

Light Detection and Ranging



# What is LiDAR?

- LiDAR stands for "Light Detection and Ranging", similar to RADAR but with light instead of sound waves.
- A remote sensing method that uses pulsed light to measure distances.
- The light pulses combined with GPS generate precise, three-dimensional information about the shape of the Earth and its surface characteristics.
- A LiDAR instrument consists principally of a laser, a scanner, and a specialized GPS receiver.
- Airplanes, helicopters, and UAVs (drones) are the most commonly used platforms for acquiring LiDAR data over large areas.
- Two types of LiDAR are topographic (uses near-infrared laser light) and bathymetric (uses water-penetrating green light to measure seafloor and riverbed elevations.

![](_page_0_Picture_10.jpeg)

### Lidar Point Classification

- Light pulses emitted from a LiDAR system reflect from objects below: trees, buildings, bridges, and pavement.
- One emitted light pulse can return to the LiDAR sensor as one or many returns. Any emitted light pulse that encounters multiple reflection surfaces as it travels toward the ground is split into the same number of returns.
- In the case of multiple returns, the intermediate returns are used generally for vegetation structure and the last return for bare-earth terrain models; however, the last return will not always be a ground return.

![](_page_0_Picture_15.jpeg)

![](_page_0_Picture_16.jpeg)

#### LiDAR flight and data capture

![](_page_0_Picture_18.jpeg)

**LiDAR returns** 

#### LiDAR stored in LAS format has a standard classification scheme **Classification Value - Meaning**

0 - Never classified 1 - Unassigned 2 - Ground 3 - Low Vegetation 4 - Medium Vegetation 5 - High Vegetation 6 - Building

7 - Low Point 8 - Reserved \* 9 - Water 10 - Rail 11 - Road Surface 12 - Reserved \* 13 - Wire - Guard (Shield)

14 - Wire - Conductor (Phase) 15 - Transmission Tower 16 - Wire-Structure Connector (Insulator) 17 - Bridge Deck 18 - High Noise 19-63 - Reserved 64-255 - User Definable

## Lidar Applications

- Topographic Lines 2-foot and 10-foot contour line intervals showing elevation
- DEM digital elevation model is countywide data where each 5-foot x 5-foot square is assigned an elevation height
- Hillshade 3D representation of the ground, with the sun's position taken into account
- Feature Extraction identification of objects in the built environment (buildings, towers, pavement, etc.)
- Heights measurement of feature heights (tree canopy, buildings, multi-planed roof surfaces)

![](_page_0_Picture_30.jpeg)

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### Lidar Data in Kenton County

• Countywide data available for 2007 and 2012

• Over 75 GB LiDAR data (LAS format)

Lovel 

- 1.7 billion points in the 2012 LiDAR dataset
- Each point represents an X,Y,Z location latitude, longitude, and elevation

![](_page_0_Picture_36.jpeg)

![](_page_0_Picture_37.jpeg)

Park

![](_page_0_Figure_38.jpeg)

Northern Kentucky mapLAB is a copyrighted, published product of Planning and Development Services of Kenton County. The goal of the initiative is to analyze a wide variety of tabular data and present them in a more visual format that facilitates understanding by the public and its elected leaders. Suggestions for future analyses are always welcom

![](_page_0_Figure_40.jpeg)

Map Gallery

![](_page_0_Picture_41.jpeg)

![](_page_0_Picture_42.jpeg)

LINK-GIS has LiDAR data for all 164 square miles of Kenton County for the years 2007 and 2012. The total number of LiDAR points in the 2012 data set is roughly 1,700,000,000 (1.7 Billion). Each point represents an X, Y, and Z value (latitude, longitude, and surface elevation). Preliminary scheduling is underway for a county-wide LiDAR update in 2018 or 2019. More information can be found in the Story Map at: <u>linkgis.org</u>

![](_page_0_Picture_44.jpeg)

**Goals and Objectives** 

**C** Community Identity **H** Health **N** Natural Systems **HC** Healthy Communities Primary Goal E Economy Secondary Goal **G** Governance M Mobility

> How Does This Topic **Apply to Direction 2030?**

Strive to achieve a balance between development and preservation.

Encourage innovative design on sites with constraints based on the presence of natural systems and incentivize the protection of quality open space.

**G** Encourage cooperative governance.

Continue to encourage the sharing of technical tools and resources effectively reducing the cost of the system.