Better Buildings®
U.S. DEPARTMENT OF ENERGY

Building Energy Data Analysis (BEDA) Accelerator

January 8, 2019

Starting at 2:05 ET

U.S. DEPARTMENT OF ENERGY

Agenda

- Introductions & Who's on the line
- Status updates from the field
  - DOE Updates: Miami-Dade County Data Analysis & Overview
  - Around the phone updates
- Product Road Map
- UBID Look-Up Site Preview
- Time Permitting: UBID Implementation Process

DOE Data Sharing Updates

Analysis of Miami-Dade County

Pacific Northwest
NATIONAL LABORATORY

UBID for Miami-Dade County

Mark Borkum
Computer Scientist

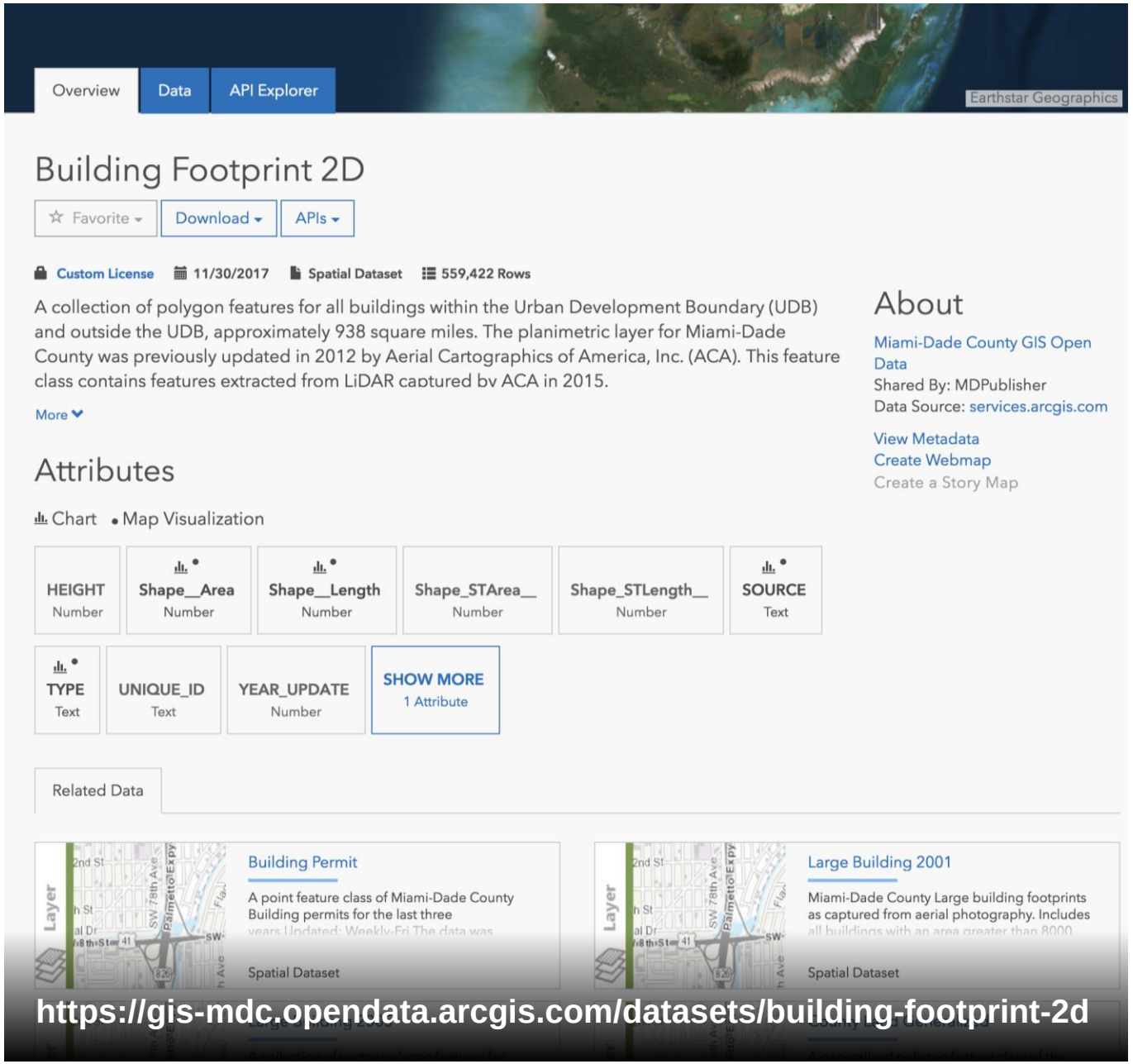
U.S. DEPARTMENT OF ENERGY BATTELLE

PNNL is operated by Battelle for the U.S. Department of Energy

Pacific Northwest
NATIONAL LABORATORY

Data Source

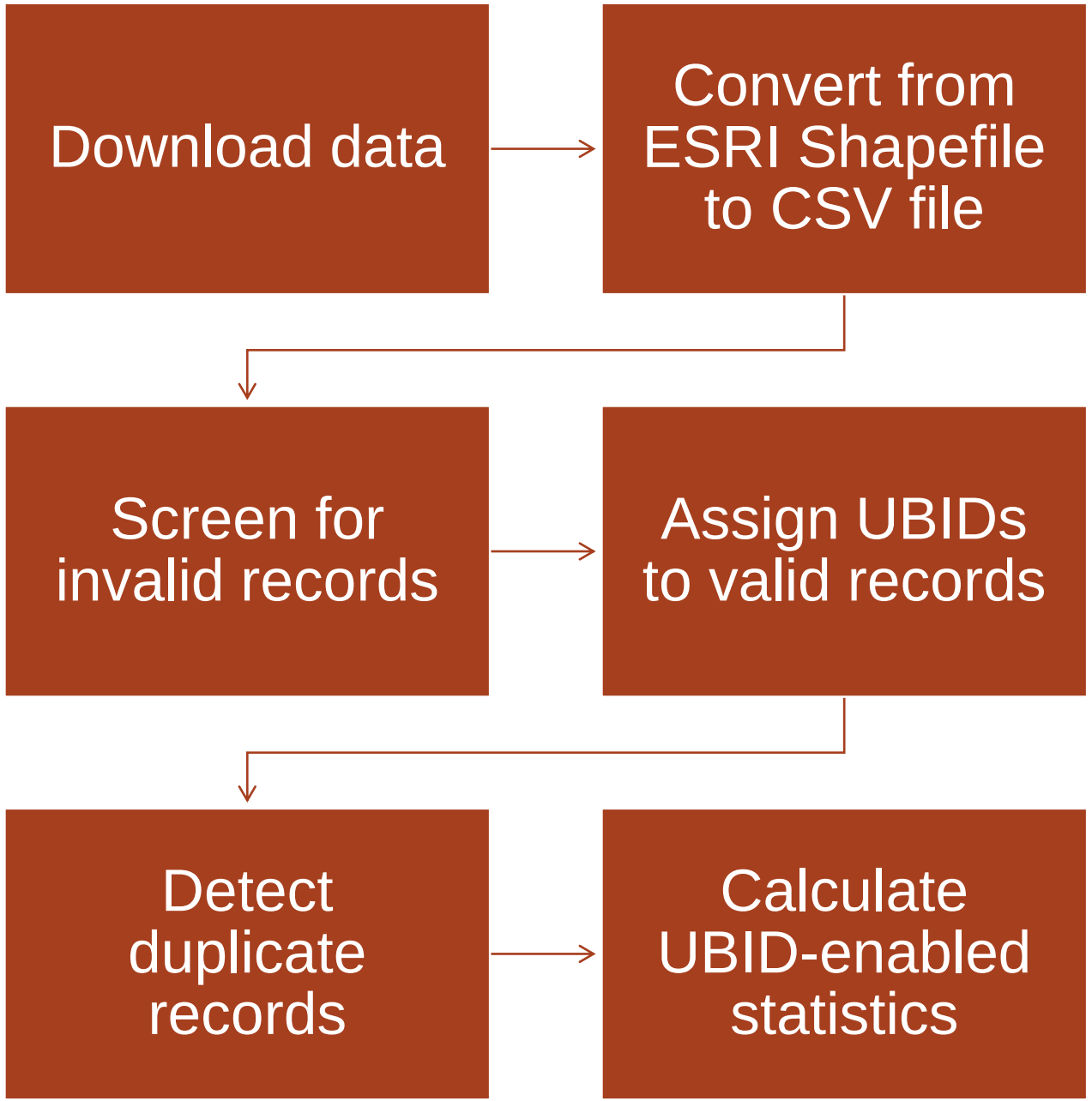
- ESRI Shapefile
  - Polygons
  - WGS-84 projection



Pacific Northwest
NATIONAL LABORATORY

Methodology

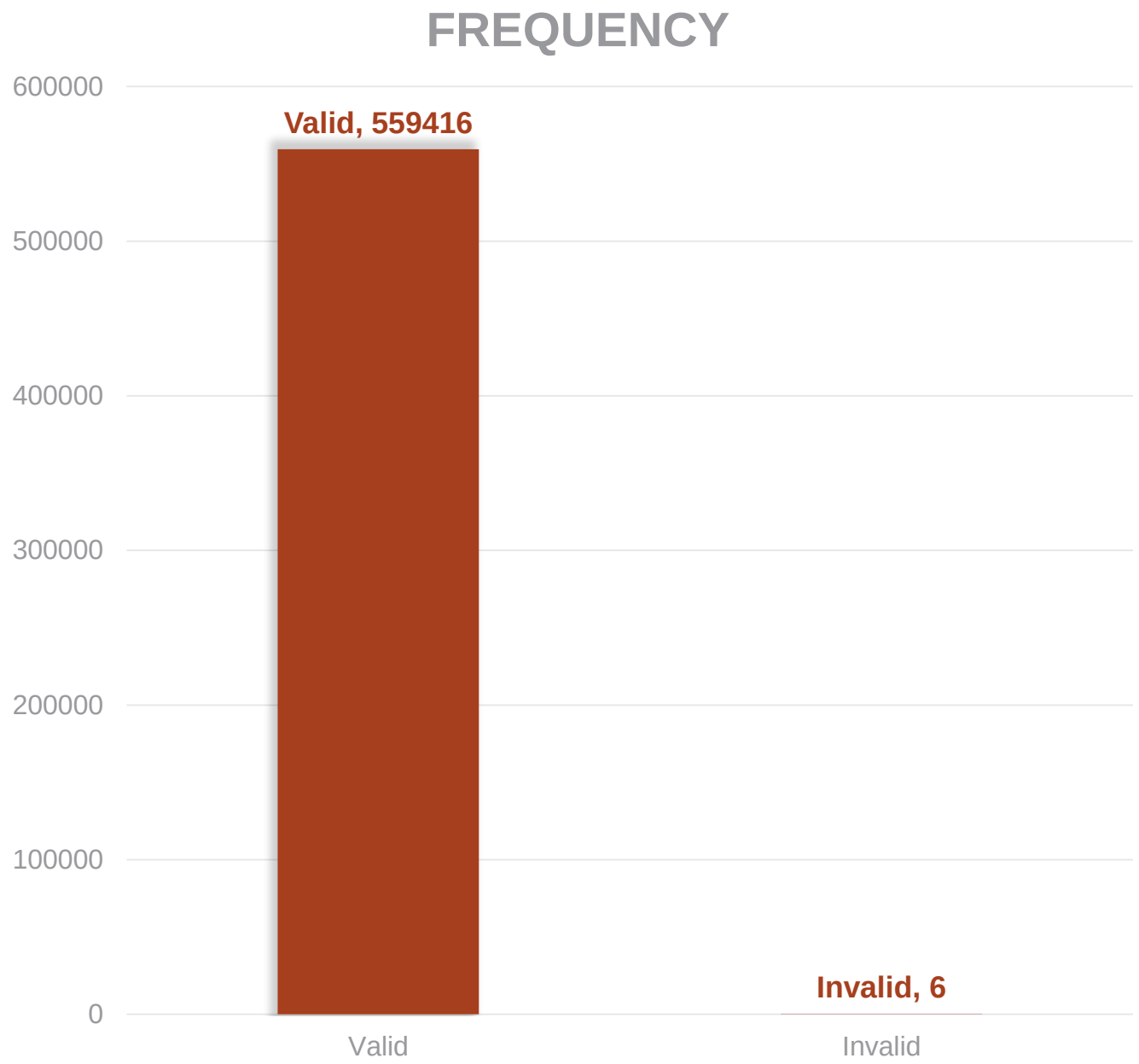
- Open source:
  - UBID assignment
- Closed source:
  - Screening
  - Duplicate detection
  - Statistical analyses



Pacific Northwest NATIONAL LABORATORY

Screening

- "OBJECTID" values for invalid records:
  - 111697
  - 111735
  - 114083
  - 113512
  - 124290
  - 373308



Pacific Northwest NATIONAL LABORATORY

Duplicate Detection

- UBID detects duplicates that elude other methods

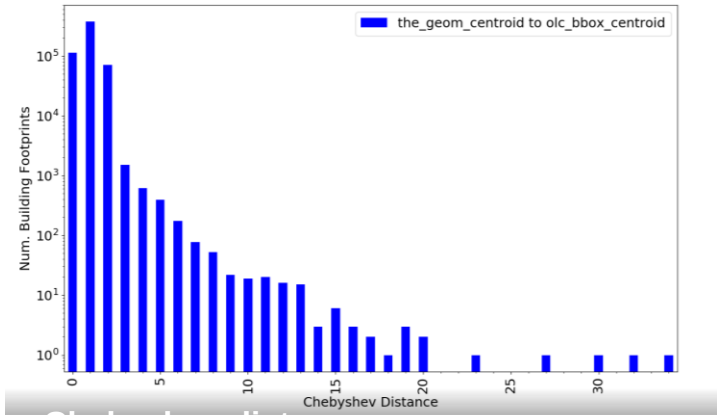
- “OBJECTID” field = No duplicates
- “UNIQUE_ID” field = No duplicates

- UBID = 136 duplicates of 68 strings
  - 2 duplicates per string

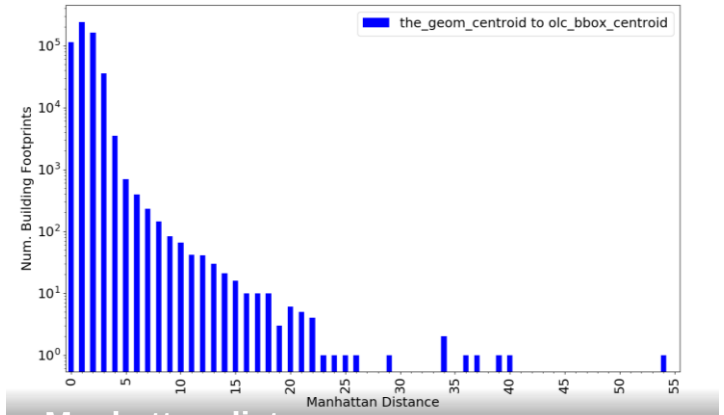
- 0.0122% of dataset is duplicated data

Statistical Analyses

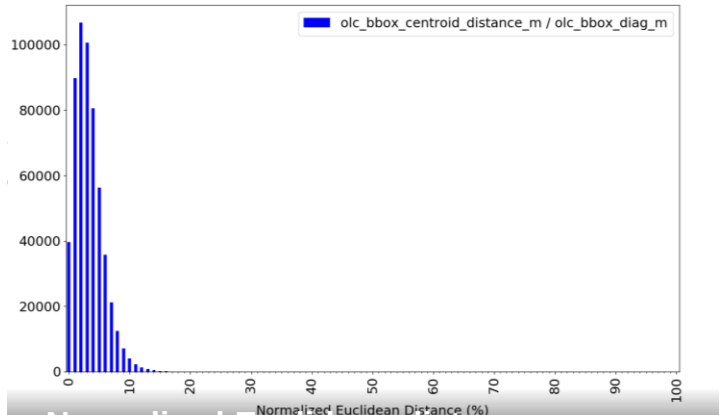
Up to 99th %tile shown



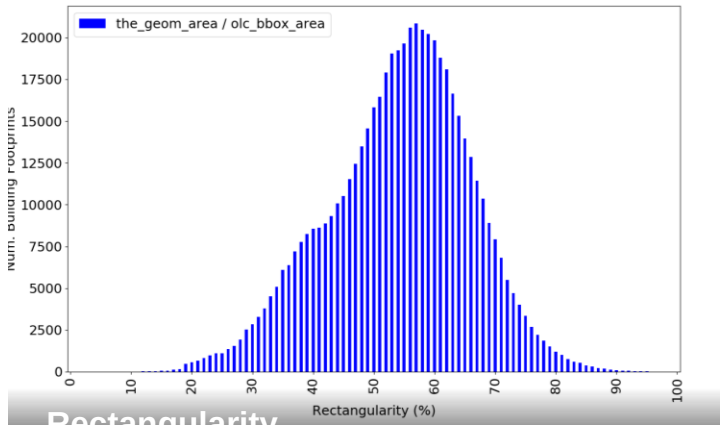
Chebyshev distance



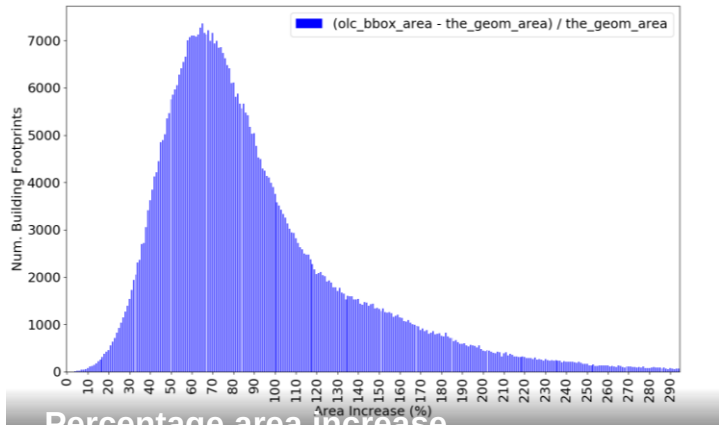
Manhattan distance



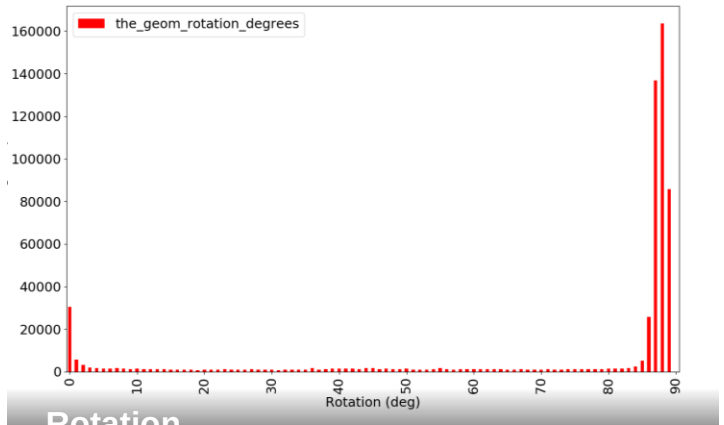
Normalized Euclidean distance



Rectangularity



Percentage area increase



Rotation

Pacific Northwest NATIONAL LABORATORY

Statistical Analyses (cont.)

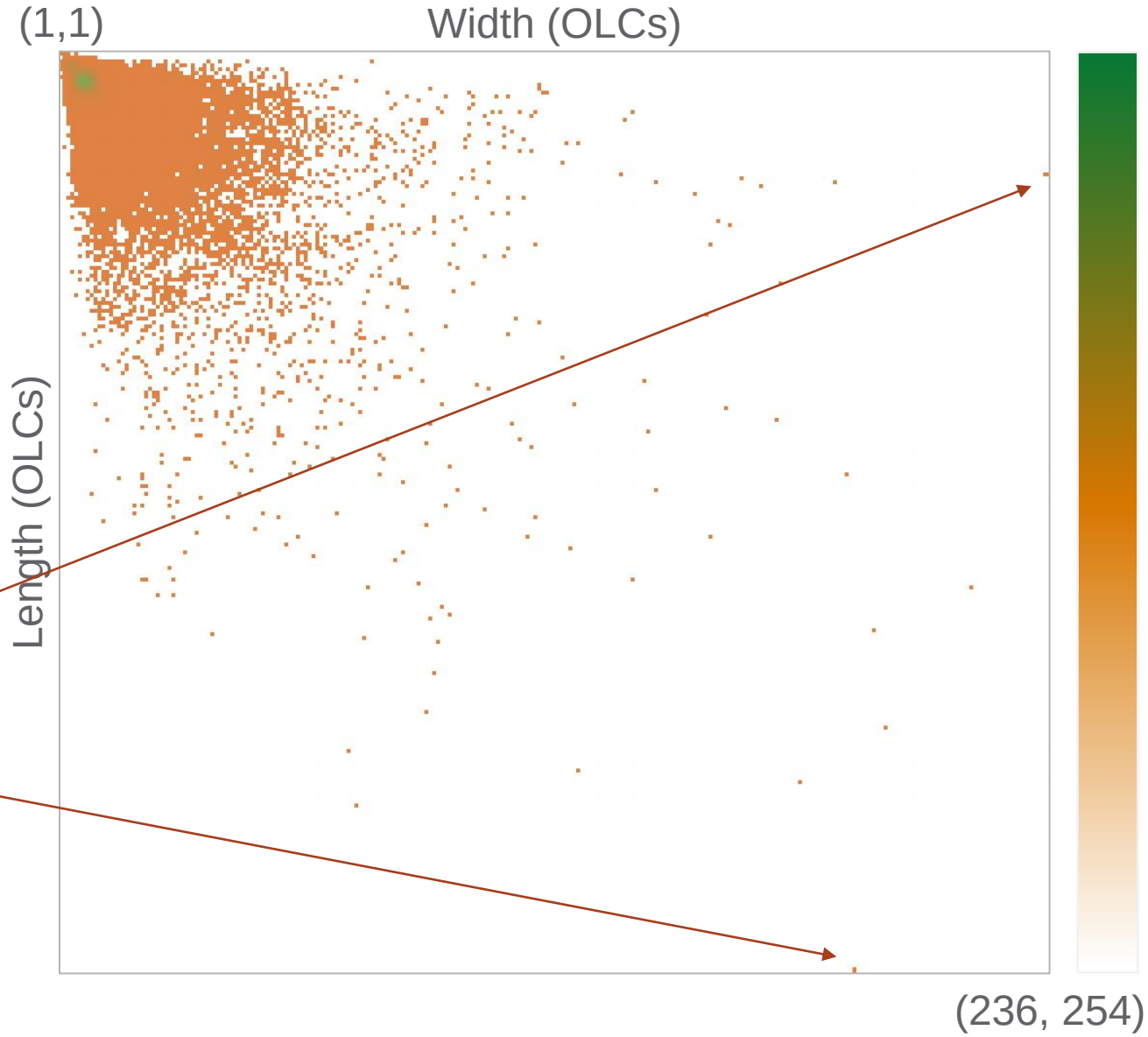
	Mean	Std. Dev.	Min	25th %tile	50th %tile	75th %tile	99th %tile	Max
Chebyshev distance (OLCs)	0.939696	0.637992	0	1	1	1	2	34
Manhattan distance (OLCs)	1.253446	0.954960	0	1	1	2	3	54
Normalized Euclidean distance (%)	0.037889	0.022865	0.000055	0.021009	0.034132	0.050323	0.109327	0.345063
Rectangularity (%)	0.547195	0.117476	0.020155	0.472921	0.557375	0.627712	0.800137	1.142382
Percentage area increase (%)	0.934695	0.546434	-0.124636	0.593087	0.794124	1.114519	2.942340	48.616482
Rotation (deg.)	74.022433	28.302354	0	84.037135	87.845227	88.572023	89.923000	89.999915
Area (sq. km)	0.350906	1.265453	0.001573	0.133946	0.213840	0.317833	3.106893	182.375183
OLC Area (OLCs)	81.719943	240.960888	2	42	56	80	550	48380

(Anomalies highlighted in red color)

Pacific Northwest
NATIONAL LABORATORY

UBID Extent Heatmap

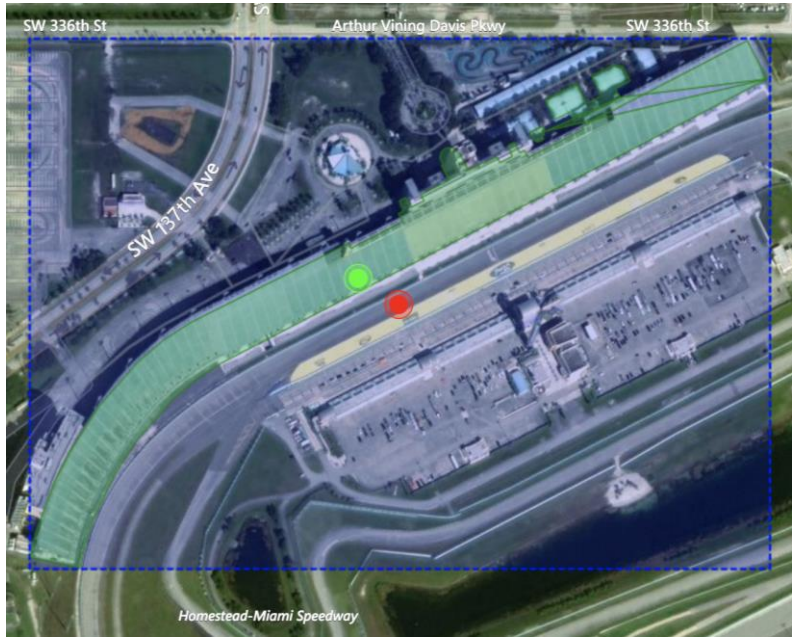
- Cluster at (7, 7)
  - Area of 350–450 m^2
- Extreme outliers



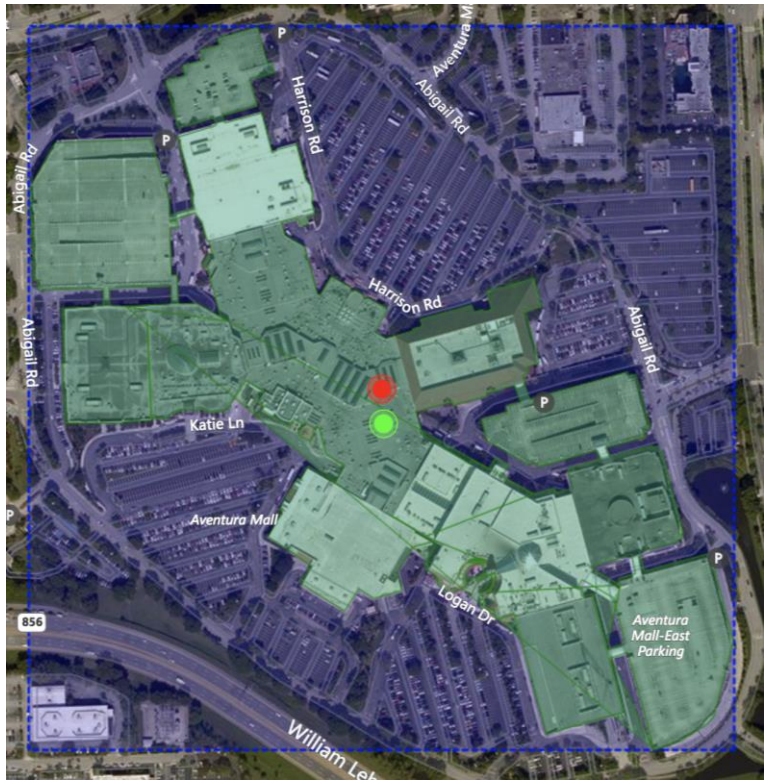
Pacific Northwest
NATIONAL LABORATORY

Extreme Outliers

- Lengthiest building footprint (north/south extent) is **Aventura Mall**
- Widest building footprint (east/west extent) is **Homestead Miami Speedway**



76QXFH3Q+9JV-77-118-94-94
(self-intersecting polygon)

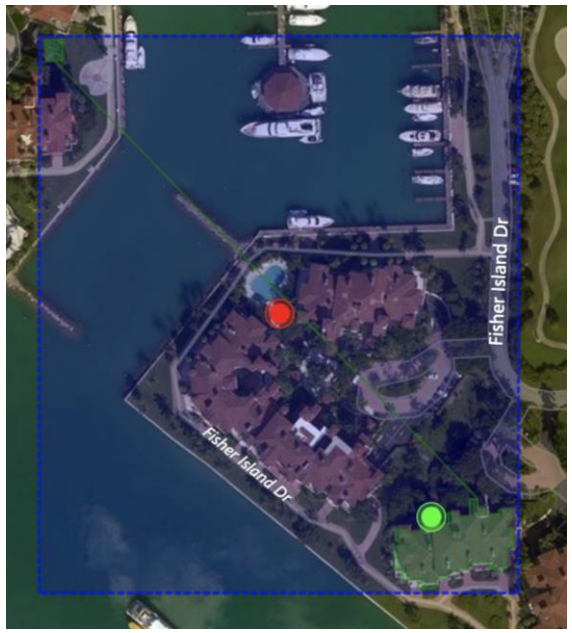


76QXXV44+PW2-128-101-105-101
(self-intersecting polygon)

Pacific Northwest
NATIONAL LABORATORY

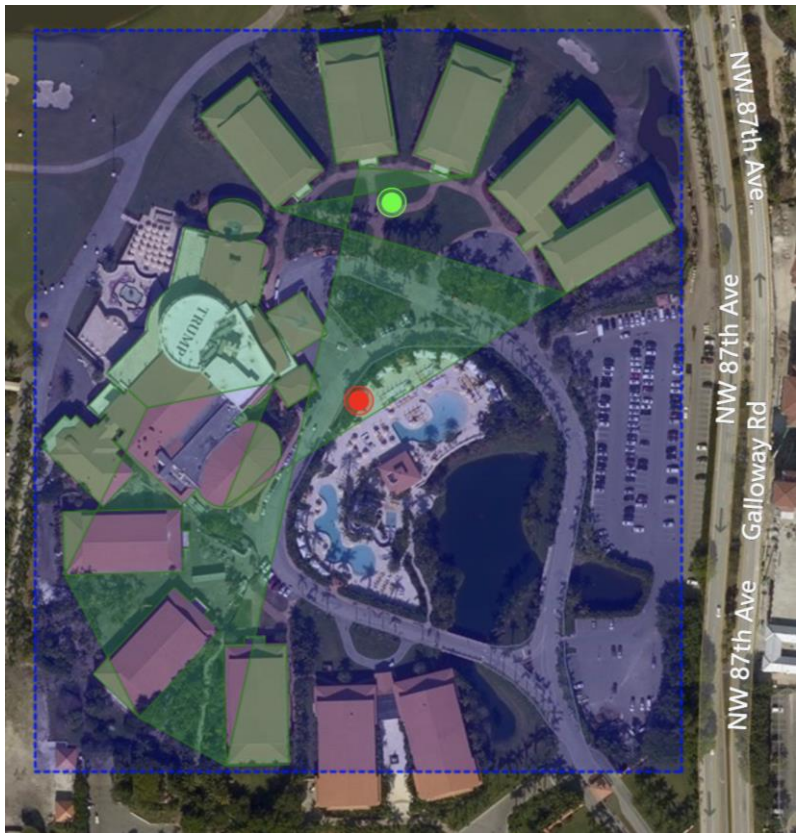
“Bad” and “Ugly” Building Footprints

76QXXR66+QHP-9-8-11-10
(incorrect polygon)



76QXQV54+FPX-77-12-12-56
(non-contiguous polygon)

76QXRRV6+433-11-13-4-1
(self-intersecting polygon)



76QXRM76+WC3-27-41-92-51
(?!?!)

Pacific Northwest NATIONAL LABORATORY

Conclusions

- Successfully processed dataset for Miami-Dade County
  - Found 6 invalid records
  - Found 68 duplicate records
- Further statistical analysis needed
  - Unusually high Chebyshev and Manhattan distances
  - Unusually low rectangularity
  - Unusually high percentage area increase
  - Unusually high area

Pacific Northwest
NATIONAL LABORATORY

Thank you

Better Buildings®
U.S. DEPARTMENT OF ENERGY

Data Sharing Updates

Partner Round-Robin

U.S. DEPARTMENT OF ENERGY

UBID Engagement & Implementation Process

- What do we need?
  - Technical Leads – who are the folks programming and supporting your database infrastructure?
  - Two+ databases – where do you want to see UBIDs incorporated and matched to each other?
- Process:
  - Mark will Skype/WebEx/etc. in with your technical team to understand your database architecture
  - Using the tooling developed at PNNL, UBIDs can be added into your existing systems. In the process, Mark can develop a replicable process for use by additional stakeholders in your organization.

Next Call: February 12th, 2019

Preview:

- Authoritative UBIDs – how do you produce a “UBID of Record”
- DC’s Newseum – condos and the museum in a shared space. How do UBIDs help clear up this relationship?

Better Buildings®
U.S. DEPARTMENT OF ENERGY

Thank You

Questions?

Harry.Bergmann@ee.doe.gov
Nora.Wang@pnnl.gov
Mark.Borkum@pnnl.gov