Mobile Mapping Solutions for Ohio’s Integrated Transportation Network

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About Woolpert

- Established in 1911
- Over 600 Professionals
- 25 Offices
- $12,000,000 invested in new technology in last 5 years
Transportation Practice

**GEOSPATIAL**
- Aerial Mapping
- Mobile Mapping
- Laser Scanning
- Survey

**DESIGN**
- Roadways
- Bridges
- Utility Relocation
- Right-of-Way Plans
- Drainage/Stormwater
- Traffic Signal

**PLANNING**
- Access Studies
- Corridor & Alignment Studies
- Feasibility Studies
- Safety Studies
- Traffic Data Collection
- Traffic Impact Studies
Mobile Mapping System (MMS)

MMS Specification

- Freightliner Cargo Van
- Optech Lynx M1
  - (2) LiDAR Sensors
    - Range – 200 meters
    - 500,000 points per/sec each
  - (4) 5MP Cameras
    - 90° FOV = 360° coverage
Optional Collection Vehicles

Hi-Rail

Boat/Watercraft

UTV/ATV
Ohio Integrated Transportation MMS Projects

- DOT (design grade)
- Asset Management (mapping grade)
- Pavement Analysis
- Utility transmission lines and vegetation encroachment
- Design-build
- FAA airport design, layout plans, distress analysis
- Shoreline assessments, urban flood mapping
- Disaster response, forensic mapping
- Condition assessments
- Rail
- Bridge
- Haul routes
- Dams & Levees
Typical MMS Deliverables

- **Point Cloud/LiDAR**
  - Raw
  - Processed to control
  - Classified

- **Georeferenced Imagery**
  - Oblique images
  - Ortho-rectified images
  - GEKO – Google Earth KMZ w/ Obliques

- **Feature Extraction**
  - Plan (2D)
  - 3D breaklines
  - Surface model - TIN/Contours
  - Cross sections

- **Asset Inventories**
  - Signs
  - Light poles
  - Power poles
  - Paint striping
  - Utilities

- **Condition assessments**
  - Curb
  - Pavement
  - Sidewalk

- Horizontal & vertical clearances
- Pavement & surface distresses
Asset Management

- Pavement Management
  - Material
  - Distresses
  - Rutting
  - Potholes
  - Paint markings
- Traffic signals
- Utility poles/lines
- Buildings
- Real Estate Info. (appraisals)
- Sidewalks
- ADA Ramps
- Guardrails
- Curb & Gutter
- Hydrants
- Manholes
- Parking meters
- Signs
- Trees
Pavement Analysis
Utility Line and Vertical Obstruction

Bridge Vertical Clearance

Utility Vertical Clearance

Other Obstructions
Airports
Railroad
DOT Design Grade
Project 5-mile Corridor

- Existing Road Design - Reduce curves, Widen road
- Safety – Keep personnel off roadway
- Provide a comprehensive cost effective solution
- Obtain 3D horizontal and vertical information for infrastructure to be used as needed during design process
- Accurate road surface data – 0.20’ horizontal 0.05’ vertical
- Accurate (60’) infrastructure data – 0.20’ horizontal 0.20’ vertical
- Accurate data for remainder of the project – 1.0’ horizontal, 0.5’ vertical
- 1” = 40’ scale planimetric and topographic mapping with 1’ contours - 0.5’ contours on roadway
- Orthoimagery at 0.25’ pixel resolution
- 3D Point Cloud (60’) corridor
- Mobile mapping Imagery
Approach: Data Fusion

• Develop an approach considering the unique complexity of the project site - blind curves, little or no shoulder, high walls and drop offs, heavy industry, manufacturing facility, sub-station, heavy traffic (semi-trucks), school bus route, bridges, overhead structures, power lines, etc.
• Obtain new 2015 1” = 350’ scale aerial imagery of the entire site
• Obtain new 2015 Mobile mapping data for the 60' roadway corridor 0.20’ horizontal 0.05’ vertical
• Use existing 2014 Statewide 1.5-meter LiDAR adjusted to the project control to be used for DTM
Project Layout
Mapping Corridor
Planimetric and Topographic Mapping Using Statewide LiDAR

Planimetric Mapping from New 1”=350’ Scale Aerial Photography

Planimetric Mapping and Existing 1.5 Meter Statewide LiDAR
Point Cloud

https://www.youtube.com/watch?v=lseeuOWdvlQ
Mobile LiDAR
Mobile LiDAR
Mobile LiDAR
Mobile LiDAR
Mobile LiDAR
Mobile Oblique Imagery & LiDAR
Mobile Mapping System Data During Design

- Highly accurate road surface – Cross-section and profile anywhere as needed
- 3D point Cloud that can be used in Microstation, AutoCAD, etc.
- Detailed oblique view imagery
- Using the point cloud and/or the imagery provides another tool
- Ex: Bridge clearance, horizontal and vertical obstructions can be measured as needed
Comprehensive Cost Effective Solution

**Mobile Mapping System for 60' Corridor**
2 Day targeting and Acquisition
One collection, multiple uses
Cross sections and profiles anywhere
Includes feature extraction of edge of pavement
3-D point cloud provides infrastructure data
Fee = $9,000 per line mile

**Traditional Survey for roadway surface data**
Two weeks with daily lane closures and safety risk
Cross sections located at 50' intervals
Fee = $10,000.00 per line mile

**New Aerial LiDAR and DTM**
1.5 meter LiDAR from Statewide Program, DTM, Contours, Contour Labels spot Elevations
Fee = $68,000.00

**Existing Aerial LiDAR and New Digital Terrain Model**
Adjusted Existing 1.5 meter LiDAR from Statewide Program, DTM, Contours, Contour Labels spot Elevations
Fee = $38,000.00
What Clients are saying about MMS

- Kentucky Transportation Cabinet
- PennDOT
- MaineDOT
- VDOT
“Woolpert as a Sub-Consultant and brings their expertise in all phases of Mobile LiDAR to the table. They were given three large Mobile LiDAR jobs (their first for PennDOT) in the Fall of 2014. Their efforts on three consecutive Mobile LiDAR projects were superb. All three projects were completed in a timely manner and with exceptional accuracy. PSS was stunned with the quality of the end product which easily exceeded the Department’s expectations.”

David Casciotti,
Photogrammetry Liaison Supervisor, Pennsylvania Department of Transportation
MicroStation V8i SS3
Point Cloud Measurement

https://youtu.be/VpWW1_Uc_68
Questions/Comments

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