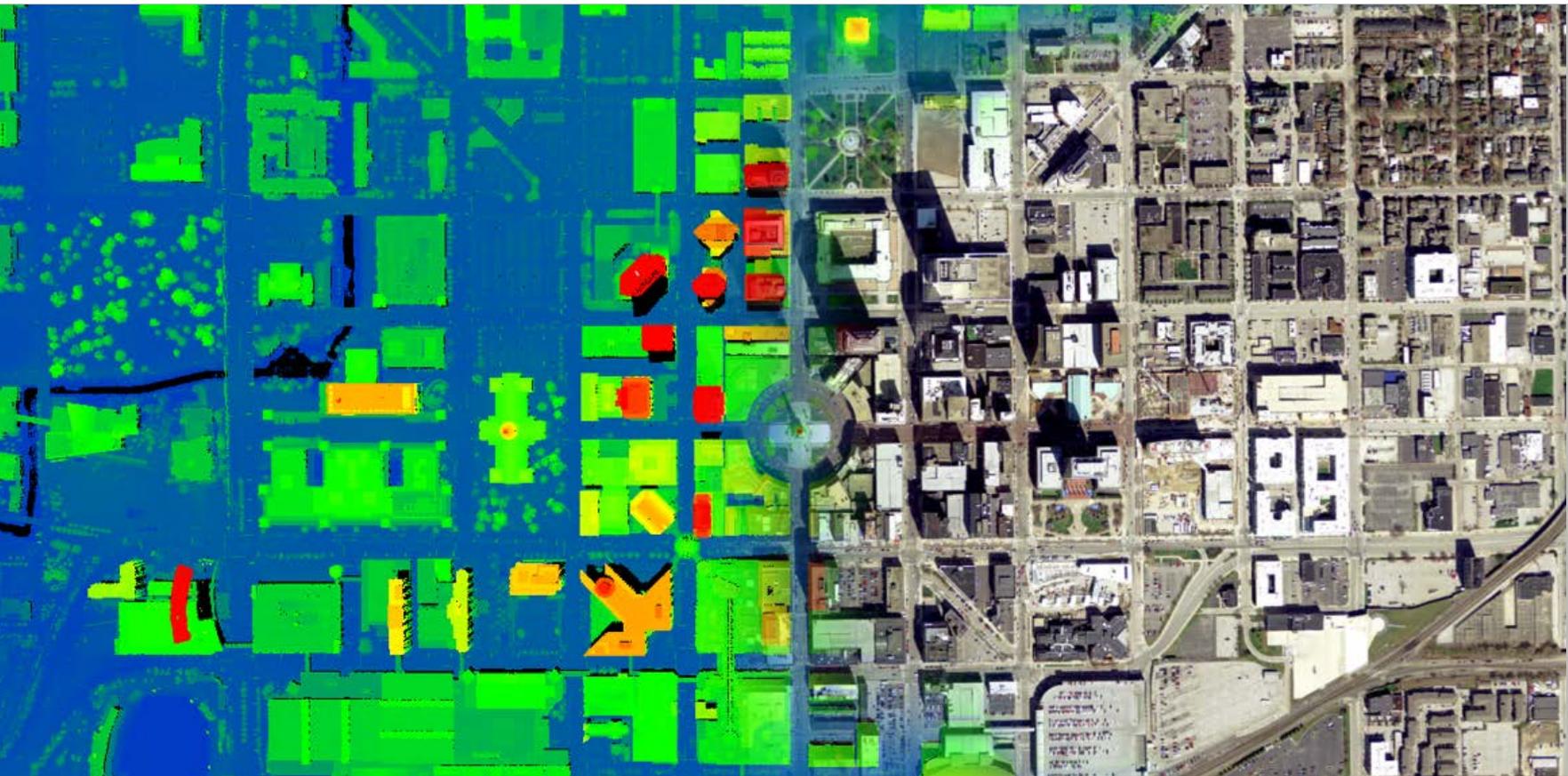


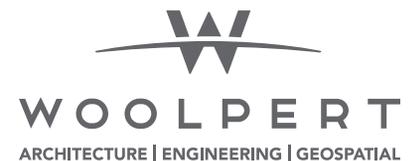
State of Indiana • Indiana Department of Administration (IDOA)

# Indiana Orthoimagery and Elevation Program

RFP 24-76258 | February 14, 2024



Business Proposal



**RFP # 24-76258  
BUSINESS PROPOSAL  
ATTACHMENT E**

**Instructions:** Please provide answers in the shaded areas to all questions. Reference all attachments in the shaded area.

***Business Proposal***

**2.3.1 General (optional)** - Please introduce or summarize any information the Respondent deems relevant or important to the State's successful acquisition of the products and/or services requested in this RFP.

Woolpert, Inc. having provided multiple statewide solutions over multiple years, has the technical and collaborative experience to deliver a superior solution to Indiana. We will deliver a superior technical solution while sharing a wealth of knowledge and strategy for successful collaboration with state agencies and local governments, a key component for success of a statewide imagery/lidar program.

From a technical perspective, we have designed a solution which will provide the state multiple options for best acquiring quality new statewide orthoimagery and lidar data for the Indiana Geographic Information Office's Imagery and Elevation program. This solution includes the implementation of cutting edge aerial camera sensors and lidar sensors to provide an innovative and cost-effective answer to Indiana's geospatial needs.

First, our solution is based on co-collection of aerial imagery and lidar, not just resulting in a more efficient use of resources, but also providing the state matching co-registration of two foundational base datasets. This matching co-registration of aerial imagery and lidar will be a first for a statewide program and is only possible with our acquisition approach design and the marriage of camera/lidar sensors. The key is our long standing history of building aerial lidar sensors for the federal government, which benefits Indiana exponentially with the implementation of superior sensors, and the knowledge behind sensor technology for highly accurate and density rich lidar collection. The implementation will exceed the minimum requirement for QL1 Lidar (8 ppsm) with an enhanced point density of 25 ppsm.

Second, our proposed flight plan will include both the acquisition of high density aerial lidar and the option for either 6- or 3-inch orthoimagery statewide. Being able to provide statewide 3-inch orthoimagery is a huge undertaking and only possible by having both sensors used together to achieve optimal performance.

Lastly, having co-collected, matching co-registration of orthoimagery and lidar datasets will provide the best possible starting point when implementing artificial intelligence and machine learning (AI/ML). Having datasets collected at different times results in doubt concerning which dataset to prioritize over the other (due to possible changes since time of collection). Having matching, time stamped datasets breeds greater confidence during the extraction of secondary datasets including building outlines, as both datasets match each other from a time perspective, eliminating doubt concerning data prioritization. And, with the additional lidar point density mentioned above, the AI/ML process will be enhanced from a richer dataset allowing more ground features to be defined and extracted accurately.

**2.3.2 Respondent's Company Structure** - Please include in this section the legal form of the Respondent's business organization, the state in which formed (accompanied by a certificate of authority), the types of business ventures in which the organization is involved, and a chart of the organization. If the organization includes more than one (1) product division, the division responsible for the development

and marketing of the requested products and/or services in the United States must be described in more detail than other components of the organization. Please enter your response below and indicate if any attachments are included.

Incorporated in the State of Ohio, Woolpert is a corporation consisting of employee associate shareholders who annually elect a board of directors. Executive officers are responsible for directing the operations, finances, technical development, sales and marketing, human resources, and business planning functions of the firm. Woolpert is organized by sectors/markets and disciplines directed by the chief of operations, each with a market director/discipline leader. Approximately 2,000 professional and technical personnel deliver Woolpert’s services through design and geospatial/IT services.



A long-standing industry leader in surveying and mapping, Woolpert has built and vetted a global network of aerial platform and sensor providers that layer traditional methods with innovative new technologies to collect and process data efficiently for areas of interest (AOIs) around the world. Beyond these core capabilities, we’ve garnered an international reputation as a leader in space utilization, CAD/GIS mapping and analysis, database development, and utilities surveys, to name a few. ([Geospatial - Woolpert](#))



Woolpert owns and operates an extensive array of survey equipment including total stations, precise digital levels, ground penetrating radar (GPR), vacuum excavation vehicles, aircraft, UAVs, ground-based interior and exterior imaging and lidar sensors, numerous airborne position and orientation systems, and survey instrumentation. As a team, we are well-versed in a variety of survey equipment used within our geospatial operations and have developed sensor-agnostic data acquisition and data processing procedures to support any task.

**Please refer to the detailed descriptions of representative projects provided at the end of this document.**

**2.3.3 Respondent’s Diversity, Equity and Inclusion Information** - With the Cabinet appointment of a Chief Equity, Inclusion and Opportunity Officer, on February 1, 2021, the State of Indiana sought to highlight the importance of this issue to the state. Please share leadership plans or efforts to measure and

prioritize diversity, equity, and inclusion. Also, what is the demographic compositions of Respondents' Executive Staff and Board Members, if applicable.

Woolpert is providing, as a separate attachment, a description of our Supplier Diversity Program.

**2.3.4 Company Financial Information** - This section must include documents to demonstrate the Respondent's financial stability. Examples of acceptable documents include most recent Dunn & Bradstreet Business Report (preferred) or audited financial statements for the two (2) most recently completed fiscal years. If neither of these can be provided, explain why, and include an income statement and balance sheet, for each of the two most recently completed fiscal years.

If the documents being provided by the Respondent are those of a parent or holding company, additional information should be provided for the entity/organization directly responding to this RFP. That additional information **should explain the business relationship between the entities and demonstrate the financial stability of the entity/organization which is directly responding to this RFP.**

Woolpert is providing, as a separate attachment, a recent Dunn & Bradstreet business report.

**2.3.5 Integrity of Company Structure and Financial Reporting** - This section must include a statement indicating that the CEO and/or CFO, of the responding entity/organization, has taken personal responsibility for the thoroughness and correctness of any/all financial information supplied with this proposal. The areas of interest to the State in considering corporate responsibility include the following items: separation of audit functions from corporate boards and board members, if any, the manner in which the organization assures board integrity, and the separation of audit functions and consulting services. The State will consider the information offered in this section to determine the responsibility of the Respondent under IC 5-22-16-1(d).

Senior Vice President and Managing Principal of the Woolpert's Government Solutions Market, Jeff S. Lovin, CP, PS, will serve as the team's Project Principal and authorized signatory for this Statewide Program. Jeff, and Woolpert's Chief Operating Operator, Kirk McClurkin, GISP, IAM, can certify the information offered in the proposal meets all general conditions including the information requested in Section 2.3.4 of the RFP and accept responsibility for the thoroughness and correctness of our financial information provided for this submittal. Their respective contact information is as follows:

- Jeff S. Lovin, CP, Senior Vice President  
O: 513.527.2600, C: 937.609.5627, [jeff.lovin@woolpert.com](mailto:jeff.lovin@woolpert.com)
- Kirk McClurkin, GISP, IAM, Chief Operating Officer  
O: 720.279.3716, C: 303.503.7752, [kirk.mcclurkin@woolpert.com](mailto:kirk.mcclurkin@woolpert.com)

**2.3.6 Contract Terms/Clauses** - Please provide the requested information in RFP Section 2.3.6.

Woolpert has reviewed the terms of the RFP and sample contract provided. Per the RFP, Woolpert understands that the mandatory clauses are non-negotiable while non-mandatory clauses are highly desirable. We take no exception to the mandatory clauses.

**2.3.7 References** - Reference information is captured on **Attachment H** Respondent should complete the reference information portion of the **Attachment H** which includes the name, address, and telephone number of the client facility and the name, title, and phone/fax numbers of a person who may be contacted for further information if the State elects to do so. The rest of **Attachment H** should be completed by the reference and **emailed DIRECTLY** to the State. The State should receive four (4) **Attachment Hs** from clients for whom the Respondent has provided products and/or services that are the same or similar to those products and/or services requested in this RFP. **Attachment H** should be

submitted to [idoareferences@idoa.in.gov](mailto:idoareferences@idoa.in.gov). **Attachment H** should be submitted no more than ten (10) business days after the proposal submission due date listed in Section 1.24 of the RFP. Please provide the customer information for each reference.

|  |   |
|--|---|
| <b>Customer 1</b>                            |   |
| Legal Name of Company or Governmental Entity | State of Ohio, Ohio Department of Administrative Services, Office of Information Technology (OIT) |
| Company Mailing Address                      | 77 South High Street, 19th Floor  |
| Company City, State, Zip                     | Columbus, OH 43215  |
| Company Website Address                      | <a href="https://das.ohio.gov/">https://das.ohio.gov/</a>   |
| Contact Person                               | Donovan Powers  |
| Contact Title                                | Executive Director, State GIO/OGRIP Director  |
| Company Telephone Number                     | 614.265.6772  |
| Company Fax Number                           | 614.728.5297  |
| Contact E-mail                               | <a href="mailto:donovan.powers@das.ohio.gov">donovan.powers@das.ohio.gov</a>                      |
| Industry of Company                          | State Government  |
| <b>Customer 2</b>                            |   |
| Legal Name of Company or Governmental Entity | Kosciusko County, Indiana   |
| Company Mailing Address                      | 100 W Center Street   |
| Company City, State, Zip                     | Warsaw, IN 46580  |
| Company Website Address                      | <a href="https://www.kcgov.com/">https://www.kcgov.com/</a>                                       |
| Contact Person                               | William Holder  |
| Contact Title                                | GIS Director  |
| Company Telephone Number                     | 574.372.2485  |
| Company Fax Number                           | 574.372.2476  |
| Contact E-mail                               | <a href="mailto:bholder@kcgov.com">bholder@kcgov.com</a>  |
| Industry of Company                          | County Government   |
| <b>Customer 3</b>                            |   |
| Legal Name of Company or Governmental Entity | The Board of Trustees of the University of Illinois<br>c/o Facilities and Services – UIUC         |
| Company Mailing Address                      | Natural Resources Building, 615 E Peabody Drive<br>M/C 650  |
| Company City, State, Zip                     | Champaign, IL 61820   |
| Company Website Address                      | <a href="http://www.fs.illinois.edu">http://www.fs.illinois.edu</a>                               |
| Contact Person                               | Mark Yacucci  |
| Contact Title                                | Associate Scientist, Scientific Data Preservation<br>Head, Geoscience Information Stewardship     |
| Company Telephone Number                     | 217.265.0747  |
| Company Fax Number                           | 217.244.1542  |
| Contact E-mail                               | <a href="mailto:Yacucci@illinois.edu">Yacucci@illinois.edu</a>                                    |
| Industry of Company                          | Academia  |
| <b>Customer 4</b>                            |   |
| Legal Name of Company or Governmental Entity | Clinton County, Ohio  |
| Company Mailing Address                      | 1850 Davids Drive   |
| Company City, State, Zip                     | Wilmington, OH 45177  |
| Company Website Address                      | <a href="https://co.clinton.oh.us">https://co.clinton.oh.us</a>                                   |

|                          |  |
|--------------------------|--|
| Contact Person           | Joe Merritt, GISP  |
| Contact Title            | GIS Manager  |
| Company Telephone Number | 937.382.0035   |
| Company Fax Number       | 937.383.2884   |
| Contact E-mail           | <a href="mailto:jmerritt@clintoncountyengineer.org">jmerritt@clintoncountyengineer.org</a> |
| Industry of Company      | County Government  |

**2.3.8 Registration to do Business** – Per RFP 2.3.8, Respondents providing the products and/or services required by this RFP must be registered to do business by the Indiana Secretary of State. The Secretary of State contact information may be found in Section 1.18 of the RFP. This process must be concluded prior to contract negotiations with the State. It is the successful Respondent’s responsibility to complete the required registration with the Secretary of State. Please indicate the status of registration, if applicable. Please clearly state if you are registered and if not provide an explanation.

Woolpert holds an active registration with the State of Indiana and is in good standing with the Secretary of State. Woolpert has provided, **as a separate document**, a copy of our current Certificate of Existence.

**2.3.9 Authorizing Document** - Respondent personnel signing the Executive Summary of the proposal must be legally authorized by the organization to commit the organization contractually. This section shall contain proof of such authority. A copy of corporate bylaws or a corporate resolution adopted by the board of directors indicating this authority will fulfill this requirement. Please enter your response below and indicate if any attachments are included.

Jeff S. Lovin, CP, Senior Vice President and Managing Principal of the Government Solutions Market at Woolpert is legally authorized by the organization to commit Woolpert contractually. A copy of the corporate bylaws indicating his signing authority **is provided as a separate document**.

**2.3.10 Subcontractors** - The Respondent is responsible for the performance of any obligations that may result from this RFP and shall not be relieved by the non-performance of any subcontractor. Any Respondent’s proposal must identify all subcontractors and describe the contractual relationship between the Respondent and each subcontractor. Per instructions in **Attachment J**, either a copy of the executed subcontract or a letter of agreement over the official signature of the firms involved must accompany each proposal.

Any subcontracts entered by the Respondent must be in compliance with all State statutes and will be subject to the provisions thereof. For each portion of the proposed products and services to be provided by a subcontractor, the technical proposal must include the identification of the functions to be provided by the subcontractor and the subcontractor’s related qualifications and experience.

The combined qualifications and experience of the Respondent and any or all subcontractors will be considered in the State’s evaluation. The Respondent must furnish information to the State as to the amount of the subcontract, the qualifications of the subcontractor for guaranteeing performance, and any other data that may be required by the State. All subcontracts held by the Respondent must be made available upon request for inspection and examination by appropriate State officials, and such relationships must meet with the approval of the State.

The Respondent must list any subcontractor’s name, address, and the state in which formed that are proposed to be used in providing the required products and/or services. The subcontractor’s responsibilities under the proposal, anticipated dollar amount for subcontract, subcontractor’s form of organization, and an indication from the subcontractor of a willingness to carry out these responsibilities

are to be included for each subcontractor. This assurance in no way relieves the Respondent of any responsibilities in responding to this RFP or in completing the commitments documented in the proposal. The Respondent must indicate which, if any, subcontractors qualify as a Minority Business Enterprise, Women’s Business Enterprise, or Veteran Owned Business under IC 4-13-16.5-1 and IC 5-22-14-3.5. See Sections 1.21, 1.22 and **Attachments A/A1** for Minority, Women, and Veteran Business information.

IVOSB entities (whether a prime or subcontractor) must have a Bidder ID. If registered with IDOA, this should have already been provided (as with MWBEs). IVOSBs that are only registered with the Federal Center for Veterans Business Enterprise will need to ensure that they also have a Bidder ID provided by IDOA (please see section 2.3.7 for details).

Woolpert will be supported by four highly qualified IDOA-registered subcontractors.

- Resolution Group, Inc. (WBE)
- Vespa Group LLC (IVOB)
- VS Engineering, Inc. (MBE)
- Washington Columbia & Company (IVOB). *(The firm is also an IDOA-registered MBE firm)*

Large business, Keystone Aerial Surveys, Inc., will support the Woolpert team by providing redundancy in aerial data acquisition.

Woolpert has provided the required documentation (attachments A/A1, letters of commitment, and Indiana supplier diversity documentation letters), **as separate attachments** for our IDOA-registered small business enterprise teaming partners.

**2.3.11 Evidence of Financial Responsibility** – Removed at the request of the agency. This section will indicate the ability to provide the mandatory evidence of financial responsibility. See Section 1.25 of RFP for details.

Information not requested to be provided.

**2.3.12 General Information** - Each Respondent must enter your company’s general information including contact information.

| Business Information                            |  |
|---|--|
| Legal Name of Company                           | Woolpert, Inc.   |
| Contact Name                                    | Brian Stevens, CP, GISP  |
| Contact Title                                   | Vice President, Geospatial Program Director                                |
| Contact E-mail Address                          | <a href="mailto:brian.stevens@woolpert.com">brian.stevens@woolpert.com</a> |
| Company Mailing Address                         | 333 North Alabama Street, Suite 200  |
| Company City, State, Zip                        | Indianapolis, IN 46204   |
| Company Telephone Number                        | 317.299.7500   |
| Company Fax Number                              | 317.291.5805   |
| Company Website Address                         | <a href="http://www.woolpert.com">http://www.woolpert.com</a>              |
| Federal Tax Identification Number (FTIN)        | 20-1391406   |
| Number of Employees (company)                   | 1,919 (full-time employees)  |
| Years of Experience                             | 113  |
| Number of U.S. Offices                          | 35 (plus 13 project office)  |
| Year Indiana Office Established (if applicable) | 1981   |
| Parent Company (if applicable)                  | Woolpert Holdings, Inc.  |

|                                     |  |
|-------------------------------------|--|
| Revenues (\$MM, previous year)      | \$507.3 Million of estimated revenue in 2023 |
| Revenues (\$MM, 2 years prior)      | \$392.9 Million of revenue in 2022           |
| % Of Revenue from Indiana customers | \$11.8 Million in 2023                       |

- a. Does your Company have a formal disaster recovery plan? Please provide a yes/no response. If no, please provide an explanation of any alternative solution your company has to offer. If yes, please note and include as an attachment.

Yes. Woolpert’s Back-up, Recovery, and Disaster Recovery Systems and Procedures plan has been provided as a separate document.

- b. What is your company’s technology and process for securing any State information that is maintained within your company?

Project data is stored in our Azure cloud environment, with sensitive projects (i.e., CMMC CUI data) stored in our GCC high government enclave. Access to Woolpert sensitive information is provided only after express management authorization has been obtained from the role or designated owner of such information. Access requires a named account using multi-factor authentication. Employees can access only specific information systems based on their permissions and roles. Access permissions are reviewed periodically. All data at rest is encrypted (encrypted AES 256bit at rest and TLS 1.2 https in transit). Physical security measures are implemented covering guarding, personnel safety, access control mechanism, intrusion detection systems, and protection against environmental factors (e.g., fire, lighting, flooding, climate control).

**2.3.13 Experience Serving State Governments** - Please provide a brief description of your company’s experience in serving state governments and/or quasi-governmental accounts.

Woolpert is under contract with many agencies that encourage and participate in partnership programs and often provide management and financial resources. Our long history of performing projects with multiple contributing partners gives us an understanding of how the uniqueness of individual partners can, through collaboration, achieve a successful project. Once potential partners have been identified, Woolpert will invite them to attend program seminars to learn more and/or meet with each individual potential partner at their location. Woolpert’s management team, together with our marketing and communication group, can provide support with promotional documents, materials, and creative solutions. We can also assist Indiana Office of Technology (IOT) and partnering agencies with the documentation and applications for funding procurement from various sources such as grants, contributions, and appropriations.

Woolpert’s previous experience on the original, and subsequent Statewide Indiana Orthoimagery programs exemplifies our understanding and dedication to performing statewide programs. Challenges overcome include the mobilization and scheduling of a team of aircraft; the ability to work around adverse weather and ground conditions; the interaction with multiple subcontractors and QC vendors concerning the production and review of lidar and orthoimagery; and the delivery of final products and client interaction throughout the entire program’s life cycle.

**2.3.14 Experience Serving Similar Clients** - Please describe your company’s experience in serving customers of a similar size to the State with similar scope. Please provide specific clients and detailed examples.

Woolpert has performed geospatial projects for numerous private sector clients and federal, state, and local governments for more than 50 years including several statewide lidar and imagery programs spanning Ohio, Maine, Texas and **Indiana**. In each instance the client selected Woolpert for our team’s

unmatched aerial data collection, processing and delivery experience. Our team:

- Brings innovative solutions, including high-performance computing, AI/ML, and cloud computing to produce high-quality, robust geospatial data products with efficiency, scalability and accuracy.
- Has an entire team dedicated to cloud-specific software engineering, infrastructure architecture, and support.
- Ensures current client infrastructure and business workflows are enhanced, non-disruptive, by adopting cloud-based approaches and that solutions are intuitive to use.

In the field of AI/ML, Woolpert provides increased efficiencies for in-house processing, providing quicker turnaround times for clients and cost savings.

- Systems and methods for impervious surface detection and classification (patent number 11353554). In June 2022, Woolpert received the referenced patent. Systems and methods were provided for impervious surface mapping of a target geographic area. The impervious surface mapping utilizes four-band imagery data and lidar data collected from the target geographic area. The identified impervious surfaces can be attributed to parcels within the target geographic area for purposes of generating bills for storm water runoff to parcel owners.
- Offers new products made possible by ML, by leveraging high-quality training data accrued by Woolpert and subject matter expertise and moves toward providing clients information and insights.

**Note:** specific client and project examples are detailed at the end of this business proposal.

**2.3.15 Indiana Preferences** - Pursuant to IC 5-22-15-7, Respondent may claim only one (1) preference. For the purposes of this RFP, this limitation to claiming one (1) preference applies to Respondent’s ability to claim eligibility for Buy Indiana points. **Respondent must clearly indicate which preference(s) they intend to claim. Additionally, the Respondent’s Buy Indiana status must be finalized when the RFP response is submitted to the State.**

Approval will be system generated and sent to the point of contact email address provided within the Bidder Registration profile. This is to be attached as a screenshot (copied/pasted) for response evaluation.

Buy Indiana

Refer to Section 2.7 for additional information.

Two of the Woolpert team’s four small business teaming partners are currently designated under BUY INDIANA. Designation approval/expiration dates are as follows:

- VS Engineering – Bidder #1707.
  - Certification validity dates: 1/17/2024 – 1/17/2029
- Vespa Group LLC – Bidder #35074
  - Certification validity dates: 7/25/2023 – 7/25/2028

Woolpert has registered with IDOA for BUY INDIANA status and subsequent eligibility for BUY INDIANA points on the basis that Woolpert makes significant capital investments in Indiana and provides substantial positive economic impact on Indiana. This recognition can be justified based on the following criteria:

Bidder ID Number: 0000015959

- Woolpert’s Indianapolis office has been open and maintained since 1981
- Payroll in 2023 ..... \$4.3 Million

|  |
|--|
| <ul style="list-style-type: none"> <li>• Gross receipts in 2023 ..... \$10.2 Million</li> <li>• Facility (office lease payments in 2023)..... \$0.4 Million</li> </ul> |
|--|

**2.3.16 Payment** - Please provide the requested information in Main RFP Section 2.3.16.

Woolpert’s preferred method of client payment is EFT, followed by check. Woolpert can process client credit card payments, however, it is a manual process, and each payment must be processed separately.

Woolpert understands that the State may choose payment by credit card as an optional form of payment. Woolpert understands and will accept this form of payment – to include any associated credit card-user handling fees associated with the transaction.

**2.3.17 Extending Pricing to Other Governmental Bodies** – Indicate your willingness to extend prices of awarded products and/or services to other governmental bodies per RFP section 2.3.17.

Yes, Woolpert is willing to extend prices of awarded products and/or services to other governmental bodies.

# Supplemental Information

## (2.3.2 Company Structure)

### Geospatial Services Overview

With more than five decades of experience working with advanced technologies, Woolpert can provide integrated geospatial services and project support to meet the varied geospatial needs of statewide client organizations. These services include, but are not limited to the following:

**Aerial Acquisition Capabilities.** Woolpert owns and operates eight high-performance aircraft—four Cessna 404s, two Reims F406s and two Beechcraft Super King Air 300 aircraft. These aircraft, are configured with dual ports for simultaneous data collections, are outfitted with computer control navigation systems (CCNS) and multiple aerial data sensor systems—all equipped with GPS/GNSS/IMU technology. All acquired data is positioned using airborne Kinematic GPS.

- Aircraft are maintained and operated under FAA regulations.
- Lidar systems are fully compliant and certified under the U.S. Department of Health and Human Services standard CDHR 1040.

**Note:** Due to the uncertainty of weather, ground conditions, and in the rare event of equipment failure, Woolpert is supplementing our acquisition capabilities by bringing on a valued partner, Keystone Aerial Survey, who owns/operates multiple twin engine aircraft and sensors.

**Digital Imagery.** Our digital imagery solution includes two Leica DMC4h imagery sensors. The Leica DMC-4 is a highly efficient airborne imaging sensor delivering superior image fidelity for versatile applications and complex mapping environments. With over 31,500 pixels across swath, the system maximizes acquisition efficiency and improves the imaging performance by 20% compared to previous systems. The sensor leverages Leica Geosystems' CMOS-based MFC150 camera module with mechanical Forward Motion Compensation (FMC) to deliver the highest image detail. The DMC-4 was designed with application versatility in mind and supports multiple photogrammetry and remote sensing applications.

Our digital imaging capabilities also include two Leica ADS80s and one Leica ADS100. Our digital sensors collect a 12-bit image RGB and NIR with the dynamic range of each multispectral band at 4,096 pixel values, compared to 256 pixel values with traditional film. Additionally, we have six Leica RCD30 cameras integrated into our Leica TerrainMappers and Chiroptera bathy-topo lidar sensors, and two VisionMap A3 Edge digital image sensors.

**Lidar.** Woolpert is an expert in the acquisition and processing of lidar data, including airborne linear (e.g.: QL0, QL1, QL2, other), single photon, bathymetric, full waveform, mobile, terrestrial or enhanced. This also includes specialized processes to optimize imagery use and elevation points to produce the most realistic colored point clouds available.

**Woolpert is a Valued USGS 3DEP/3DHP Contractor. Since 1993, Woolpert has provided mapping services in all 50 states in support of the USGS.** In February 2016, Woolpert was awarded the GPSC 3 (Contract G16PC00022) from USGS. Under this contract we received 61 task order awards comprised of more than 419,683 square miles of topographic lidar data acquisition and processing in support of the USGS 3D Elevation Program (3DEP). In August 2021, Woolpert was again selected by the USGS as a prime contractor to provide professional mapping and surveying services to include elevation derived hydrography (EDH) and tasks involving high-precision airborne geophysical surveying services for graphics and spatial vector production and raster digital data under the Geospatial Products and Services 4 A/E IDIQ contract for services throughout the U.S., its territories, and possessions (140G0221D0013).

## Our lidar acquisition services includes:

- **Airborne.** Woolpert has provided airborne topographic lidar services since 1999. Our airborne topographic lidar capacity includes four Leica TerrainMapper sensors along with accompanying HxMap processing software. These systems can be mounted and operated on fixed-wing and helicopter platforms. With 2-MHz pulse repetition frequency and sensitive collection optics, Leica TerrainMapper increases data collection while providing more efficient flight planning and even point distribution. Along with current linear mode lidar technology, Woolpert pioneered and developed the first high-altitude single photon lidar (SPL) sensor as a requirement for one of its U.S. government contracts.
- **Bathymetric.** Woolpert provides airborne lidar bathymetric capabilities with two Leica Chiroptera 4X topographic and bathymetric sensors. This system can be coupled with the Leica HawkEye 4X deep channel lidar system to provide an operational depth measurement range greater than 3.0 Secchi. Since 2019, we have consistently measured depths of 45 to 47 meters at various locations in the Pacific. Although bathymetric lidar provides a viable solution for clear bodies of water, when dealing with substantial water turbidity, a solution incorporating sonar will yield better results. An overview of Woolpert's marine capabilities is described below:
  - Through Woolpert's acquisition of eTrac in 2022, we now provide hydrographic data acquisition and processing of multibeam, singlebeam, and sidescan sonar. Our staff are thoroughly trained in modern hydrography and marine geology, nationally recognized as Certified Hydrographers (NSPS-THSOA) and GIS Professionals. Woolpert's sonar-based geospatial capabilities coupled with existing nearshore and shallow-water riverine geospatial offerings expand our marine solutions strategy.
  - Woolpert has conducted airborne and marine survey operations over all U.S. coastal waters and territories, and at multiple international locations. Our capabilities include acquisition, processing, analysis, and quality control of bathymetric lidar data; and the production of nautical chart features, DEMs, coastal erosion/accretion volume changes, storm impacts and change maps, shoreline position vectors, land use characteristic products, lidar point clouds, and other specialized products. Hydrographic survey operations include the use of cutting-edge technology such as multibeam echosounders (MBES) and sidescan sonars to produce bathymetric DEMs; feature datasets showing dangers to navigation, soundings, and contours; sidescan and backscatter imagery; and other products related to nautical chart updates.
    - In the past three years, Woolpert has acquired more than 6,350 square miles of bathymetric sonar data on hydrographic projects for NOAA OCS and more than 11,743 square miles of bathymetric sonar data for a variety of federal and state agencies, and numerous private sector clients.
- **Terrestrial.** Woolpert specializes in the operation of terrestrial scanning using Leica RTC-360, Leica P-50, Trimble X-7, and Trimble SX10 high-definition scanners. We use TopoDOT, Leica Cyclone, and CloudWorx interactive software for post-processing of raw point cloud and image data to produce derivative products, allowing our team to provide field-to-finish data capture, modeling, and integration capabilities.
- **Mobile.** Woolpert's Leica Pegasus II Ultimate Mobile Mapping System (MMS) collects seamless 360-degree images calibrated to point clouds through a 24 MP camera system providing stitching-free images, additional sync ports to connect thermal imaging, multibeam sonar, and ground-penetrating radar sensors. The Leica Pegasus Two Ultimate creates a 360-degree image calibrated to the lidar profiler, enabling digital reality captures from car, train, or boat.

**Remote Sensing.** Woolpert's Remote Sensing group has developed proprietary methodologies to extract additional information and value from your data. Woolpert's remote sensing services offer value added products to include land use/land cover, forestry characterization and metrics, vegetation classification, buildings and structures, biomass and carbon/GhG calculations, solar potential mapping (for photovoltaic array

placement), transmission and utility maps, emergency response plans, as well as pre- and post-event/disaster planning.

Our remote sensing specialists are also skilled at creating supervised and unsupervised classification schemes for automated land use/land cover extraction and analysis from digital multi-spectral and hyper-spectral imagery sources. Data fusion techniques allow multiple data sources to be combined and used for feature extraction and analysis.

Data fusion has focused on tidal inlets and the land/sea interface to capture changing volumes, morphological change and datum-derived shorelines over both long- and short-term timeframes. Interactive 3D visualization of fusion deliverables lends decision support for managers and engineers understanding complex coastal morphodynamics. This type of analysis along inlets and shorelines is especially valuable when data is refreshed regularly or after impactful events.

**Surveying.** Woolpert has more than 100 years of surveying experience for clients across the globe. Our survey discipline is comprised of varying levels of geospatial professionals including field technicians, utility designators, CAD technicians, and professional land surveyors with more than 30 years of experience. Our experience includes, but is not limited to, boundary surveys of public and private lands, GPS/DGSP surveys, photo control surveys, aeronautical surveys, horizontal and vertical control surveys, structural surveys, route location surveys, quantity surveys, construction layout surveys, hydrographic surveys, geodetic (including National Geodetic Bluebook surveys), topographic surveys, and utility location surveys. Woolpert has developed unique survey standards and practices that allow survey crews from multiple offices and teammates to coordinate and work seamlessly.

**Photogrammetry and Feature Extraction.** Our photogrammetrists average more than 20 years of experience extracting information from various imagery and lidar sources, including digital aerial imagery, mobile lidar, and aerial lidar platforms. Final deliverables are reviewed by our quality control group, which performs a detailed check of all deliverables and is responsible for creating all CAD, Esri, or InRoads deliverables.

Woolpert is an **A/E industry leader in its use of CADD** tools and in-house developed applications created specifically for the construction of data required to meet A/E/C CADD (v5 or higher) and SDSFIE standards. Collectively, we support more than 400 seats with the latest in CADD programs for our A/E and GIS projects. Our experience with CADD and GIS in support of SDSFIE delivery requirements includes the following software packages:

- AutoCAD (graphics/automated design and drafting).
- Bentley MicroStation and GeoGraphics.
- Intergraph Modular GIS Environment (MGE).
- Civil Soft (civil engineering design).
- SDSFIE Toolbox.
- AutoCAD Civil3D (civil engineering design).
- Oracle Spatial.
- eGIS Toolbox.
- ArcGIS

### (2.3.14 Experience Serving Similar Clients)

Provided in this section are descriptions of the representative projects for whom we have submitted an Attachment H evaluation form, as well as additional project examples.

The products and/or services performed are the same or similar to those products and/or services requested in this RFP and range from currently in production to completed. These projects (aside from those that are current) have been satisfactorily completed within budget and in accordance with project specifications, were invoiced and paid in full to provide further evidence of satisfactory project completion.

# Ohio Statewide Imagery Program (OSIP 3)

## Ohio

The Ohio Statewide Imagery Program 3 is a contract issued by the State of Ohio for the acquisition of professional geospatial services such as orthoimagery, lidar, oblique imagery, parcel conversion, and remote sensing analysis. The scope of this contract includes the entire geographic area of the state of Ohio and immediately adjacent territory. Woolpert also successfully performed similar work under the OSIP 1 and OSIP 2 contracts, which resulted in the current OSIP 3 contract.

This \$1.8 million base contract calls for the acquisition of 6-inch pixel, 3-band orthoimagery, collected over a 4-year period from 2017-2020 (the buy-up program continued through the state's 2023 fiscal year). The orthoimagery is a fundamental GIS dataset and provides benefits to a wide range of users, including public agencies, non-governmental organizations, citizens, private industry, and educational institutions. As with previous OSIP projects, the data developed through OSIP for all 88 counties in Ohio is made available and provided as public domain.

In addition to the base orthoimagery, OSIP provides state agencies and local governments the opportunity to purchase additional, value-added services through a cooperative purchasing agreement with the state of Ohio. This includes higher-resolution 4-band imagery, aerial and mobile lidar, oblique aerial imagery, topographic mapping, land use/land cover.

### Base Deliverables

The Base Requirement under this contract consisted of acquiring 3-band imagery covering the entire state of Ohio and delivering orthorectified and mosaicked imagery at a 6-inch pixel resolution delivered in 5,000' x 5,000' tiles as uncompressed GeoTIFFs with World Files, and as individual county mosaics in MrSID format. Additional standard deliverables included a project plan, flight plans, ground control plans, project kick-off meetings, project reports, ground control and check (QA/QC) points, FGDC-compliant metadata in XML format, and a final project report. The data was acquired by Woolpert owned and operated aircraft and sensors, along with support from our subcontractors providing additional aircraft and sensors.

### Buy-Up (Derivative) Services

Since the first iteration of OSIP 1 in 2006, 56 of Ohio's 88 counties have opted to contract "buy-up" orders, requiring additional airborne acquisition of data covering more than half the state's 41,276 square miles. The buy-ups—or enhanced deliverables—represent specific data to be acquired and delivered for various cities, counties, and regions within the state. Specifications for the buy-ups have included acquisition of lidar at a nominal post spacing of 0.7-meter and 1-meter, 4-band imagery at pixel resolutions of 1.5-inch and 3-inch, natural color oblique imagery and feature extraction of building footprints, land use/cover polygons, change detection, solar potential mapping, and impervious surface polygons.

Requirements have also included the acquisition of airborne GPS; ground control surveys and QA/QC checkpoint control; applying projections, datums, and coordinate transformations; aerial triangulation; lidar point clouds delivered in LASv1.4; seamless color/tone balanced orthorectified and mosaicked imagery; hydrologic flattening and stereo extraction of hydrologic features; generation of contours; production of Digital Elevation Models (DEMs), to include reflective last return and penetrative bare earth surface; lidar intensity images; and automated filtering, attribution, and feature extraction. Specifications for optional and additional enhanced product deliverables include, but are not limited to:

#### Client

State of Ohio, Ohio Department of Administrative Services, Office of Information Technology (OIT)

#### Contact

Donovan Powers, Executive Director/GIO  
77 South High Street, 19th Floor  
Columbus, OH 43215  
614.265.6772  
[donovan.powers@dnr.state.oh.us](mailto:donovan.powers@dnr.state.oh.us)

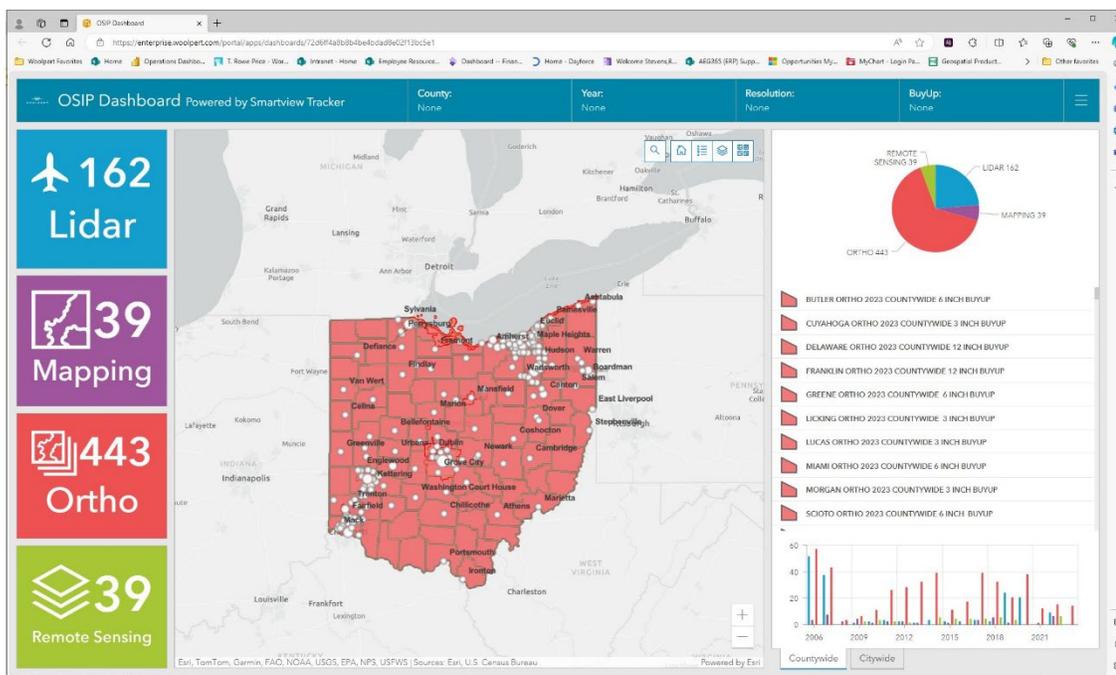
#### Dates

2016 – 2023 (current)

- **Contours (1-, 2-, 4-, and/or 5-foot).** For 2011-23, 30 counties/cities exercised the option to buy-up for 0.5-, 1- or 2-foot contours. Data deliverables included the addition of 3D breaklines, development of a bare-earth digital terrain model (DTM), and contours.
- **Oblique Aerial Imagery.** For 2011-23, 72 counties exercised the option to buy-up for oblique aerial imagery.
- **Enhanced Remote Sensing Products.** For 2011-2023, 42 counties/cities exercised the option to buy-up for enhanced GIS base mapping data layers (e.g., landcover, building outlines, change detection, impervious surface delineation, CAUV)
- **Higher-Resolution Citywide/Countywide Imagery.** As of Spring 2023, 205 projects in cities/counties have exercised 3” pixel resolution or better buy-ups.

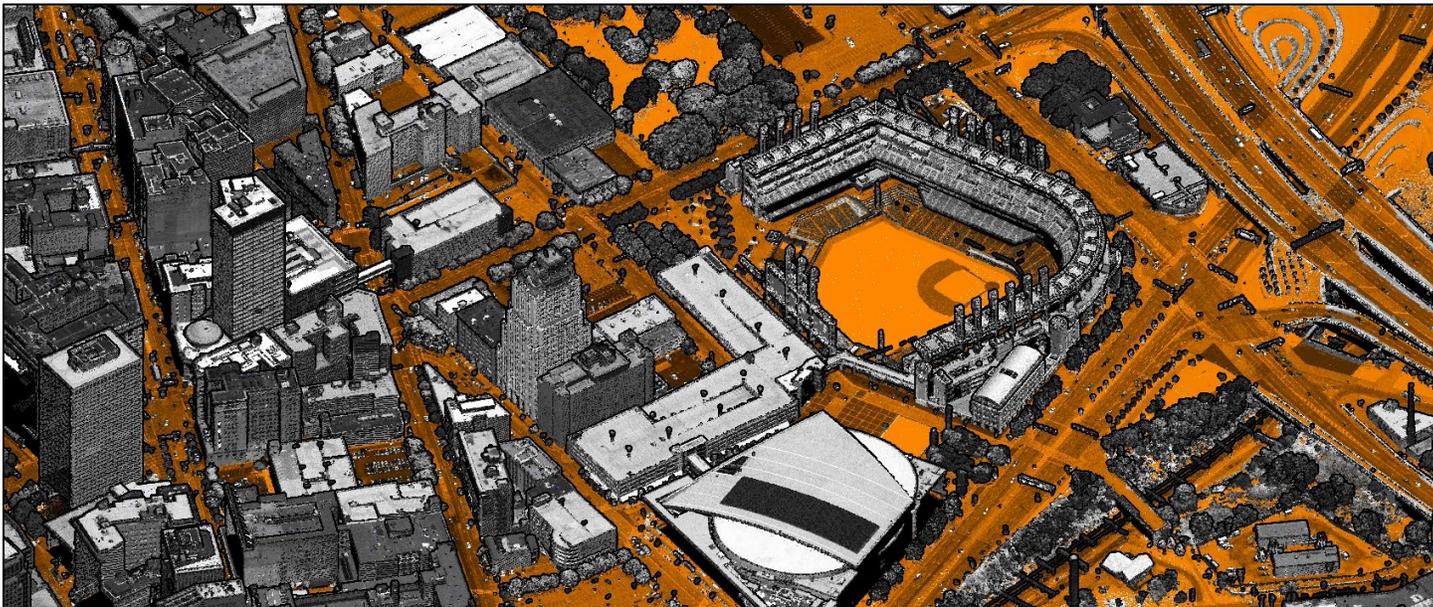
## OSIP Tracker

To aid the County and their stakeholders in reviewing the status of their projects via a secure, reliable and on-demand way, Woolpert architected an OSIP “tracker”. The tracker is an ArcGIS website used to easily track and review what type, when, and how many base and buy-up projects have taken place within the Imagery Program. It tracks all geospatial projects, including orthoimagery, aerial lidar, traditional photogrammetric and remote sensing (AI/ML) projects.

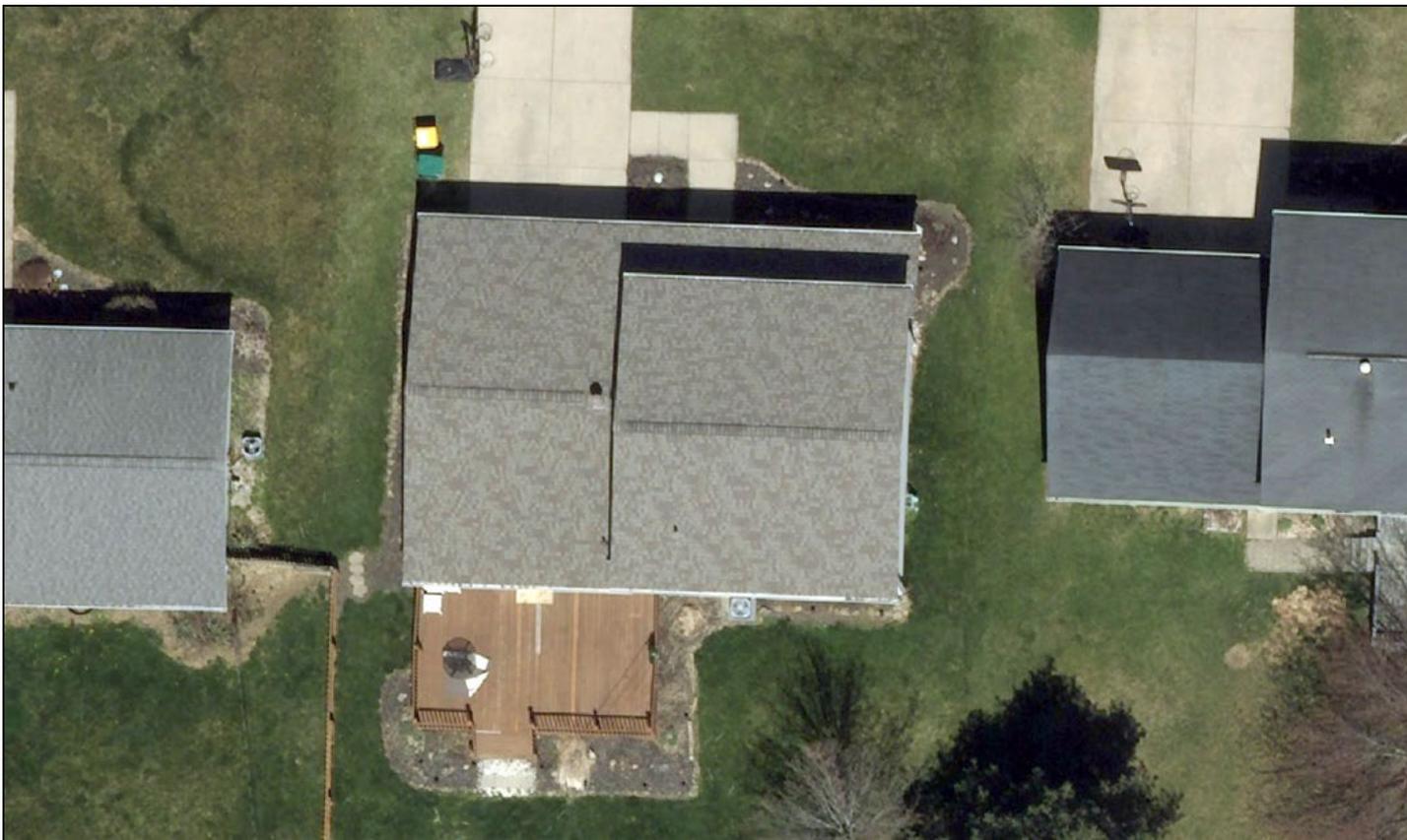


Screenshot of OSIP Tracker

The following pages contain examples of projects performed throughout the Ohio Statewide Imagery Program.



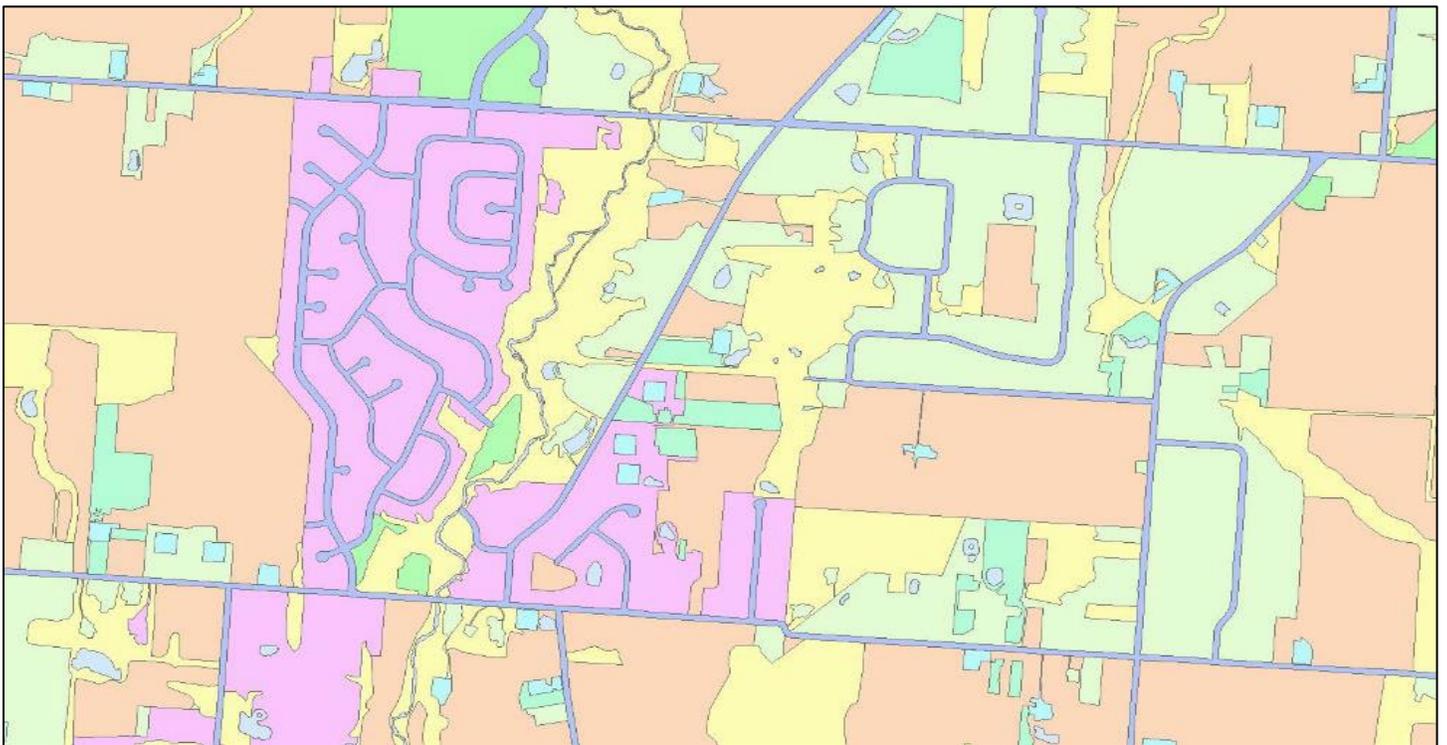
**2019-2023 Statewide 3DEP QL1 Lidar | State of Ohio.** During the Fall of 2019, Woolpert initiated the acquisition of new 3DEP QL1 lidar covering the entire state of Ohio. Of Ohio's 88 counties, several elected to enhance the base QL1 point density from 8 ppsm to either 12, 20 or 30 ppsm. The image above illustrates a small area of a digital surface model (DSM) taken from Cuyahoga County, which elected to upgrade to QL0 and 12 ppsm. Approximately 15% of Ohio's counties elected to upgrade either the vertical accuracy (from QL1 to QL0) and/or the lidar point density (greater than 8 ppsm).



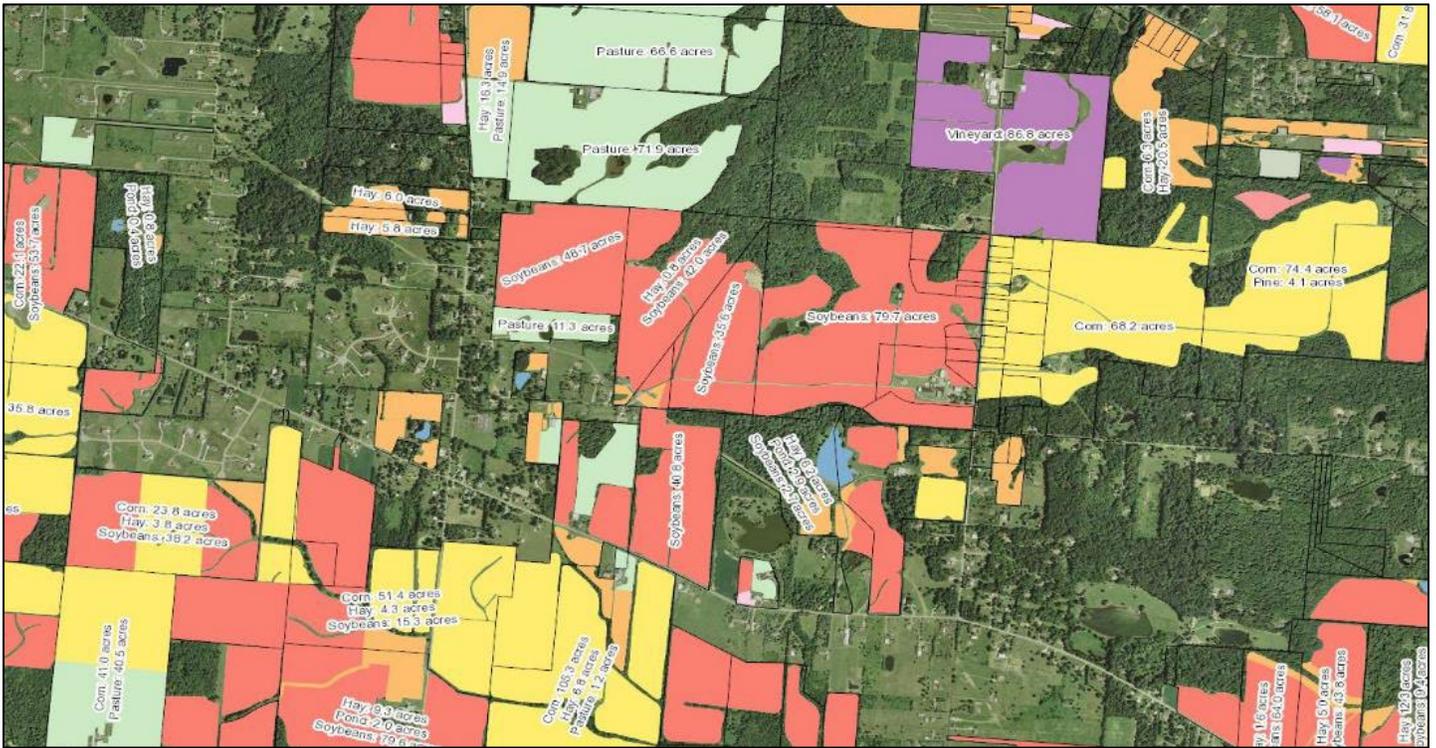
**2017-2023 Ohio Statewide Imagery Program (OSIP) | State of Ohio.** During the winter/spring of 2017, Woolpert initiated the acquisition of new statewide 6-inch orthoimagery for the state of Ohio. As part of the Imagery Program, counties and municipalities had the opportunity to upgrade to a higher image resolution and horizontal accuracy. The image above is an example of a County "upgrading" from the state's base 6-inch orthoimagery, which is taken from Sandusky County, who elected to upgrade to countywide 1.5-inch pixel resolution.



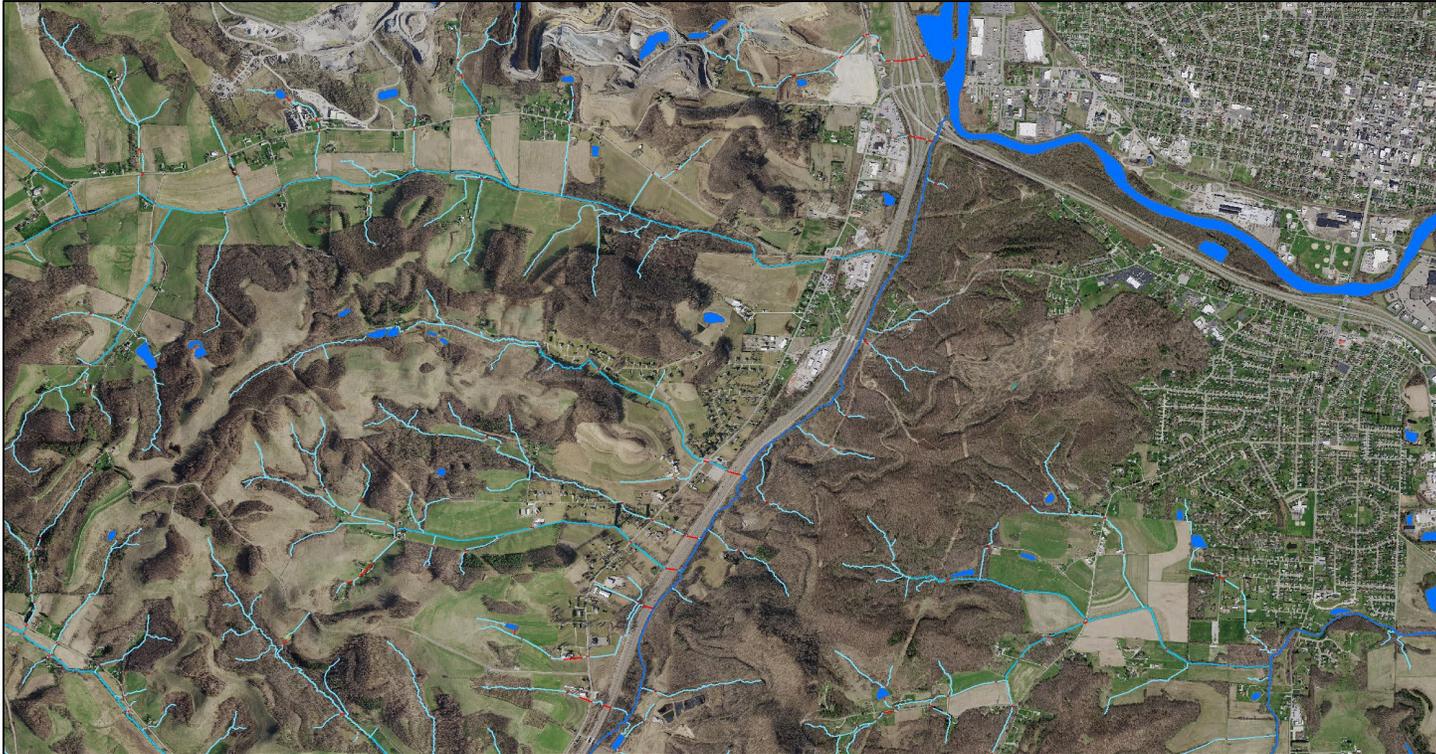
**2020-2021 Impervious Surface Delineation | City of Toledo, Ohio.** Utilizing the Ohio QL1 8 ppsm aerial lidar and 3-inch, 4-band orthoimagery, the City of Toledo undertook the implementation of AI/ML to extract citywide impervious surfaces for over 100,000 parcels (both residential and non-residential).



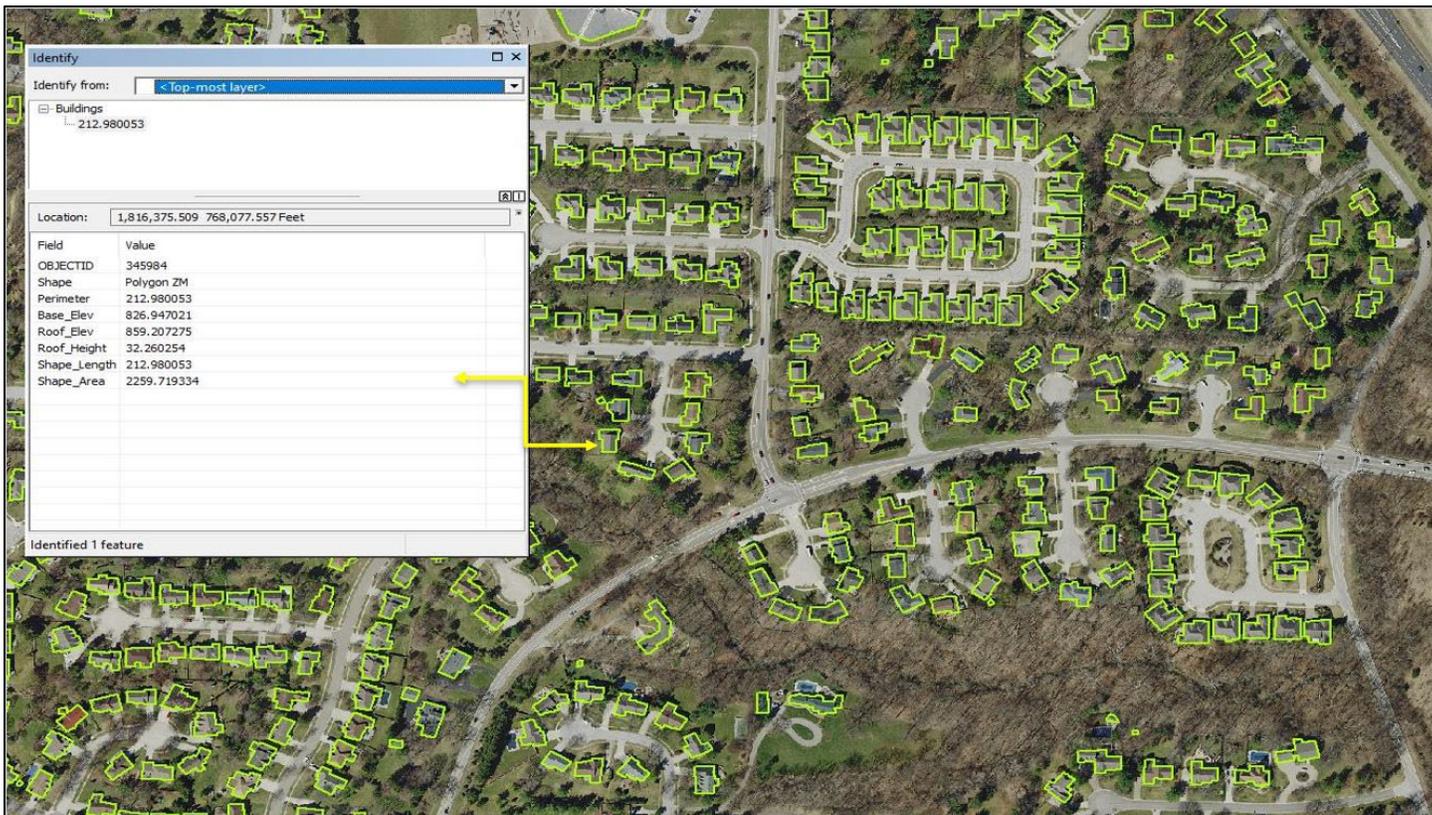
**2018 Landcover Delineation | Hardin County, Ohio.** Utilizing countywide 3-inch, 4-band orthoimagery, Hardin County undertook a hybrid AI/ML process to extract countywide landcover for over 471 square miles.



**2022 Orthoimagery, CAUV Crop Delineation | Fairfield County, Ohio.** In 2022, Woolpert acquired new 4-band, 3-inch pixel resolution digital imagery for the County. Woolpert also acquired new summer countywide (508 square miles) color digital imagery used to produce 4-band, 12-inch pixel resolution imagery. This imagery was used to perform CAUV crop delineation to identify specific crop types, acreage of each crop, and percentage of each crop within county provided parcels.



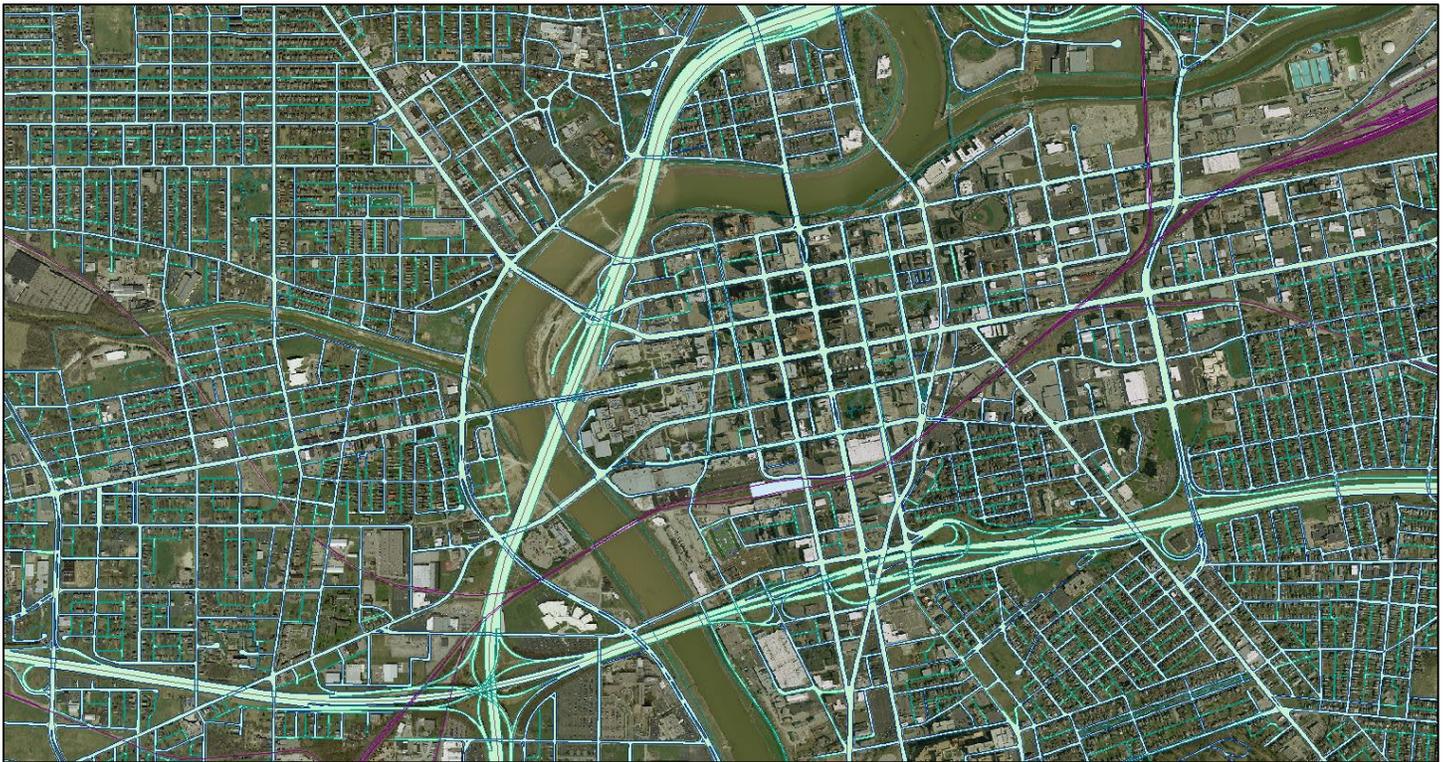
**2022 3DHP | Tuscarawas County, Ohio.** In 2022, Tuscarawas County worked with Woolpert to perform a countywide 3DHP project. The statewide QL1 8 ppm aerial lidar and countywide 3-inch orthoimagery were used to perform the hydrography creation, which included lakes/ponds 0.25-acre and above, as well as streams/rivers 15-feet and wider shown as polygons, along with the delineation of both perennial and ephemeral single line drainage flowlines. All drainage was based on a foundational 6-acre catchment unit size.



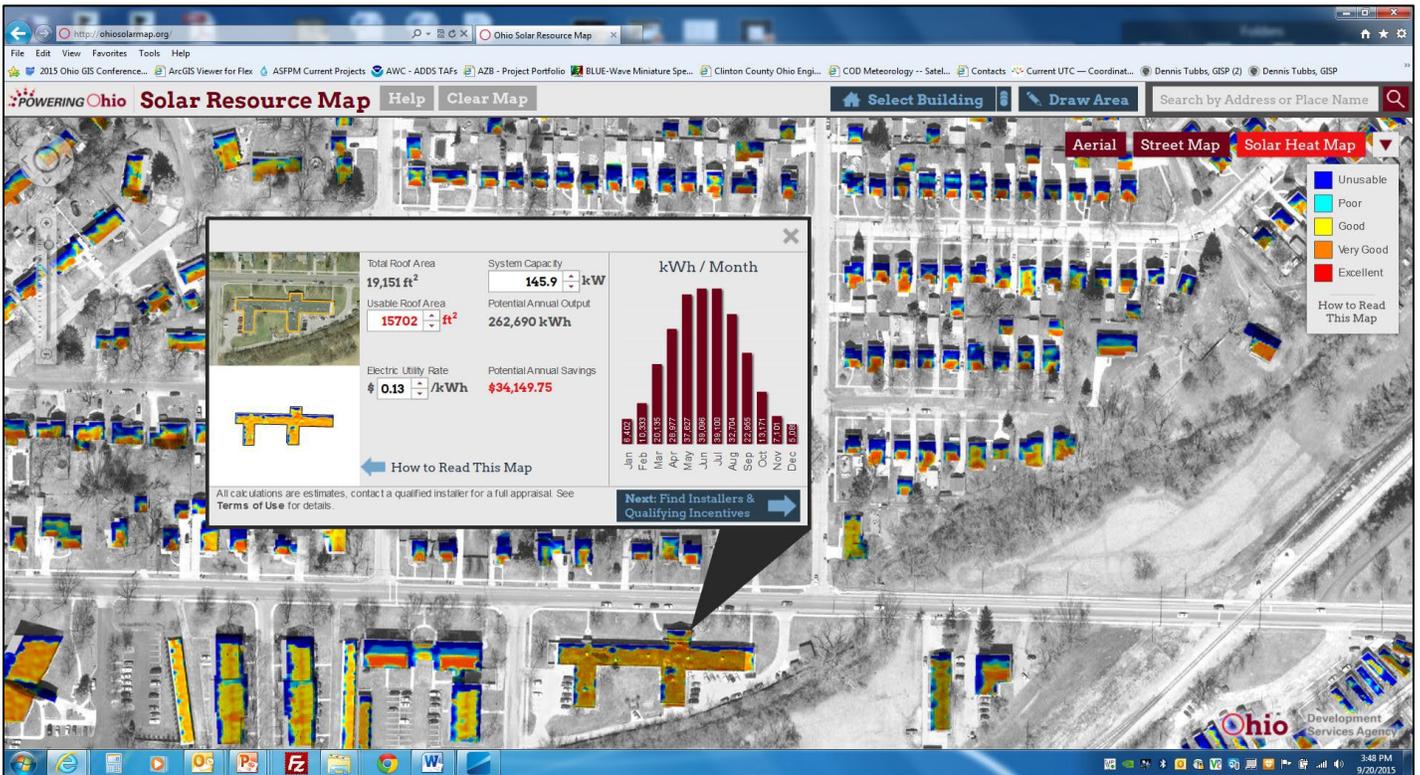
**2020 and 2022 Building Outlines/Building Outline Update | Franklin County, Ohio.** In 2020, Franklin County undertook a countywide building outline project, including any building structure 100-square feet or larger. This process was performed using AI/ML with the input datasets being comprised of 4-band, 3-inch pixel resolution orthoimagery (2020 and 2022 3-inch resolution imagery collected from aerial imagery obtained with 60% sidelap to create a more nadir imagery product) and 8 ppsm (2020) and 30 ppsm (2022) aerial lidar. In addition to the creation of building outlines, elevations were included for both the roof height and ground elevation for each structure.



**2020 Orthoimagery and Building Outlines/Change Detection | Guernsey County, Ohio.** Woolpert acquired new countywide (528.4 square miles) color digital imagery used to produce 4-band, 8-bit orthoimagery at a 6-inch pixel resolution. In addition to the imagery, Woolpert acquired new aerial lidar (1-meter point density) for the County to perform the feature extraction of countywide building outlines (64 square feet or larger) and change detection. Woolpert created the building outlines and change detection services using orthoimagery/lidar datasets within a remote sensing feature extraction process.



**Road Edge-of-Pavement | City of Dayton, Ohio.** The City of Dayton contracted with Woolpert to extract road edge-of-pavement (delineation of all public roadways within the city). AI/ML, using high resolution orthoimagery and aerial lidar, was utilized to perform the data extraction.



**Solar Potential | Ohio Department of Development.** The ODoD contracted with Woolpert to utilize aerial lidar to estimate the solar potential for an ~1,000-square mile area located in northwest Ohio. Once the solar potential mapping was complete, the ODoD contracted for the creation of a public facing website to ingest the mapping, perform a calculation of potential savings to each homeowner, and provide a list of installers/contractors within the general area of the homeowner.

# Kosciusko County Aerial Mapping Program

## Indiana

Woolpert has enjoyed a rich history working with Kosciusko County, IN, that dates back to 2002 when Woolpert was first awarded a project to assist Kosciusko County in creating a GIS and digital orthophotos for property appraisal. That project involved acquiring new lidar and aerial imagery for the entire 554.3-square mile County area for the subsequent production of 1"=100' scale digital orthophotos with 0.5-foot pixel resolution and selected 1"=50' scale digital orthophotos with 0.25-foot pixel resolution.

In the Fall of 2010, Woolpert was awarded a multi-year contract by the State of Indiana to help develop and/or update specific geospatial datasets for use by state government agencies, other levels of government, academia, and the general public, and to provide these datasets for inclusion to the IndianaMap, a resource for geographic information technology users within the State and beyond. This statewide initiative included photogrammetric, GIS/remote sensing, QA/QC, surveying and program development and outreach services. Woolpert provided 6-inch orthoimagery again to the County in 2011, and then in 2016 under this contract.

In February 2016, Woolpert was again selected by the state of Indiana to provide solutions for digital aerial imagery, lidar and related professional services through a new multi-year contract in continuation of the Indiana Statewide Orthoimagery program. The program was divided by the client into three project areas: Central (2016), Eastern (2017), Western (2018) and county and city-based enhanced deliverables (orthoimagery, impervious surfaces, land cover, contour, etc., 2016-2019). The term of the contract was three years from the date of contract execution. There were two one-year renewals—which the State chose to exercise—for a total of five years (2016-2021).

For Kosciusko County, newly acquired countywide lidar coverage was used for digital orthophotography rectification and future contour generation. Cartographically correct 2-foot contours, spot elevations, and contour labels for the City of Warsaw, City of Winona Lake, City of Syracuse and Caldwell Lake were provided.

In addition to the aerial data collection, Woolpert surveyors provided a horizontal and vertical ground control survey and airborne GPS to support the digital orthophotography and topographic mapping production. Woolpert targeted 66 existing ground control points and established 34 new semi-permanent horizontal and vertical ground control points. Kosciusko County partnered with Woolpert by performing a reconnaissance mission of the existing photo control, section comers and NGS control stations throughout the project area. Woolpert also delivered Kosciusko County with 0.7 ppsm lidar/elevation data that was collected for the entire state of Indiana in 2017. The final lidar data supported automated feature extraction, building footprints, planimetric mapping, contours, land cover/use, impervious surface mapping, 3D modeling, and wetlands delineation.

The foundational geospatial datasets performed by Woolpert and used by the County supports the mapping and geographic data needs of both the County and the public by supporting applications for the public to view the data created and maintained by County government.

### Client

Kosciusko County, Indiana

### Contact

William Holder, GIS Director  
100 W Center Street  
Warsaw, IN 46580  
574.372.2485  
(fax) 574.372.2476  
[bholder@kcgov.com](mailto:bholder@kcgov.com)

### Dates

January 2002, 2011 and 2016

# Illinois Aerial Photography Project

## Illinois

The Illinois State Geological Survey (ISGS) has been serving aerial photography and orthophotography collections for Illinois since the late 1990s. In January 2023, under Woolpert’s Photogrammetry and Lidar Services Retainer Agreement (U20R24-1), with the ISGS and UIUC Facilities and Services under the Illinois Height Modernization Program, Woolpert was awarded two task orders (U23054 and U23055) to acquire 6-inch ground sample distance, 4-band (red, green, blue, and infrared) orthoimagery in the Fall/Winter of 2022 through Spring of 2023. The acquisition covers approximately 75 percent of the State of Illinois in the corresponding State Plane East (SPE) or State Plane West (SPW) coordinate system, North American Datum 1983 (NAD83). Due to differing climate and vegetation conditions, the project has been divided into a northern project area, excluding Chicago area counties in northeast Illinois, and a southern project area.

The total area of interest is roughly 52,500 square miles and includes a 100-foot buffer beyond the state boundary. Files will conform to the 5,000-foot x 5,000-foot statewide tiling system used in the statewide orthophotography project of 2015/2016 for the Illinois Department of Transportation.

Project deliverables will include full resolution TIFF images in RGB 4-band natural color; images georeferenced to SPE or SPW as appropriate in NAD83; accompanying .TFW and reference projection (e.g., GIS .prj file); and an orthorectified image mosaic for each of two target areas.

Once all imagery has been flown and accepted, the University will contract for image processing to create deliverables including image stitching and/or georeferencing of full-resolution natural-color TIFF imagery, associated spatial reference files, and documentation of acquisition and processing steps.

Woolpert’s previous experience with the University of Illinois at Urbana-Champaign (May 2020) involved the acquisition and processing of lidar for the counties of Crawford, Jasper, and Lawrence—an approximate 1,409-square-mile area. The acquired lidar data and associated derivative data deliverables met USGS 3DEP Quality Level 2 Plus (QL2+) specifications as outlined in U.S. Geological Survey National Geospatial Program Lidar Base Specification, Version 2.1, October 2019. Nominal point spacing was 0.5 meters (4 ppsm).

The project area lies within the State Plane East coordinate system, specifically the North American Datum 1983 (NAD 83) High Accuracy Reference Network (HARN) State Plane East Federal Information Processing Standard (FIPS) 1202 (with the 2011 adjustment).

### Client

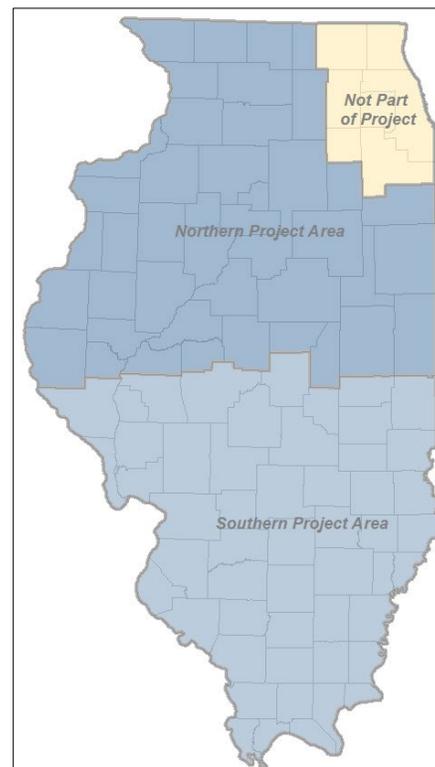
The Board of Trustees of the University of Illinois  
c/o Facilities and Services – UIUC  
<http://www.fs.illinois.edu/>

### Contact

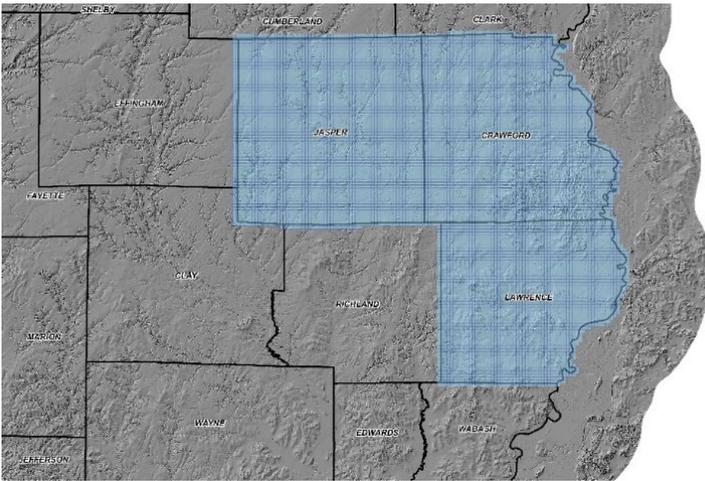
Brent Lewis, PLA, CA, NGICP  
Capital programs, University  
Landscape Architect  
1501 South Oak Street  
Champaign, IL 61820  
217.300.3164  
[bcl@illinois.edu](mailto:bcl@illinois.edu)

### Date

2023



Location and boundaries of the aerial photography.



Deliverable data was accompanied by acquisition metadata, control, collection reports, survey reports, compliance with National Standard for Spatial Database Accuracy standards, and data calibration reports. All breaklines developed for use in hydro-flattening were delivered as an Esri feature class, PolylineZ or PolygonZ format, as appropriate to the type of feature represented. Breaklines were delivered as a continuous layer using the same horizontal and vertical coordinate reference system and units as the lidar point delivery.

Field survey ground control point data with accompanying picture(s), and a report detailing the method used to collect each shot (total station, GPS RTK, level) were provided as project deliverables.

# Clinton County Base Mapping Program and Imagery Hosting

## Ohio

Woolpert is cresting a 25 plus year history with Clinton County dating back to 1999 when we provided the County with digital orthophoto-based GIS and parcel map conversion services. Below are the geospatial services performed for the County in support of their Base Mapping Program.

- 1999 – 2004 | Digital orthophoto-based GIS and parcel map conversion services – ground control, Countywide (412.4 square miles) new aerial photography and high-resolution lidar, landcover delineation, 1"=100' and 1"=200' scale digital orthophotography, parcel map conversation
- 2005 | New countywide 1"=100' scale color digital orthoimagery (6-inch pixel resolution)
- 2007 | New countywide 1"=100' scale color digital orthoimagery (6-inch pixel resolution). (Clinton County chose to exercise a "buy up" program offered under Woolpert's Ohio Statewide Imagery Program (OSIP) contract with the State of Ohio, Office of Information Technology.
- 2011 | New countywide 1"=100' scale color digital orthoimagery (6-inch pixel resolution)
- 2014 | New countywide 1"=100' scale color digital orthoimagery (6-inch pixel resolution).
- 2016 | New countywide 1"=100' scale color digital orthoimagery (6-inch pixel resolution) to update the existing countywide orthoimagery collected by Woolpert in 2014. This included building updates.
- 2018 | Parcel fabric conversion
- 2019 | New countywide, 6-inch, 8-bit, 4-band "leaf-off" orthoimagery and new 3-inch, 8-bit, 4-band "leaf-off" orthoimagery for the City of Wilmington (50 sq. mi. New ground control was collected and used along with existing control and existing DEM data to provide the County the most economical, but current product.
- 2020 | STREAM:RASTER Imagery Hosting Service. The subscription software housee and supported the Southwest Ohio county's orthoimagery in the cloud, while reducing maintenance costs.
- 2022 | New countywide, 6-inch orthoimagery (3-inch orthoimagery for the city of Wilmington), new countywide 30 ppsm aerial lidar, and countywide building outline updates.
- 2023 | Countywide road network (edge of pavement) data in Esri geodatabase format.

### Client

Clinton County, Ohio

### Contact

Joe Merritt, GIS Manager

1850 Davids Drive

Wilmington, OH 45177

937.382.0035;

[jmerritt@clintoncountyengineer.org](mailto:jmerritt@clintoncountyengineer.org)

### Date

1999 – 2024 (current)

**STREAM:RASTER.** In August 2020, Clinton County, Ohio, signed an annual contract with Woolpert for STREAM:RASTER, a subscription software service that hosts, maintains and facilitates access to geospatial imagery in the cloud. The Southwest Ohio county owns large volumes of high-quality orthoimagery for use by the public and local, state and federal agencies.

Clinton County has accumulated layers of geospatial data, including large imagery datasets, since initiating GIS operations in the 1990s. Woolpert has worked with the county for more than 20 years, and Clinton County Engineer, Jeff Linkous, was instrumental in the County's early adoption of GIS. Support has continued to benefit the County as technology has advanced and geospatial applications have grown.

Mapping Clinton County in one flight at a standard 6-inch resolution created about 200 GB of data. Upgrading from 6-inch to 3-inch resolution, which can vary per the needs of the collection, quadrupled the size of the dataset. When you upgrade to 3-inch resolution, as Clinton County did this year for the city of Wilmington, you quadruple the size of that dataset. Hosting and maintaining that volume of data, on top of the existing historical data, is challenging, time-consuming and costly to perform in-house.

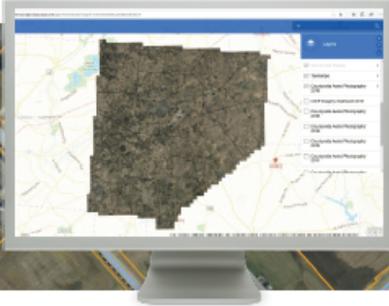
Clinton County GIS Manager, Joe Merritt, said the size and storage of the county's imagery base mapping data was becoming counterproductive. He said accessibility constraints were limiting use by county offices and the general public, thus reducing the data's usefulness and compromising years of investment. Because the County has imagery from 20 years ago that they couldn't access effectively, the STREAM:RASTER subscription service provided an easy, ready and cost-effective solution to a problem that had literally been building for years. With this service, the County now accesses this data without worrying about future costs in software, storage, or IT staffing.

Over the years, Woolpert has seen geospatial datasets grow and the demand for access to those datasets become greater than ever. At the same time, we've seen our local government clients operating under limited budgets for staff, storage and servers. Access to these geospatial resources is intrinsic to the operation of local governments, and their use and application will only grow as technology continues to advance. STREAM:RASTER was designed to evolve with geospatial data and imagery to support communities effectively around the world.






**Clinton County**  
Location: Southwest Ohio  
Area: 412 square miles  
Population: Approximately 42,000



### The Challenge

Clinton County, located in southwest Ohio, has spent decades building a rich collection of aerial imagery. To make these assets more widely available, the county organized a website for photography grid downloads. When the solution proved inconsistent because many users lacked the necessary viewing software, Clinton County jumped at Woolpert's proposed solution for managing and distributing imagery.

### The Solution

Backed by a strong, 20-year relationship, Woolpert approached Clinton County with STREAM:RASTER®, Woolpert's proprietary, cloud-hosted map tile server. The county integrated STREAM:RASTER into its ArcGIS environment and quickly realized how easy and foolproof data delivery can be. Users can now access data via a simple URL, eliminating the need for downloading instructions or viewing software.

STREAM:RASTER enables users to view more than 10 aerial layers that can be toggled on and off for easy data comparison. Additionally, the county has confidence in the cloud backup to keep its data secure.

GIS Department Manager Joe Merritt stated that being able to provide the county's pertinent vector and raster data online through STREAM:RASTER during the global pandemic shutdown was precisely what they needed. "The ability to easily incorporate imagery into ArcGIS online maps and apps transformed the way in which Clinton County Ohio serves up its GIS data," said Merritt.

### Benefits

- 

Aerial photography available on any device at any time
- 

Three times more hits across multiple applications
- 

Over 10,000 data viewer page hits within 90 days
- 

Reduced time spent educating users how to access and view data

### Working with Woolpert

Clinton County Ohio has worked with Woolpert for two decades. GIS Department Manager Joe Merritt stated, "Woolpert has been one of the finest [consultants] I've worked with in my career; our data has always been on time, on budget and of excellent quality." Given Clinton County's confidence in Woolpert, they were eager to test and implement STREAM:RASTER. Merritt looks forward to continuing the county's relationship with Woolpert and acquiring data and solutions that exceed their standards.

"What has happened in the past nine months (some due to COVID) has revolutionized how we deliver GIS data to the public, and STREAM:RASTER was a necessary step to making aeriels a part of the delivery."

Adam Fricke, Clinton County Deputy Engineer

Contact Us

Want more information?  
Contact Woolpert at  
[cloudsuccess@woolpert.com](mailto:cloudsuccess@woolpert.com).



B1-222, November 2020

# Indiana Statewide Orthoimagery and Lidar Program

## Indiana

- February 2011—December 2015 State of Indiana Imagery and Lidar Project
- February 2016—December 2019 (contract extension September 2020) State of Indiana Imagery Project
- January 2017—December 2020 USGS-Indiana Lidar Project

In the Fall of 2010, Woolpert was awarded a multi-year contract by the state of Indiana to help develop and/or update specific geospatial datasets for use by state government agencies, other levels of government, academia, and the general public to provide these datasets for inclusion to the IndianaMap, a resource for geographic information technology users within the State and beyond. This statewide initiative included photogrammetric, GIS/remote sensing, QA/QC, surveying and program development and outreach services.

In February 2016, Woolpert was again selected by the state of Indiana to provide solutions for digital aerial imagery, lidar, and related professional services through a new multi-year contract in continuation of the Indiana Statewide Orthoimagery Program. This program was divided by the client into three project areas: Central (2016), Eastern (2017), Western (2018) and county and city-based enhanced deliverables (orthoimagery, impervious surfaces, land cover, contour, etc., 2016-2019). The term of the contract was for three years from the date of contract execution. There were two one-year renewals – which the State chose to exercise— for a total of five years (2016-2021).

### Client

State of Indiana, Indiana Office of Technology (IOT)

### Contact

Megan R.L. Compton, MPA, Indiana GIO

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N551 Government Center North  
Indianapolis, IN 46204

O: 317.234.5889

C: 317.601.1347 |

mcompton@iot.in.gov

### Dates

February 2011-2015; 2016-2019,  
2017-2020

## 2011 – 2013 | 4-Band Orthoimagery and Lidar

The state of Indiana completed a 3-year program to acquire orthophotography and lidar/elevation data for the entire state of Indiana. Some counties or areas elected to buy up from 1-foot resolution, 4-band (RGBI) orthophotography to 3-inch or 6-inch resolution imagery. The State divided the project into three acquisition areas: Central (2011), Eastern (2012), and Western (2013). Woolpert acquired 28 of the central counties in 2011 and 34 of the eastern counties in 2012. For the 2013 acquisition year, in addition to 6 of the 30 counties (Dubois, Lake, LaPorte, Marion, Porter, and Spencer) buying up to 6-inch imagery, the cities of Vincennes and Bicknell purchased 6-inch orthophotography, and the city of Huntington and Purdue University purchased 3-inch orthophotography. Cities and counties across the state took advantage of the contract in 2014 and 2015 to acquire additional imagery, contour data, building outlines, and other geospatial services that met their specific business needs.

The program included new USGS compliant lidar data at either 1.0- or 1.5-meter nominal pulse spacing (NPS) for all Indiana counties, except Porter, Steuben, Noble, De Kalb, Allen, Madison, Delaware, Hendricks, Marion, Hancock, Morgan, Johnson, Shelby, Monroe, and portions of Vermillion, Parke, Vigo, Clay, Sullivan, Knox, Gibson, and Posey. The counties provided Woolpert lidar acquired between 2007-2010. Woolpert processed it according to 2011-2013 project specifications. For the 2013 acquisition year, Purdue University purchased 3.6 square miles of 4-points/meter lidar.

Boone County (2011), Dearborn (2012), Floyd (2012), Madison (2012), Jasper (2013), Lake (2013), LaPorte (2013), Newton (2013), Porter (2013), and Tippecanoe (2013) bought up to 1.0-meter NPS lidar. Although the DEM was a standardized 5-foot NPS, there was a horizontal and vertical accuracy difference between the NPS1.0 and 1.5 DEM files. The NPS 1.0 data (1"=100' scale) supported production of 1-foot contours while the NPS 1.5 data (1"=200' scale) supported production of 2-foot contours.

Woolpert compiled breaklines defining lakes (greater than two acres), double-line streams (wider than 100 feet), water bodies and streams using digital photogrammetric techniques as part of the hydrographic flattening process and provided Esri Polyline Z and Polygon Z shapefiles. Woolpert used the breaklines to perform the hydrologic flattening of water bodies, and gradient hydrologic flattening of double line streams. We compiled lakes as closed polygons and collected the surface at a constant elevation. We compiled rivers and streams in the direction of flow with both sides of the stream maintaining an equal gradient elevation. We performed the hydrologic flattening of the lidar data to support inclusion of the dataset in the National Elevation Dataset (NED).

## 2016 – 2020 | Indiana Orthophotography Refresh

In 2016, the Indiana Geographic Information Office began a 3-year (2016-2018 [2020 with contract extensions]) orthophotography update for the entire state of Indiana. The state was divided into three general acquisition areas: Central (2016), Eastern (2017), and Western (2018). These planned areas were modified slightly to account for weather conditions and buy-ups that occurred outside of the planned areas. Woolpert acquired 28 counties in 2016, 34 counties in 2017, 19 counties in 2018, and 11 counties scheduled to be acquired in 2018 were moved to 2019 due to flooding. Cities and counties had the option to buy up from the standard product of 1-foot resolution, 4-band orthophotography to 3-inch or 6-inch resolution imagery. For the 2016-2019 acquisitions, the following counties/areas exercised the buy-up option:

### 6-inch Imagery (2016)

- Fulton County | Harrison County | Jackson County | Kosciusko County | Monroe County | Morgan County | Wabash County

### 6-inch Imagery (2017)

- Dearborn County | DeKalb County | Gibson County | Shelby County | Steuben County | Wayne County | Wells County | Whitley County

### 3-inch Imagery (2017)

- Hamilton County | City of Shelbyville

### 6-inch Imagery (2018)

- Allen County | Lake County | Porter County | Putnam County

### 6-inch Imagery (2019)

- Dubois County | Perry County

### 3-inch Imagery (2019)

- City of Huntingburg | Vanderburgh County | Vermillion County

### 3-inch Imagery (2020)

- IN DNR Lake Michigan Shoreline Erosion Project (Lake, LaPorte and Porter Counties)

Woolpert obtained new 2<sup>nd</sup>-order horizontal and 3<sup>rd</sup>-order vertical ground control and QA/QC checkpoints throughout the program area. A fleet of aircraft outfitted with Leica ADS digital sensors captured 1"= 200' scale 4-band (R, G, B and NIR) digital orthoimagery (±37,162 square miles) at a 12-inch pixel resolution throughout the state. Woolpert was hosting the draft imagery on our SmartView Connect web-based QC viewer with redline tool. This QA/QC tool facilitated efficient response from the client for rapid delivery of quality digital products. The 4-band orthoimagery supported the future applications of automated feature extraction, building footprints, planimetric mapping, contours, land cover/use, impervious surface mapping, 3-D modeling, H&H modeling, and wetlands delineation. IOT partnered with the Indiana Department of Transportation (INDOT), Division of Aerial Surveying and Mapping to perform a detailed QC on behalf of the state. INDOT used Woolpert's

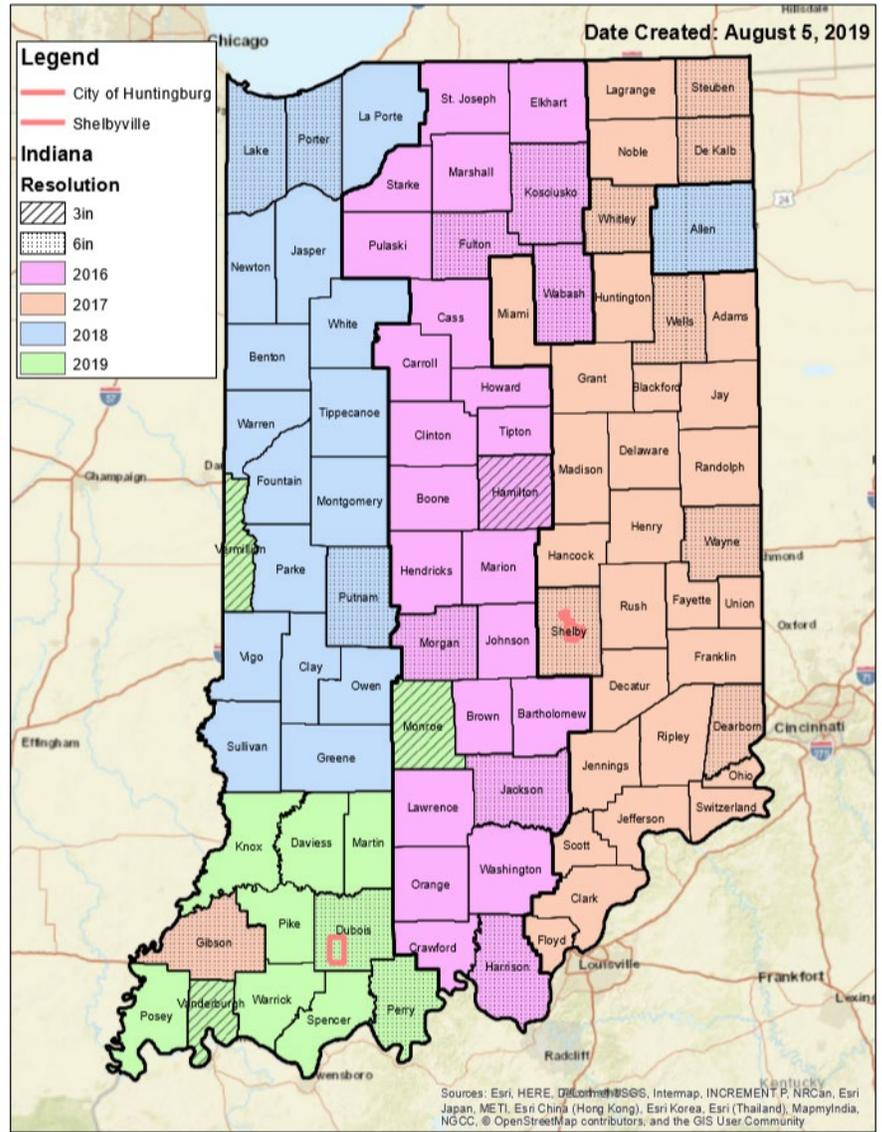
SmartView Connect that allowed participants to track, monitor, and comment on data and deliverables. With this software, the state (and counties/cities) can view the deliverables, take measurements, mark-up and make comments, review and track pending issues, and submit reports.

To facilitate faster delivery of the data to the end users, (i.e., counties), Woolpert uploaded each county's orthoimagery tiles to the cloud and provided a secure login and password that enabled data retrieval the same day final processing was completed. The state was also notified when each county was completed so a copy of the data could also be downloaded to their system for use by all state agencies.



# Program Development/Outreach

Woolpert, together with the OIT team, provided outreach to 92 county governments. The program development and outreach included: providing a program website identifying the features and benefits of the program to local government agencies; providing a statewide direct mailing and email campaign; providing annual seminars at various venues throughout the state to describe the benefits and return on investment (ROI) concerning the OIT program (product, services, cost information to county representatives, etc.); and providing individual representative follow-up meetings as needed at various location throughout the state.



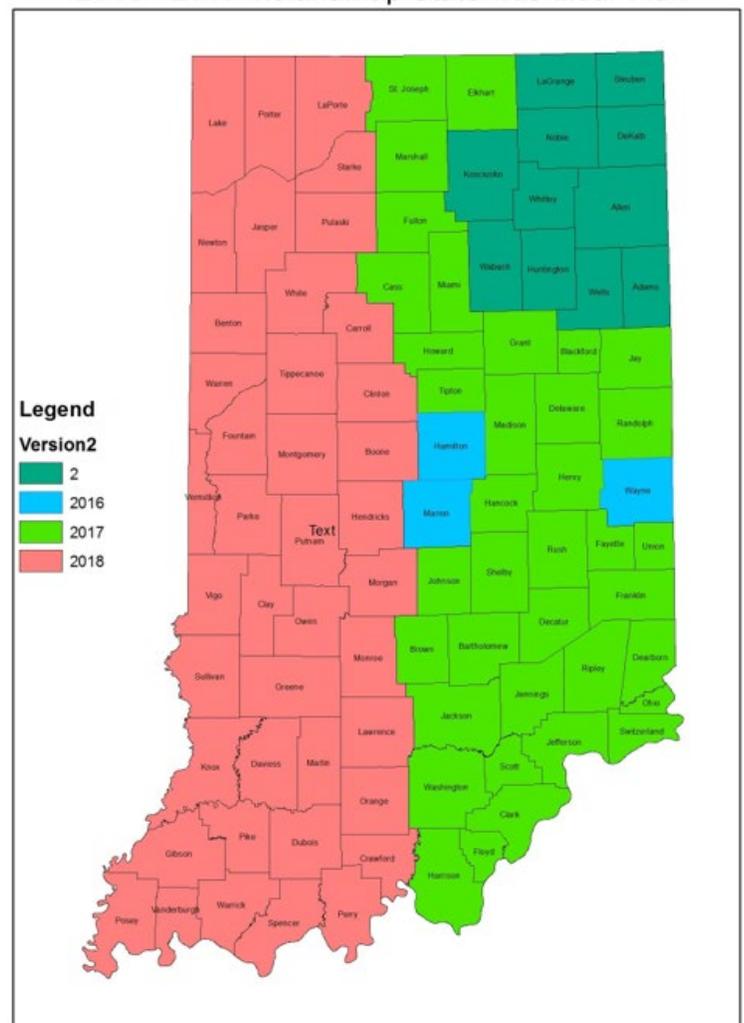
## 2017 – 2020 | QL2 Lidar

The USGS selected Woolpert to collect QL2 lidar data at an aggregate nominal pulse spacing (ANPS) of 0.7 meters, for 89 counties in the state of Indiana (36,344 square miles). Woolpert along with the Indiana OIT and NRCS-USDA assembled an ROI document and provided outreach to multiple state and local agencies to develop a funding partnership. NRCS-USDA reviewed the ROI provided for their agency and provided 100% of the funding for the project. The ASPRS-recommended distribution of total number of checkpoints between Non-Vegetated Vertical Accuracy (NVA) and Vegetated Vertical Accuracy (VVA) assessments were met. Additional ground control checkpoints in each section of Indiana were delivered in Esri ArcShape format to be used for validation. Both a raw and classified point data cloud (in LAS format) and raster DEM of the bare earth surface (in GIS-compatible ERDAS format) were generated from the newly collected lidar data. Hydro-flattening was performed for inland bodies of water.

Ground check points, NVA and VVA, were dispersed uniformly over the AOI and were distributed proportionally amongst the various vegetated land cover types. Calibration points were used for calibration of the lidar data, and the NVA and VVA points were used for the data accuracy validation. Within each classification type, the check points were distributed among all constituent land cover types in approximate proportion to the areas of those land cover types. The most common NVA land cover categories were bare earth/open terrain, and urban. The VVA land cover categories used for this project were tall weeds/crops, brush land and trees, forested, and fully grown. Upon completion of the survey work task, Woolpert provided ground control and accuracy reports.

Woolpert was responsible for post processing of lidar data of sufficient density and quality to meet the requirements specified in the referenced National Geospatial Program Lidar Base Specification Version 1.2, except where allowances were explicitly stipulated in the task order. All processing was carried out in fully compliant LAS format, v1.4 (PRF 6-10). The final lidar data has supported automated feature extraction, building footprints, planimetric mapping, contours, land cover/use, impervious surface mapping, 3D modeling, and wetlands delineation. **Contract No. G16PC00022; Task Order G17PD00269; Fee: \$6,309,523.81**

2016 - 2018 IndianaMap Statewide Lidar Plan



3DEP Project Areas 2016 - 2018, and Lidar Quality Level Map

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# Greene County Countywide Base Mapping

## Ohio

In 2007, Woolpert initiated a long-term relationship with Greene County that is still ongoing today. In, 2008, Woolpert entered into a five-year agreement with Greene County to provide new countywide (416 square miles) color digital aerial imagery and have subsequently entered into several multi-year agreements.

Most recently, Greene County's portion of Ohio's Base Mapping Program consisted of the following:

- 2020 – New countywide 8-bit, 4-band digital orthoimagery with a 6-inch pixel resolution
- 2019 – Oblique Imagery.
- 2019 – New countywide 8-bit, 4-band digital orthoimagery with a 12-inch pixel resolution (Summer); CAUV Update
- 2018 – New countywide 8-bit, 4-band digital orthoimagery with a 3-inch pixel resolution
- 2016-2017 – New countywide 8-bit, 4-band digital orthoimagery with a 0.5-foot pixel resolution; and new countywide 8-bit, 4-band digital orthoimagery with a 0.25-foot pixel resolution, countywide aerial lidar (1-point/square meter point density) and building outline updates
- 2014-2015 –New 1"=100' scale 8-bit, 4-band digital orthoimagery with a 0.25- foot pixel resolution ( $\pm 130$  square miles); and New countywide 1"=100' scale 8- bit, 4-band digital orthoimagery with a 0.5-foot pixel resolution (covering  $\pm 416$  square miles).

**Ground Control Survey.** For the 2018 orthoimagery, Woolpert used the 2015 existing control points when possible and/or new control points where required to support orthoimagery production. For 2019 orthoimagery, Woolpert used the 2018 existing ground control points when possible and/or new control points where required to support the orthoimagery production. For the 2020 orthoimagery, Woolpert used the 2018/2019 existing ground control points when possible and/or new control points where required to support the orthoimagery production.

If needed, new control points were photo-identifiable points (PID) and were GPS observed and consistent with second-order horizontal and third-order vertical. This control was sufficient to meet the required accuracy necessary to support the subsequent orthoimagery production.

**Aerial Imagery Acquisition.** For 2018, leaf-off aerial imagery (Spring) was acquired at an altitude to produce 3-inch, 4-band orthoimagery using the ADS80 digital camera system. For 2019, Woolpert obtained leaf-on aerial imagery (Summer during peak crop development) using an ADS80 digital camera system at an appropriate altitude to produce 12-inch, 4-band orthoimagery. For 2020, Woolpert obtained leaf-off aerial imagery (Spring) using the ADS80 digital camera system at an appropriate altitude to produce 6- inch, 4-band orthoimagery. All ADS80 imagery was captured with 30% sidelap and at a sun angle greater than 25-degrees. Aerial triangulation was performed on the ADS80 imagery to extend and densify the ground control.

**Orthoimagery.** Using the existing 2015 lidar-derived DEM and tiling scheme, Woolpert produced 2018 countywide 8-bit, 4-band (R,G,B,NIR) stacked digital orthoimagery with a 3-inch pixel resolution and produced 2019 countywide 8-bit, 4-band digital orthoimagery with a 12-inch pixel resolution (Summer). 2020 countywide 8-bit, 4-band digital orthoimagery with a 6-inch pixel resolution was produced from the existing 2015 lidar-derived DEM and tiling scheme. QA/QC of the orthoimagery was performed before the imagery was uploaded to SmartView Connect.

### Client

Greene County, Ohio

### Contact

Steve Tomcisin, IT/GIS Director  
69 Greene St # 200  
Xenia, OH 45385  
937.562.5151  
stomcisin@co.greene.oh.us

### Date

2013-2017, 2017-2033

Imagery for the project was referenced to the Ohio State Plane Coordinate System, South Zone, with the following datums: Horizontal Datum: North American Datum of 1983 (NAD83) (HARN); Vertical Datum: North American Vertical Datum of 1988 (NAVD88); Geoid 03. Units were expressed in U.S. survey feet.

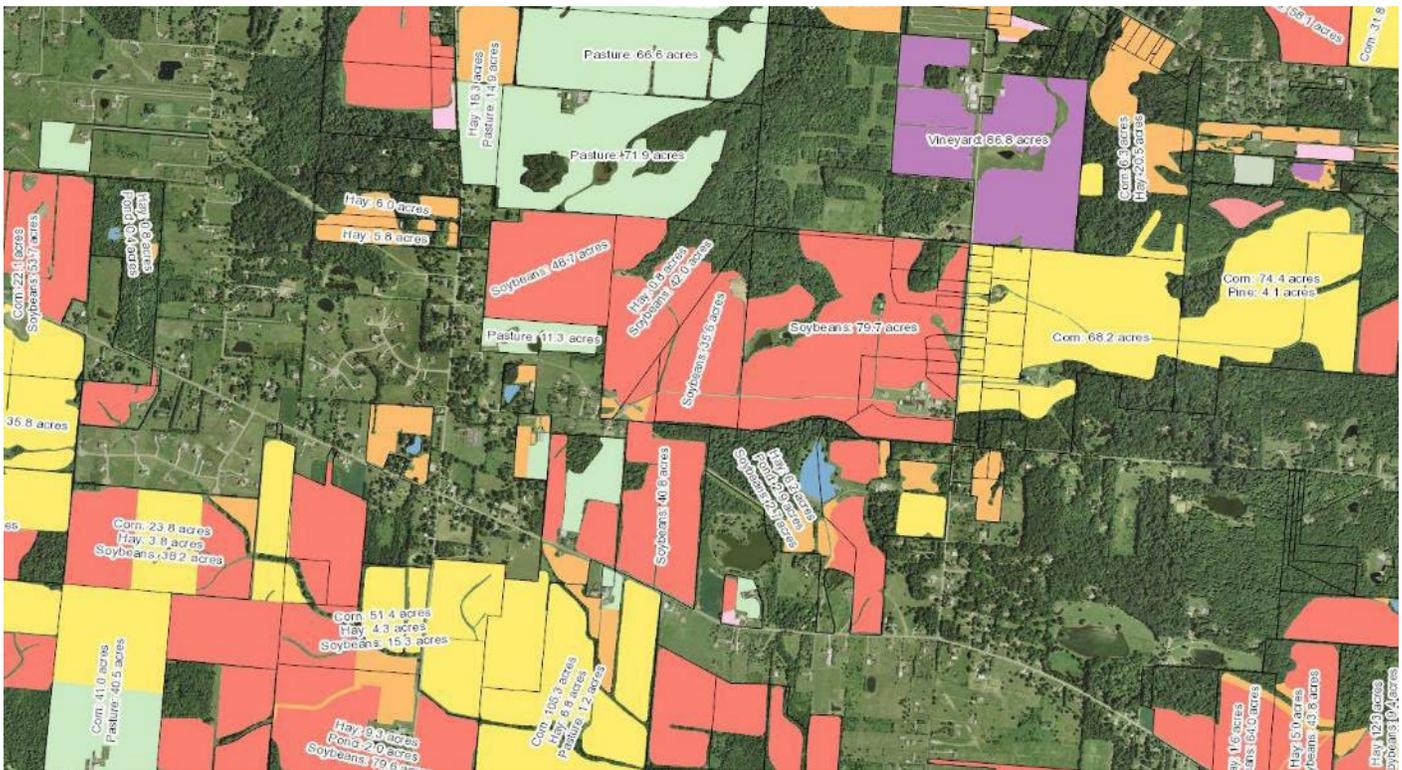
The orthoimagery met the OSIP required horizontal standard, which was slightly better than the ASPRS Positional Accuracy Standards for Digital Geospatial Data (Edition 1, Version 1.0 – November 2014): 2018 Horizontal Accuracy: 3-inch pixel resolution (OSIP ±0.96 feet) (ASPRS ±1.2 feet); 2019 Horizontal Accuracy: 12-inch pixel resolution (OSIP ±3.9 feet) (ASPRS ±4.8 feet); 2020 Horizontal Accuracy: 6-inch pixel resolution (OSIP ±1.9 feet) (ASPRS ±2.4 feet).

**Remote Sensing.** Woolpert used the latest in remote sensing technology to identify and map the different crop types in Greene County. The crop identification, discrimination, and mapping was carried out through semi-automated techniques. Using the 2019 4-band (red, green, blue, and infrared) imagery and ground-based data during the growing season, the locations of the different crop types were collected and recorded. The following crop types were identified as targets for mapping based on their economic significance: soybeans, corn, hay, wheat, tobacco, oats, potatoes, and alfalfa. An Esri geodatabase showing all identified crops as outlined during data gathering was created and delivered.

**Metadata.** Product level per tile FGDC/USGS parser complaint metadata was provided.

**Deliverables.** GeoTIFF 4-Band, 8-bit color imagery with corresponding world files (for each ortho tile – all years); Two countywide natural color MrSID images (20x and 100x compression, all years); two countywide color infrared MrSID images (20x and 100x compression, all years); countywide CAUV crop delineation in Esri geodatabase format (2019); and one copy of FGDC compliant metadata (all years).

**QA/QC via SmartView Connect.** The resultant 4-band imagery was uploaded to Woolpert’s SmartView Connect



CAUV Cropland Delineation

redline web server for interactive review and further processed into a countywide MrSID deliverable.

# North Central Texas Council of Governments (NCTCOG) Orthoimagery and Lidar Program Texas

In 2013, as part of its collaborative orthoimagery program, the North Central Texas Council of Governments (NCTCOG) partnered with Woolpert for a five-year program to provide photogrammetry, surveying, and GIS services. The NCTCOG region is comprised of 16 counties—Dallas, Tarrant, Collin, Denton, Rockwall, Kaufman, Wise, Johnson, Hood, Erath, Hunt, Navarro, Ellis, Somervell, Palo Pinto, and Parker—covering approximately 14,800 square miles.

**2013–2017.** Woolpert provided a range of geospatial services that included aerial imagery acquisition; new photo-identifiable ground control; aerial triangulation; 4-band digital orthoimagery at 6-inch pixel resolution; and web hosting services to the 16-county region. With more than 28,000 square miles of orthoimagery and 13,500 square miles of lidar acquired during this contract period, Woolpert has become a well-known geospatial data provider in North Texas.

**2017–2022.** Woolpert was once again awarded a five-year contract to provide geospatial services to the NCTCOG region. This included new photo-identifiable ground control; aerial triangulation; 4-band digital orthoimagery; lidar, derivative mapping products and cloud delivery and hosting services. For the recent 2021 and 2022 flying seasons, Woolpert captured 13,739 square miles of 6-inch orthoimagery, 604 square miles of 3-inch orthoimagery and 4,598 square miles of 0.5-meter lidar data.

**2022 – 2024.** In July 2022, Woolpert was again selected to provide orthophotography, lidar, planimetrics and related services to NCTCOG and to member communities of the NCTCOG Spatial Data Cooperative Program (SDCP). As in the past, the contract is for 24 months with up to three one-year terms.



**Orthoimagery.** Woolpert produced 4-band (natural color and CIR) digital orthoimagery with 0.25- and 0.5-foot pixel resolutions within the NCTCOG region. The images were mosaicked interactively to produce imagery with consistent tone, density, and color balance. The project-wide imagery was delivered in TIFF format with accompanying World files. True orthos were produced every two years for the central business districts of Dallas, Fort Worth, and the IH-635/I-75 intersection.

**Lidar and Derivative Products.** Woolpert produced lidar at the required 4ppsm density meeting a 10cm vertical accuracy. Using the natural color, CIR orthoimagery, and lidar data collected for the NCTCOG, all partners were able to purchase derivative products from this contract. For example, area-wide impervious surface polygon datasets were extracted from many of the cities. One-foot and two-foot contours derived from 3D breaklines and lidar were also a common tasked product. Woolpert also produced new and updated 2D and 3D planimetrics through both photogrammetric compilation methods, as well as semi-automated feature extraction methods. 3D features included buildings, sidewalks, hydrology, groups of vegetation, both unpaved and paved roads, parking lots, pavement pads, and driveways. Data was compiled into a final Esri shapefile format for merging with each city's geodatabase.

## Client

North Central Texas Council of Governments (NCTCOG)

## Contact

Shelly Boyles Stenoien, GIS Coordinator

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817.695.9156

[sbroyles@nctcog.org](mailto:sbroyles@nctcog.org)

## Date

2013-2017, 2017-2023

**Program Development/Outreach.** On an annual basis, NCTCOG coordinates with local cities, counties, and public agencies to assess the need for geospatial services. Based on participant interest, the project area and associated deliverables are defined by NCTCOG. All final imagery deliverables utilize SmartView Connect built and maintained by Woolpert and used by NCTCOG to perform QA/QC of the orthoimagery and other deliverables. It precludes the time and expense associated with preparing and shipping draft data products. Woolpert also provides NCTCOG with access to STREAM:RASTER—our high-performance OGC Compliant Web Mapping Tiling Service (WMTS Server)—custom developed to work with the exact same data we use to support the QA/QC process. Within moments of the final approval of the orthophotography, WMTS access can be enabled, and NCTCOG can consume and disseminate the data to users via the web.

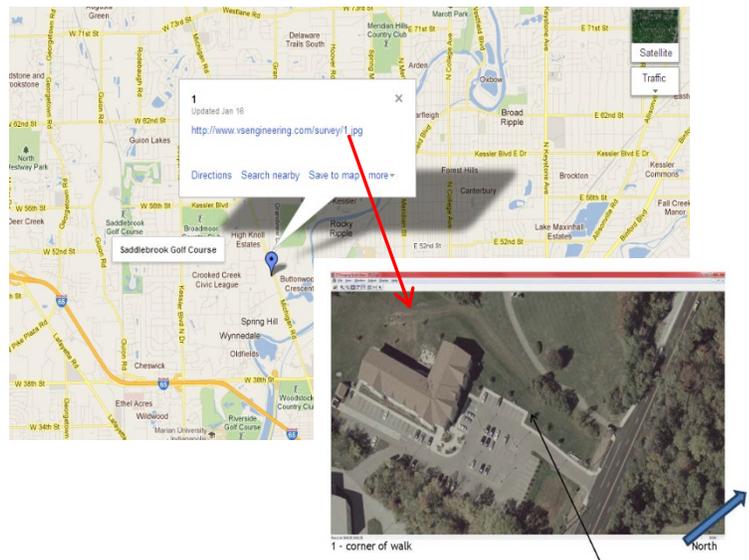
# Other Relevant Projects Performed by our Team

## IAA Aerial Imagery Ground Control and Master Plan Indiana

**As a subcontractor to Woolpert**, VS Engineering provided ground control and check points for acquisition of new imagery for the IND Master Plan update in Spring 2012. Survey crews were responsible for:

- Establishing 71 ground control points.
- Establishing 5 ground check points.
- Verifying the existing airport control (PACS & SACS monuments).
- Ties to the National Spatial Reference System (NSRS) through existing NGS Control monuments.
- Digital photographs of each control point, check point, and control monument (minimum of 2 each).
- Completing station recovery forms for each NGS control monument.
- Completing station location and visibility diagrams for each point.

To increase efficiency, VS employed one-person survey crews equipped with GPS and smartphones. Custom layers were added to Google Maps to allow survey crews to use their mobile phones to easily navigate to the location of each point. The exact target could then be identified through a link to a photograph posted on the company website. All control points were observed multiple times using RTK GPS and the INDOT InCORS network to verify measurement accuracy. In addition, the check points were observed using static GPS methods and submitted to NGS' Online Positioning User Service (OPUS) to verify their accuracy independently per FAA Advisory Circular (AC) 150/5300-17C.



All data was compiled as outlined in AC 150/5300-17C, including:

- Final coordinate listing of each control and check point.
- NSRS control point tie verification.
- Forms with correct naming convention.
- Digital photographs with correct naming convention and captions.
- Raw GPS data files.

## IAA Eagle Creek Airport Layout Plan Update Indiana

VS Engineering provided ground control and check points for acquisition of new imagery for the 2014 Airport Layout Plan (ALP) update. VS was responsible for:

- Establishing 24 ground control points.
- Establishing 5 ground check points.
- Establishing on-site Temporary Airport Control (TACS).
- Ties to the NSRS through existing NGS control monuments.
- Digital photographs of each control point, check point and control monument (minimum of 2 each).
- Completing station recovery forms for each NGS control monument.
- Completing station location and visibility diagrams for each point.
- Obstruction survey (trees), including verifying heights and marking trees for removal per direction of IAA staff.
- Existing airport easement documentation and exhibit creation.
- Boundary survey of the existing airport property.

To increase efficiency, VS employed one-person survey crews equipped with GPS and smartphones. All control points were observed multiple times using RTK GPS and the INDOT InCORS network to verify the accuracy of the measurements. In addition, the check points were observed using static GPS methods and submitted to NGS' OPUS to verify their accuracy independently per FAA Advisory Circular (AC) 150/5300-17C. Obstruction surveys were completed through a combination of both traditional survey techniques and static lidar to determine locations and elevations of trees as identified by FAA. Boundary survey and easement exhibits were prepared per the direction of the client.

All data was compiled as outlined in AC 150/5300-17C, including:

- Final coordinate listing of each control and check point.
- NSRS control point tie verification.
- Forms with correct naming convention.
- Digital photographs with correct naming convention and captions.
- Raw GPS data files.

### Resolution Group, Inc.

Sherman Park Infrastructure Development | City of Indianapolis Department of Metropolitan Development, Indianapolis, IN.

- Resolution provided preliminary field work for drone services and performed a topographic survey.

US50 | INDOT, Daviess County, IN

- Resolution performed a topographic survey, location control route survey, and right-of-way engineering services.

SR59 | INDOT, Clay County, IN

- Resolution performed a topographic survey, location control route survey, and right-of-way engineering services.

SR66 | INDOT, Posey County, IN

- Resolution performed a topographic survey and a location control route survey.

SR66 | INDOT, Posey County, IN

- Resolution performed a topographic survey and a location control route survey.

SR933, US20, SR23 | Indiana Department of Transportation (INDOT), St. Joseph County, IN

- Resolution performed a topographic survey.

SR18 | INDOT Grant County, IN

- Resolution performed a topographic survey.

## Vespa Group

- **IOT.** Vespa has served for two years as their lead cloud architect focusing on Azure infrastructure, identity management, and security.
- **IOT.** As a subcontractor to Cincinnati Bell Technology Solutions, Vespa provided unified voice implementation.
- **IN State Department of Health.** As prime contractor, Vespa developed a comprehensive COVID Case Management and Contact Tracing solution built on the Microsoft Power Platform (D365, Power Apps, Flow, Power BI). They supported the efforts of State health officials, 96 local health jurisdictions, and a third party call center for 500+ users.
- **IN Department of Workforce Development.** Vespa provided D365 advisory, development, and project management for multiple applications and citizen/employer facing portals to support grant management, business services, and unemployment activities.
- **Indiana Family and Social Services.** Serving as a subcontractor to multiple Medicaid insurance providers, Vespa provided staff augmentation (focusing on data analytics) for the Healthy Indiana Plan (Medicaid).
- **Indiana Family and Social Services.** As a subcontractor to Knowledge Services, Vespa provided staff augmentation for this Eligibility Services contract.
- **Indiana National Guard.** Vespa provided advanced cyber training support via an IAP Inc. contracting vehicle.
- **City of Indianapolis, IN.** As a subcontractor to Daniels Associates Inc., Vespa provided .NET development support.
- **City of Indianapolis, IN.** As a subcontractor to Bell Techlogix, Vespa provided PC refresh and desktop support.
- **City of Indianapolis, IN.** As a subcontractor to KSM Consulting, Vespa provided project coordination for business intelligence implementation/training project.
- **Indiana Department of Corrections.** As a subcontractor to Union Supply Group, Vespa provided staff augmentation for Bulk Commissary Supply.
- **U.S. Dept of Veterans Affairs.** As a subcontractor to Booz Allen Hamilton, Vespa provided large scale data integration for CRM applications.
- **U.S. Dept of Veterans Affairs.** As a subcontractor to Booz Allen Hamilton, Vespa provided systems administration for private cloud hosting.
- **Private Global Retail Company.** Vespa was the lead architect for a major business intelligence and reporting project.

- **Global Energy Company.** Vespa developed a comprehensive change management application on the Microsoft Power Platform that supports change agent activities across the globe.
- **Indiana Department of Corrections.** As a subcontractor to Circle City Software Solutions, Vespa provided technical writing for PEN Products.
- **Indiana Department of Corrections.** As a subcontractor to GTL, Vespa provided hardware purchasing services for offender tablet deployment.

