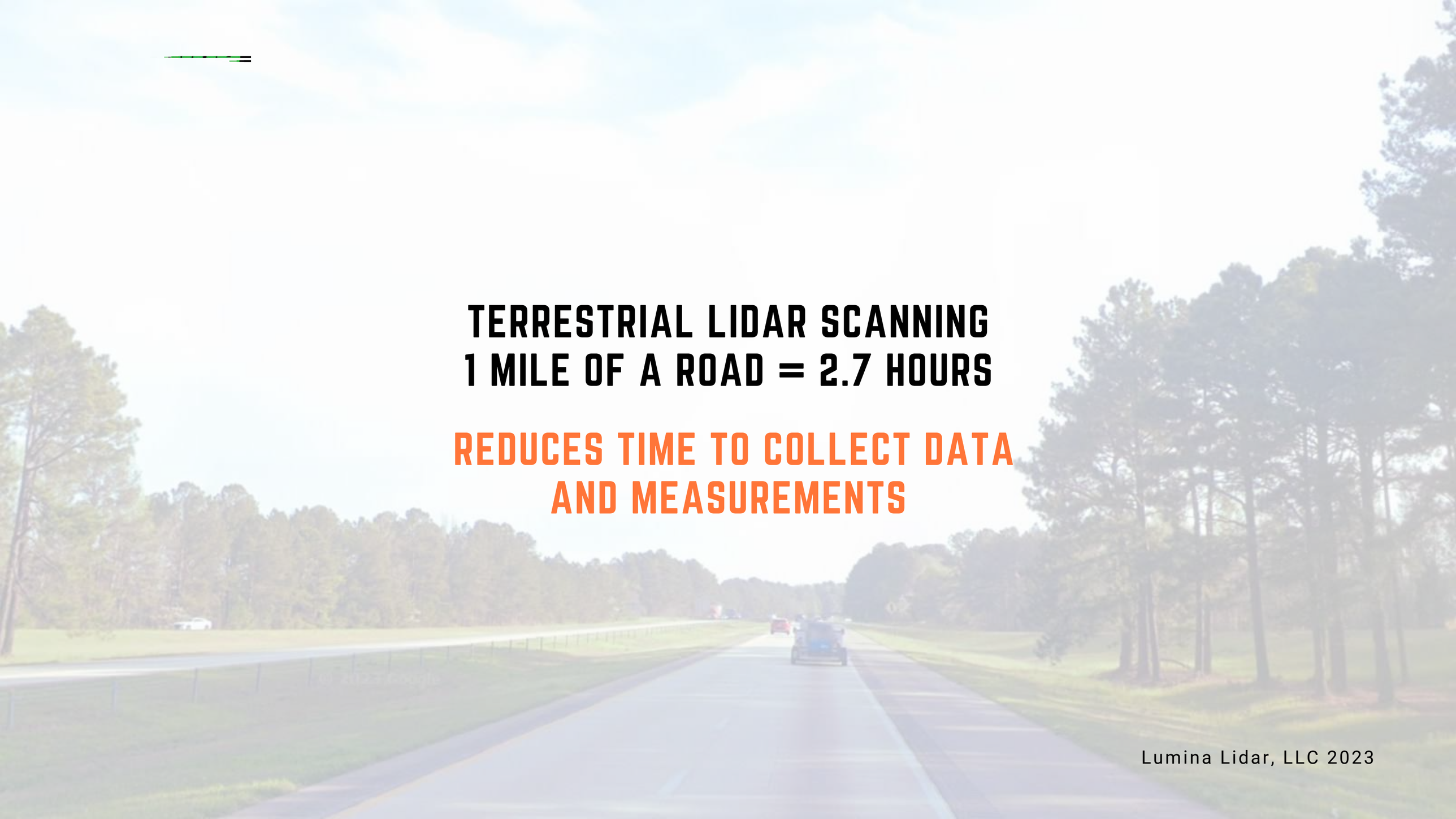
The most accurate of all the different types of LiDAR unit. This type of LiDAR can be mounted on a tripod, car roof, or on a flat surface without the need to level the equipment.

1 operator → 8 hours → 500+ scans

More than 500 scans (50mdeg) of approx. 5 km of downtown streets with adjoining buildings have been taken by just one operator within 8 hours of full acquisiton time in the field. The mission was executed during night, the data of the whole scene was acquired by taking individual scan positions with approx. 10 m distance in between.

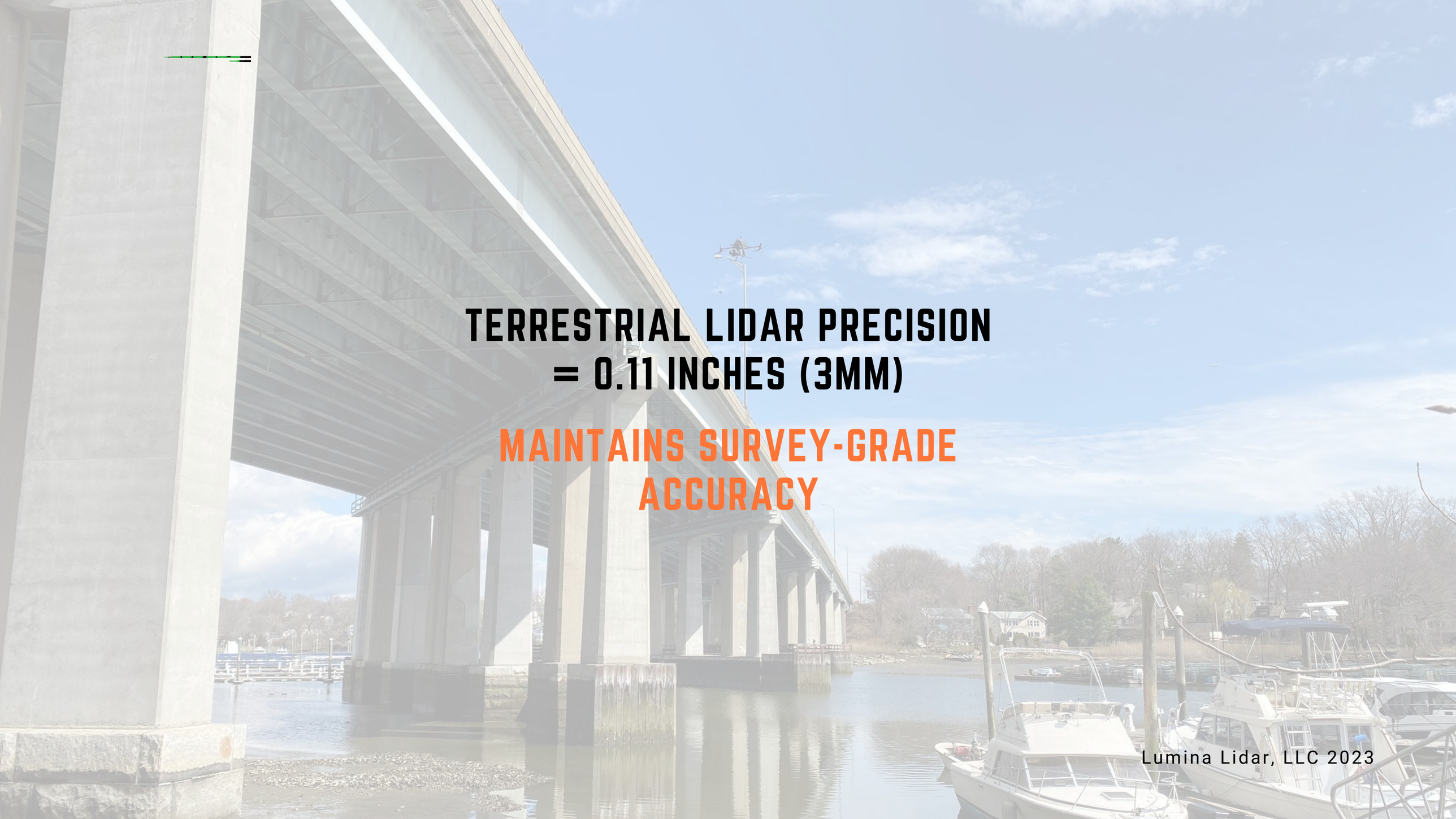


(c) Riegl USA data



TERRESTRIAL LIDAR SCANNING
1 MILE OF A ROAD = 2.7 HOURS

REDUCES TIME TO COLLECT DATA AND MEASUREMENTS

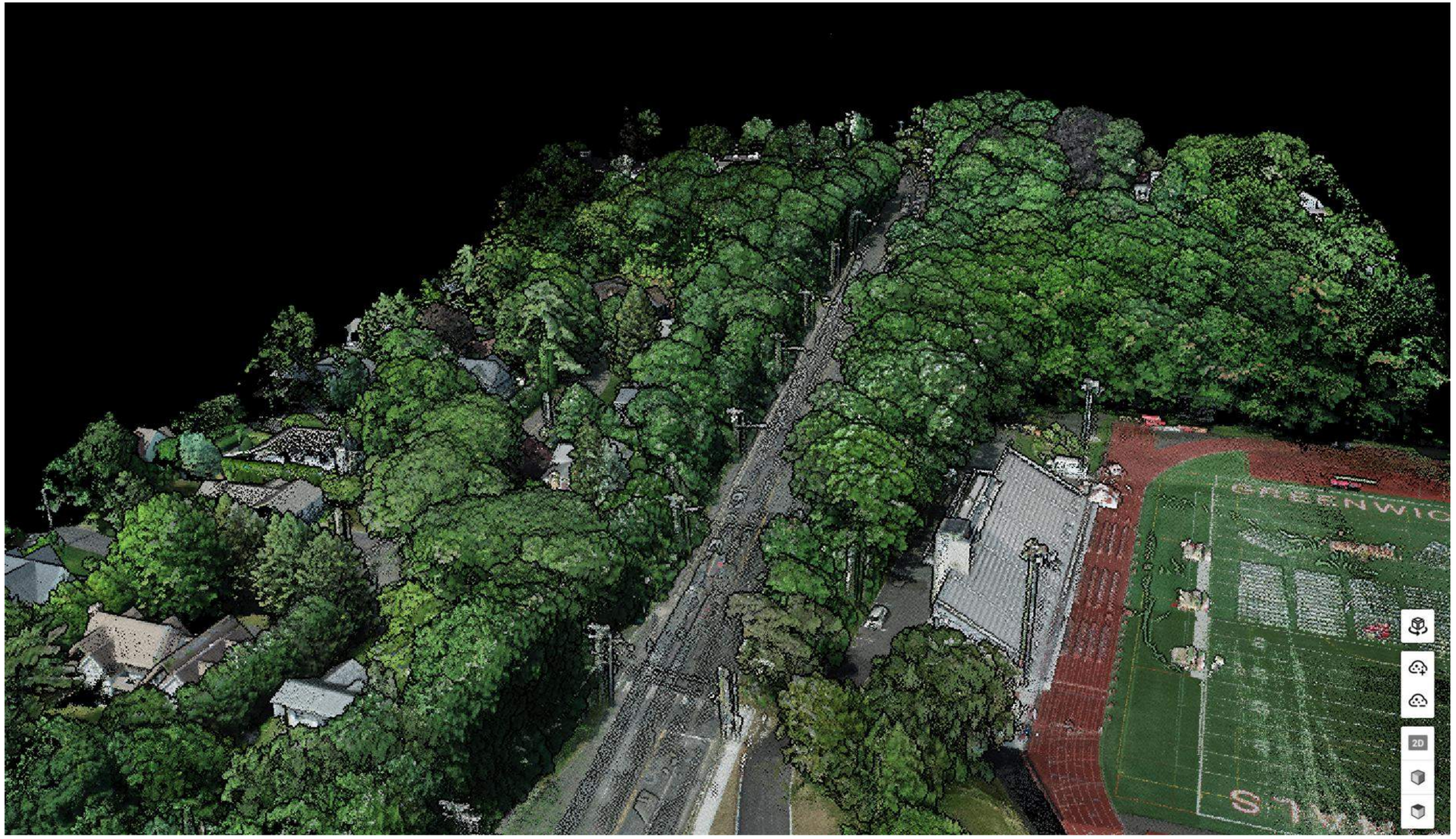


TERRESTRIAL LIDAR PRECISION = 0.11 INCHES (3MM)

MAINTAINS SURVEY-GRADE ACCURACY

AERIAL LIDAR

Commercial drones have payload capacity of 5 lbs. Some of them has a maximum speed of up to 50 mph. This allows the drone to be integrated in the inspection workflow to minimize the time & physical effort. There are different equipment that could be mounted on a drone to help on the inspection of a bridge.



Route 1, collected by Lumina Lidar using an aerial LiDAR unit in less than 2 hours

AERIAL LIDAR PAYLOAD

Some drones have a capability to go through small openings and have sensors for its collision avoidance feature.

The speed could go as fast as 11mph while maintaining the accuracy of 1.2 inches (3cm).

AERIAL LIDAR SCANNING
1 MILE OF ROAD = 10 MINUTES

FAST DATA COLLECTION, SPECIFICALLY FOR UNPAVED & VEGETATED AREAS

AERIAL LIDAR DETECTION RANGE = 1,400 FT (450M)

GATHERS ADDITIONAL DETAIL ON TALL STRUCTURES THAT ARE HARD TO REACH

HIGH RESOLUTION CAMERA PAYLOAD

Drone camera resolution can go up to 100 Megapixels. This allows drones to capture cracks as small as 0.004 inches (0.1mm).

Some drones can also attach camera on top of it, making it possible to capture photos on the underside of the bridge.

This could cut hours of renting manlift, a barge or a snooper.

THERMAL CAMERA PAYLOAD

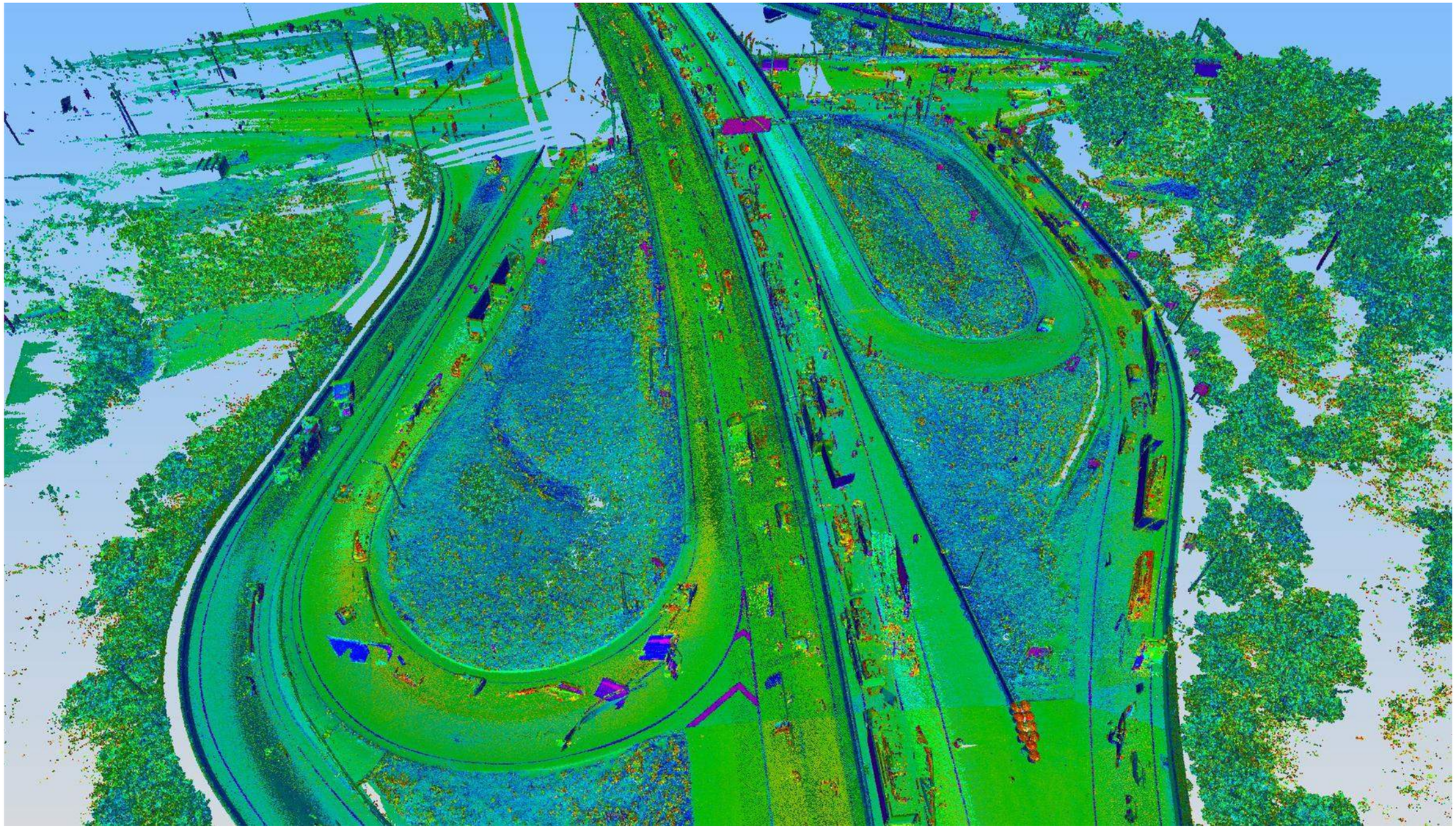
This camera can help detect delamination and capture it's location by geotagging the photos using the on-board GPS of the drone and the Real Time Kinematics (RTK) antenna.

This would help narrow down the areas needed to be inspected by chain-dragging or tap testing methods. Less manual tests, less lane closures.

*This presentation is not sponsored by Taco Bell

MOBILE LIDAR

This equipment is one of the fastest way to collect road data. The car can run on traffic speed (60 mph on highway) while maintaining a survey-grade accuracy, and it could eliminate lane closures.



Route 8, collected by Lumina Lidar using a mobile LiDAR unit at traffic speed

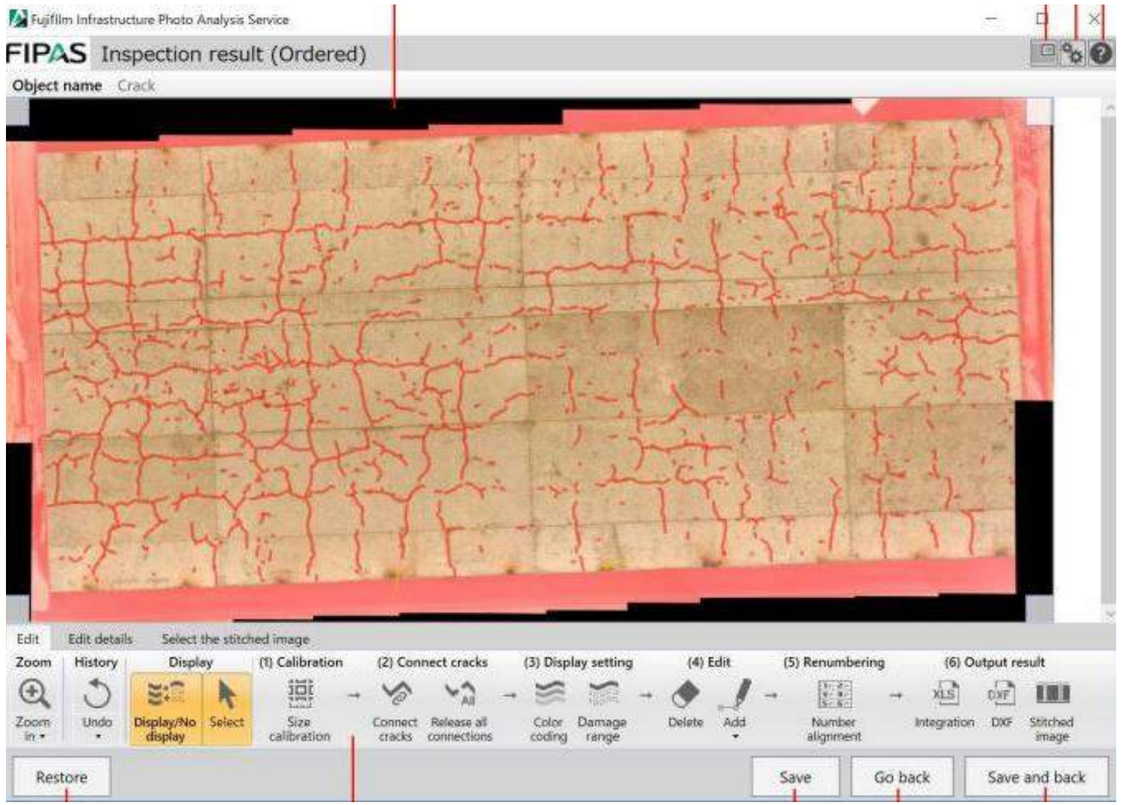
FUJIFILM INFRASTRUCTURE PHOTO ANAYLYSIS SERVICE (FIPAS)

THE PROGRESS OF AUTOMATION

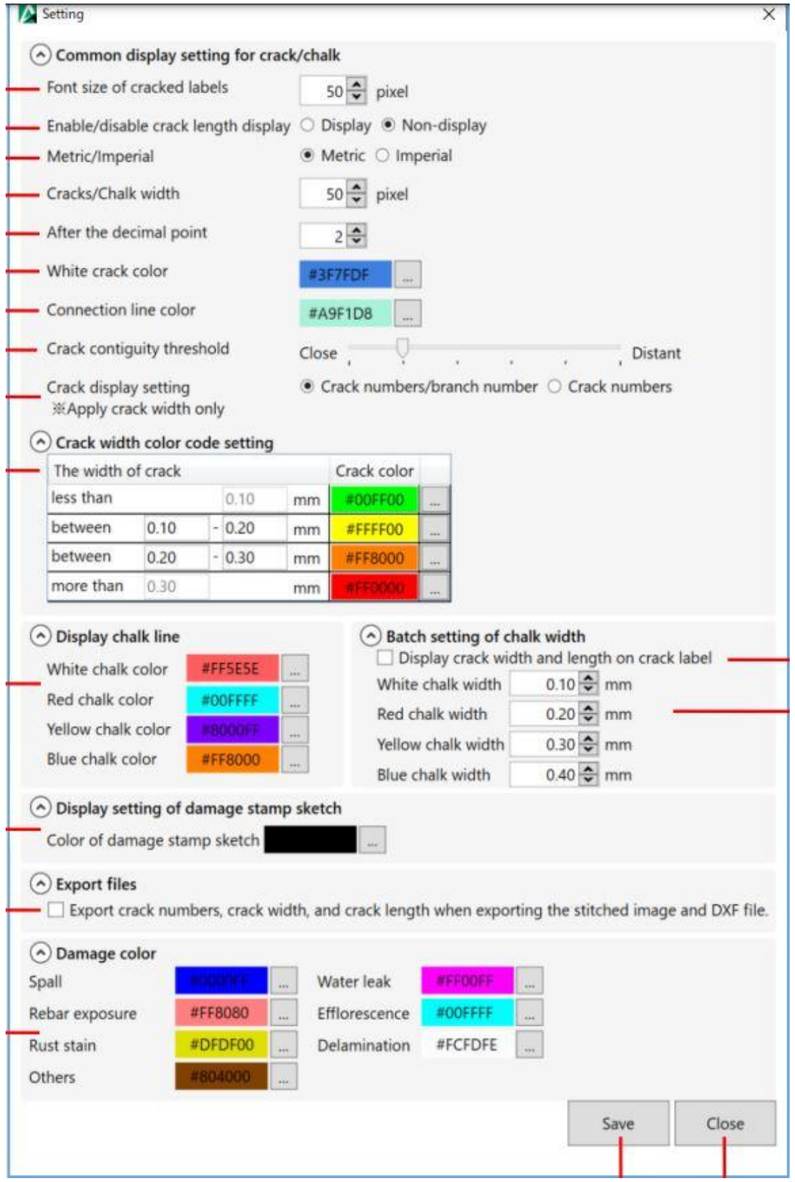
CRACK DETECTION

One of the major features of the FIPAS is its A.I. which detects cracks in concrete and other defects such as efflorescence and spalling. The photographs collected are stitched by the software and shows the following:

- Crack ID
- Crack Width
- Crack Length
- Other defect area in terms of square feet or square meters.



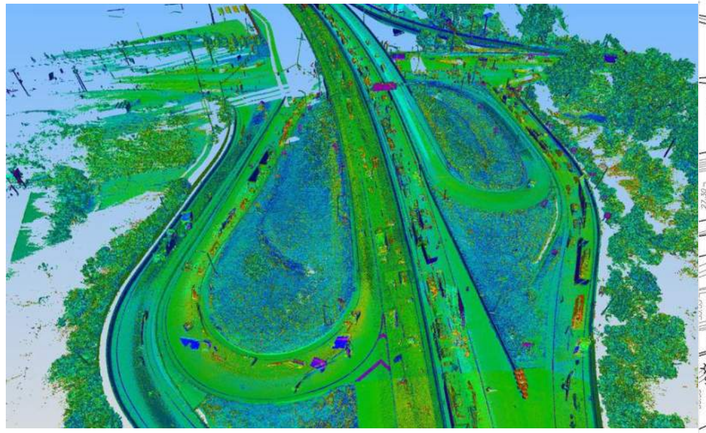
The software colorizes different sizes of cracks depending on the range required on the specific project.

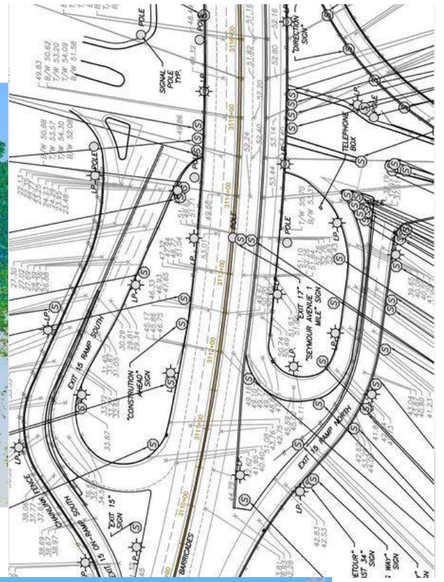


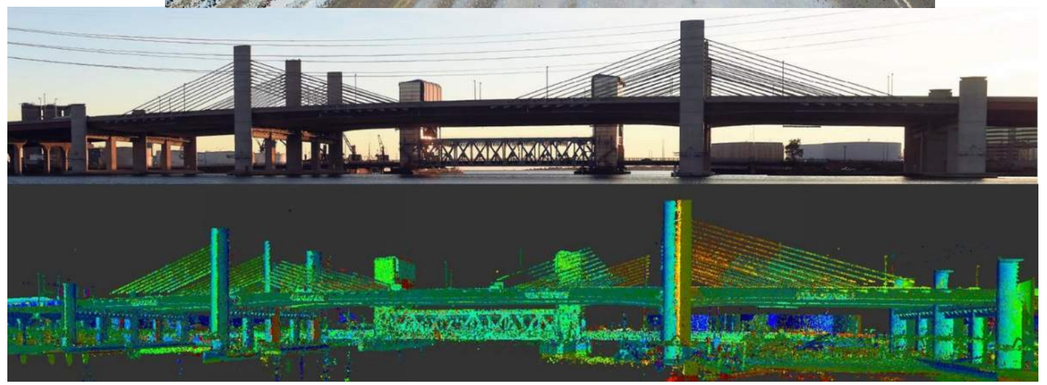

Lumina Lidar, LLC 2023

THE INTEGRATION

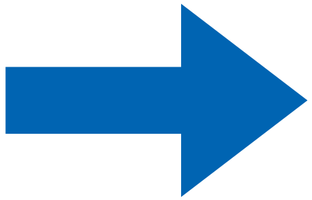
THE CUTTING EDGE TECHNIQUE

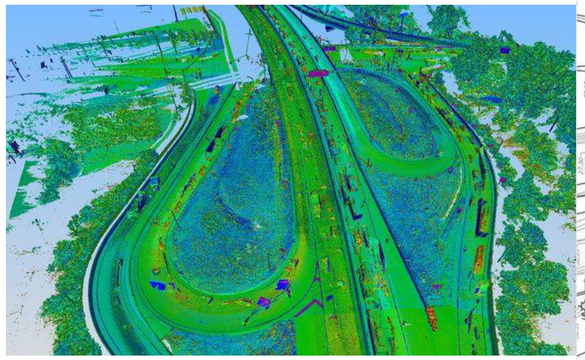


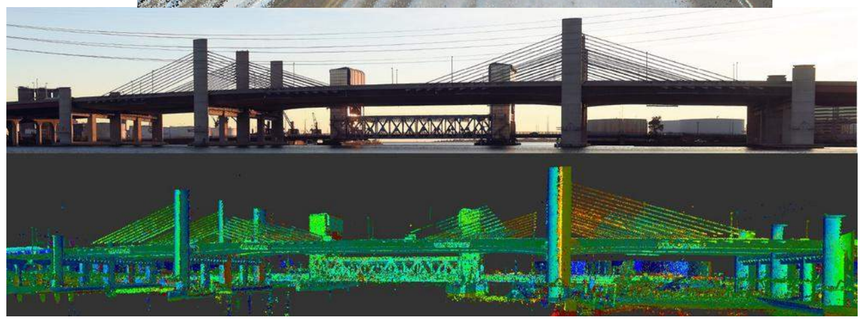




Lumina Lidar, LLC 2023



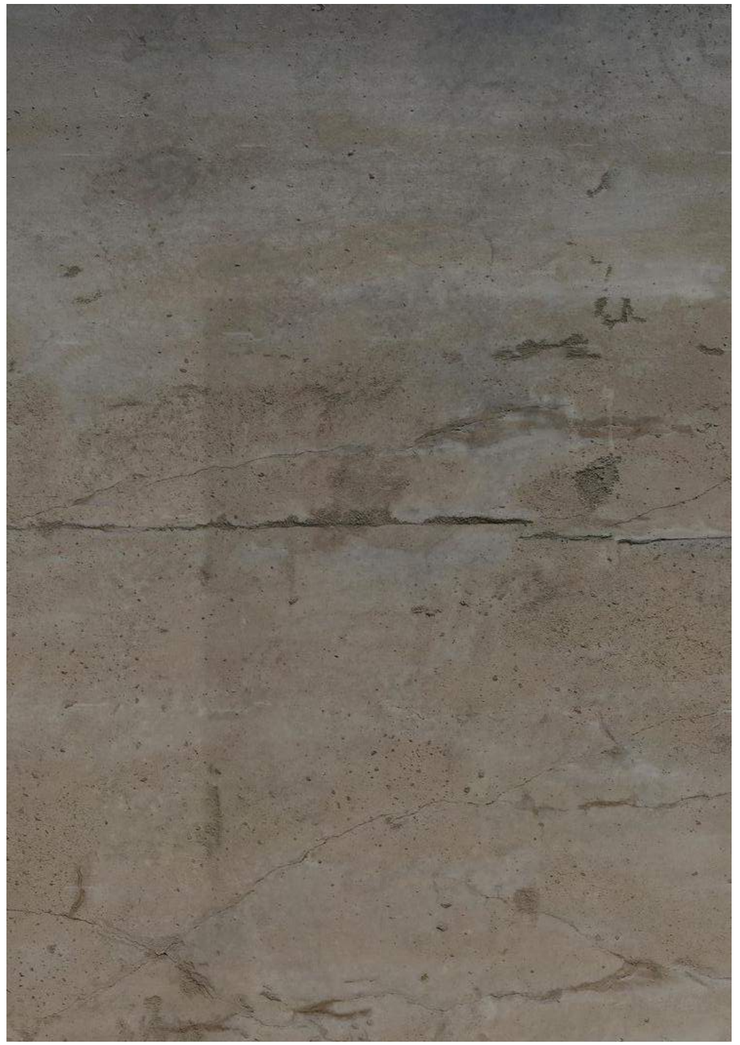


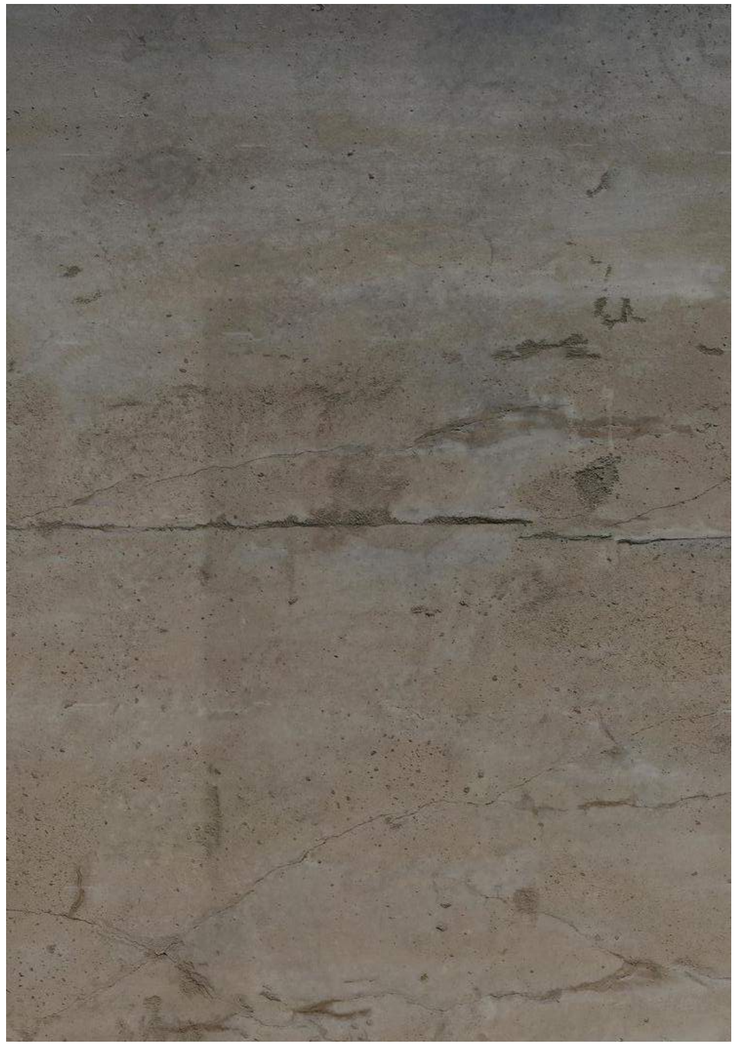


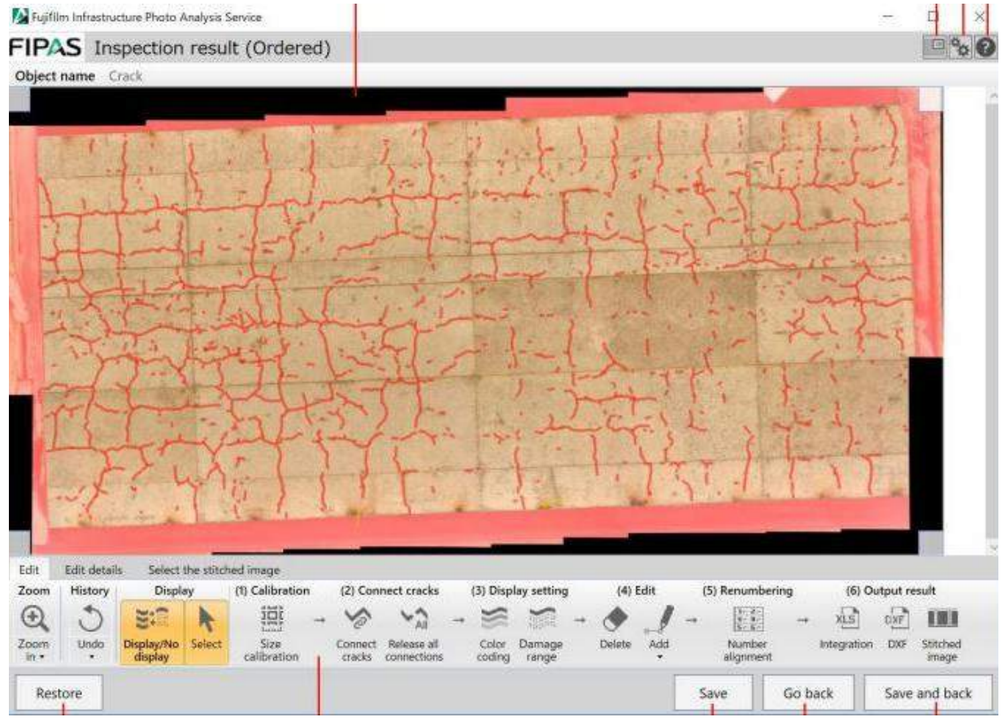
OUTPUT

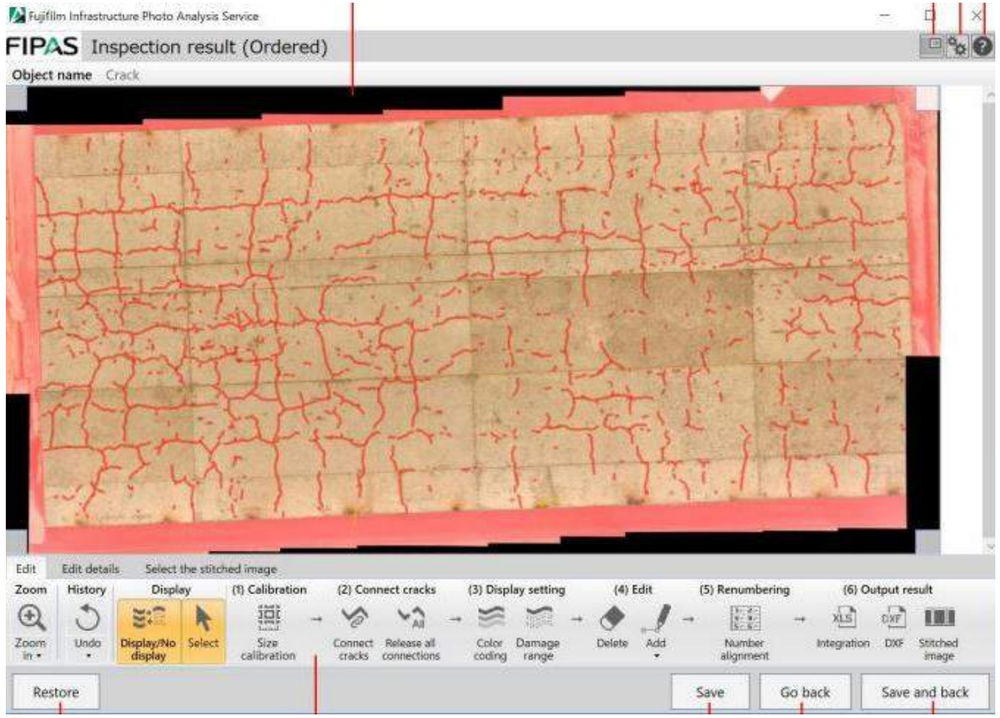
The LiDAR provides accurate measurements that will be used to properly merge the photos so that the cracks and other defects would stay on the right spot.

We can then upload to FIPAS and let the A.I. detect the cracks and defects.

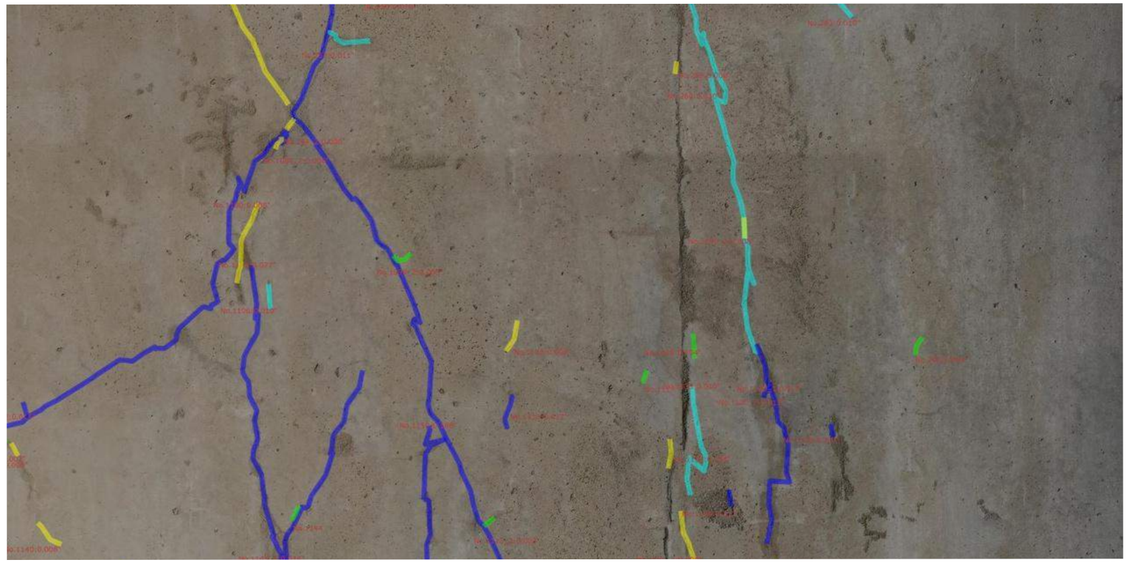


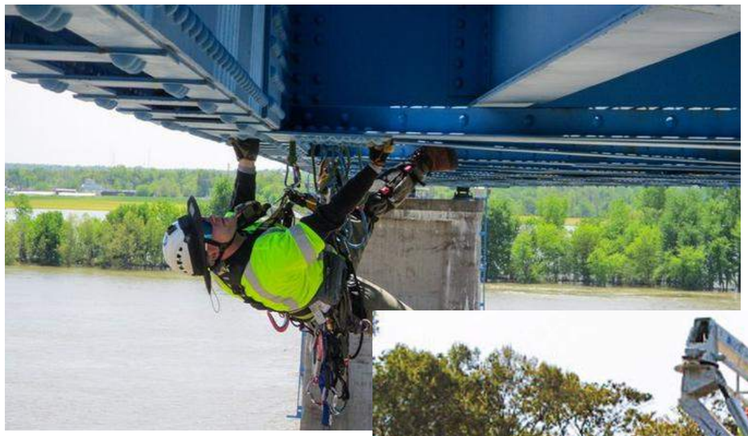




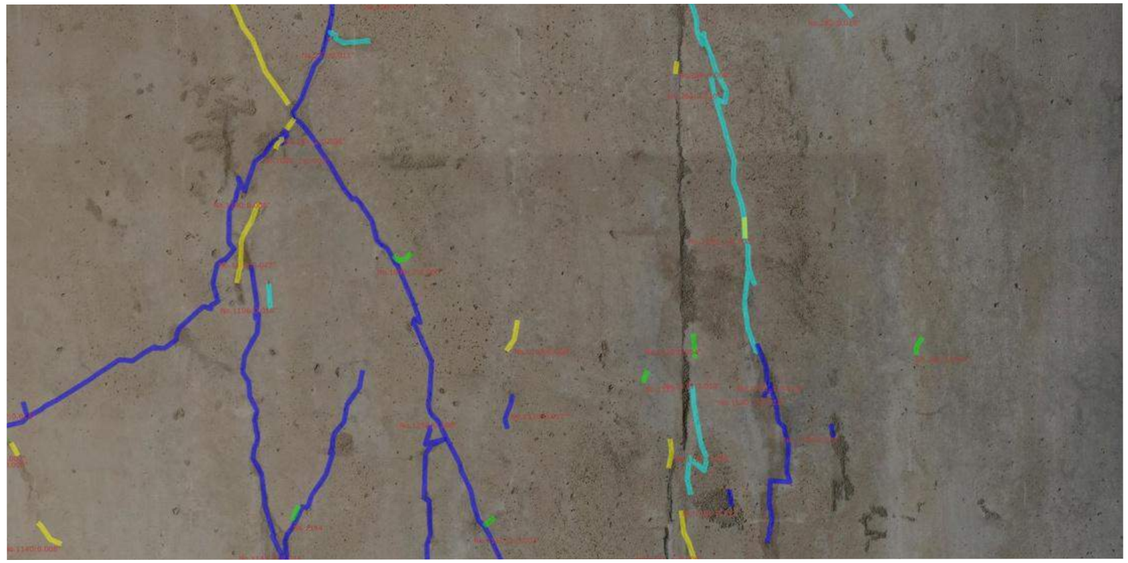


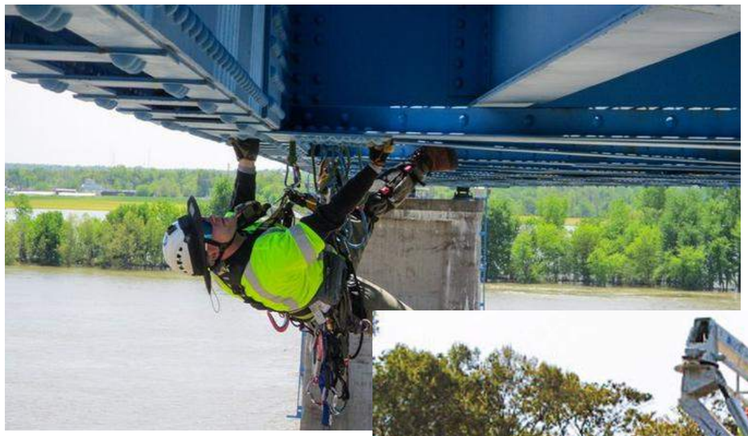
Once the cracks and other defects have been detected, the inspectors can go back to look at the major defects instead of looking at the entire surface area of the bridge.





MORE AUTOMATION, LESS CLIMBING.





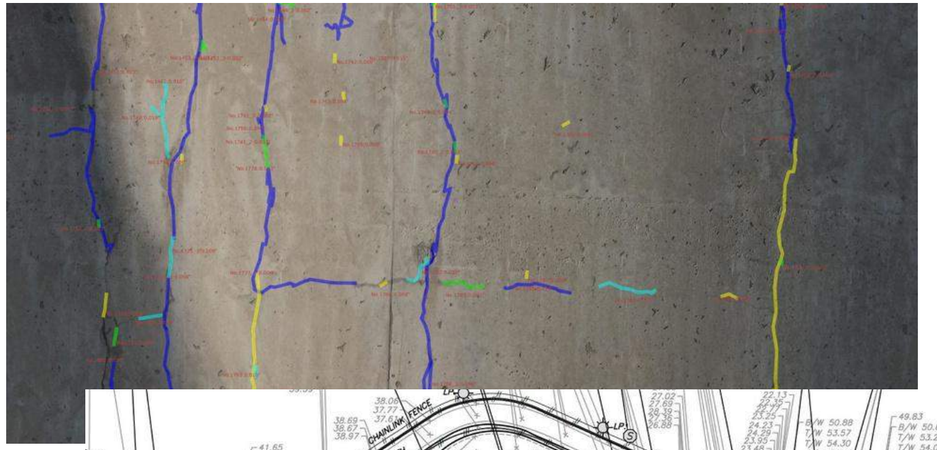
DELIVERABLES

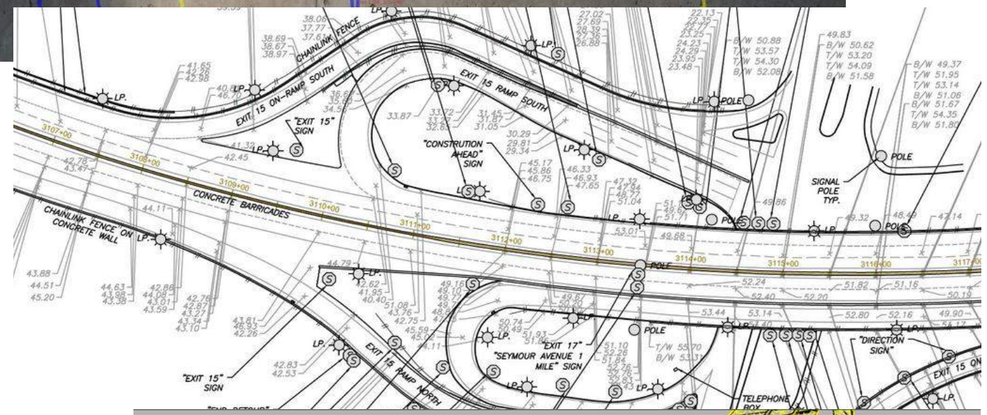
THE POLISHED PRODUCT

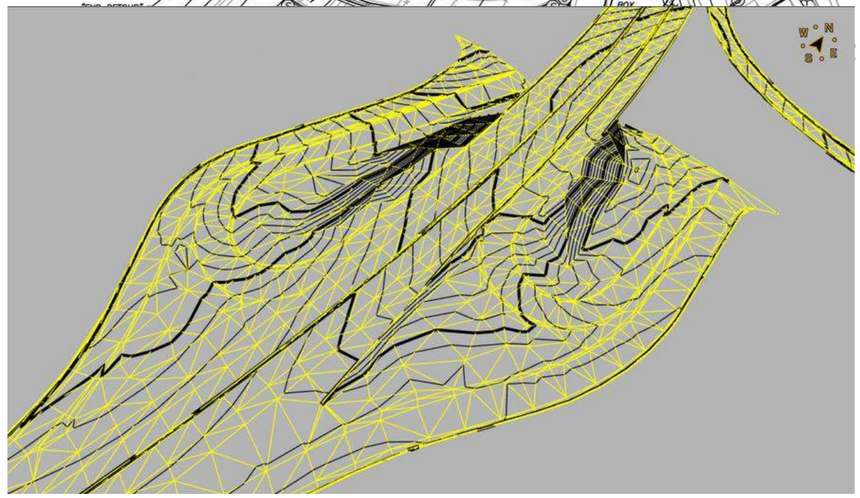
DELIVERABLES

These are the following deliverables that will be included in most bridge inspection report:

- Crack Map in PDF format
- Excel Spreadsheet containing the information
  - Crack or Defect ID
  - Crack or Defect Width
  - Crack or Defect Length
  - Location
- Crack Map photos in PNG format
- CAD file in .DWG format
- Digital Terrain Model (DTM), Digital Elevation Model (DEM), or Digital Surface Model (DSM) in .TIFF & .XML format.







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GOT QUESTIONS?

CONTACT US

ADDRESS

1155 East Putnam Avenue, Suite 2

Riveside, CT 06878

PHONE

(203) 900-7162

EMAIL

tga@luminalidar.com

kbf@luminalidar.com

FUJIFILM USA

CONTACT PERSON

Diana Hellman, Ph.D.

Director, Industrial and Corporate New Business Development

Email: diana.hellman@fujifilm.com

Cell: 408-568-6014