Assessing Land Cover Change with High-Resolution Imagery:

Impervious Surface Example

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Problem:

How to detect areas of true, persistent change, and filter out false, ‘ephemeral’, change?

Ex: New housing development vs. cars on a field

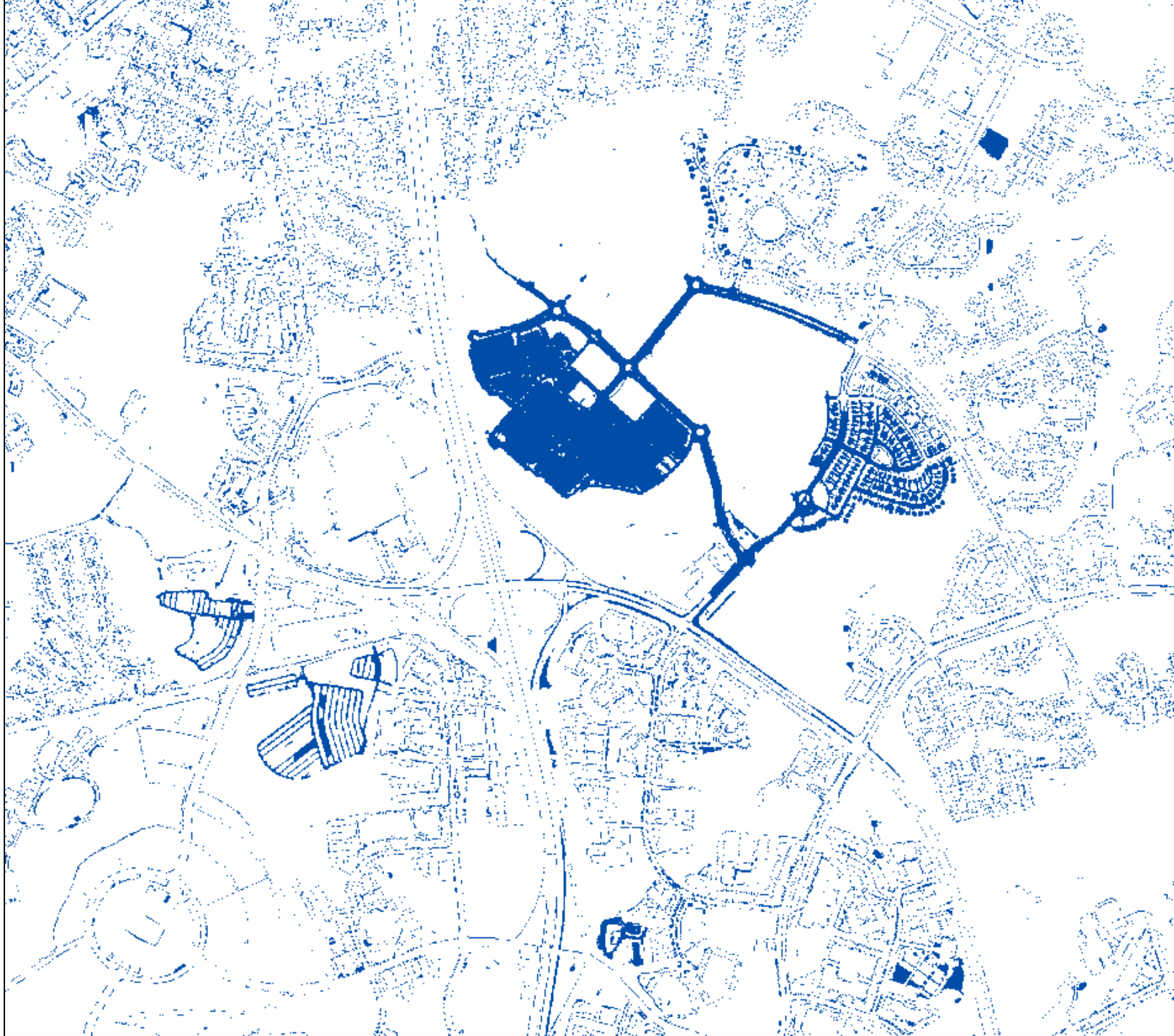
Solution:

Explore two method options in Prince George’s county using 2009 and 2013 high-res land cover.

Data Preparation

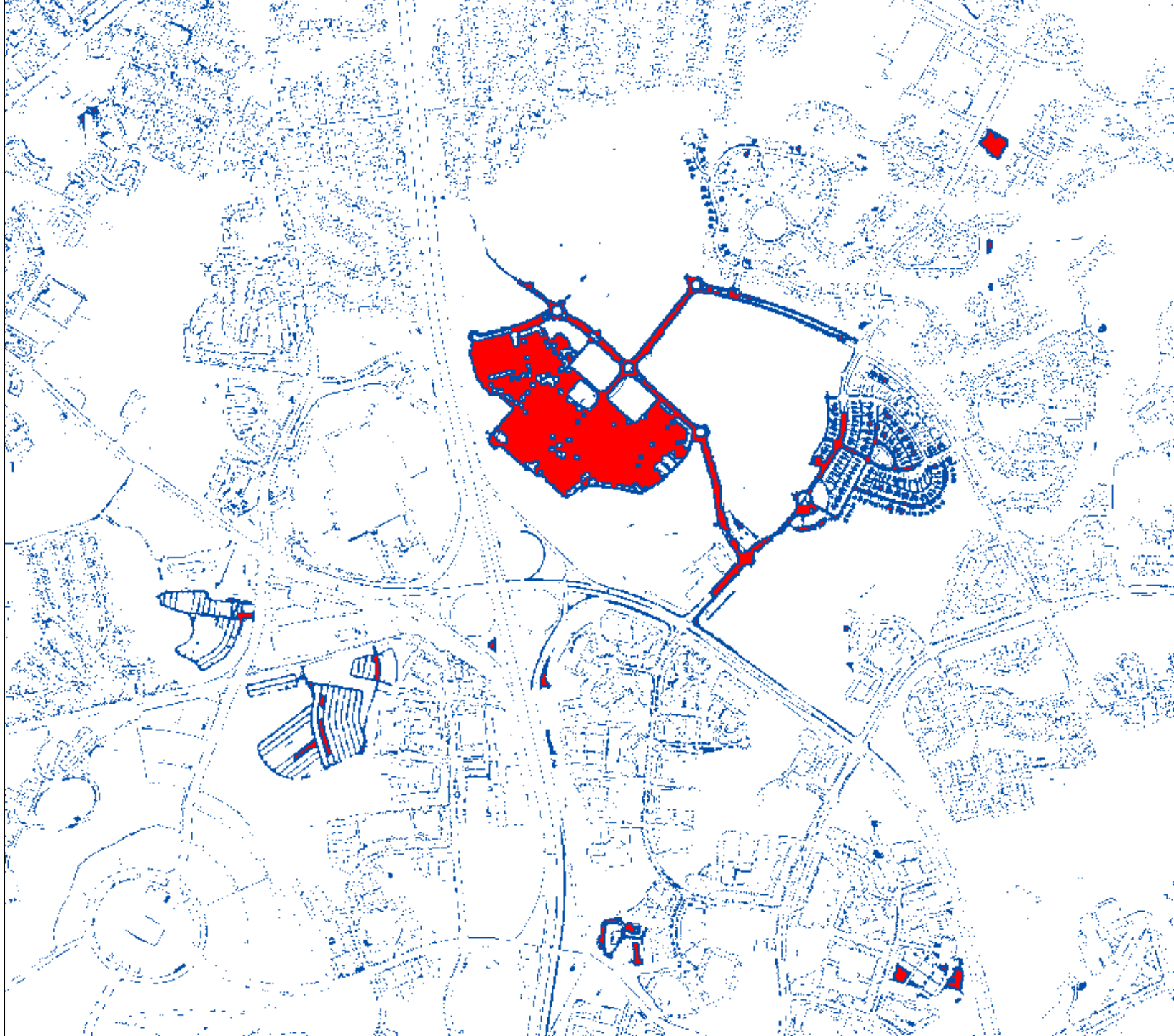
Step 1: Identify all areas of impervious surface change (2009-2013)

Note magnitude of change along feature edges- most of this is “noise”.



Data Preparation

Step 2: Shrink away the ‘noise’

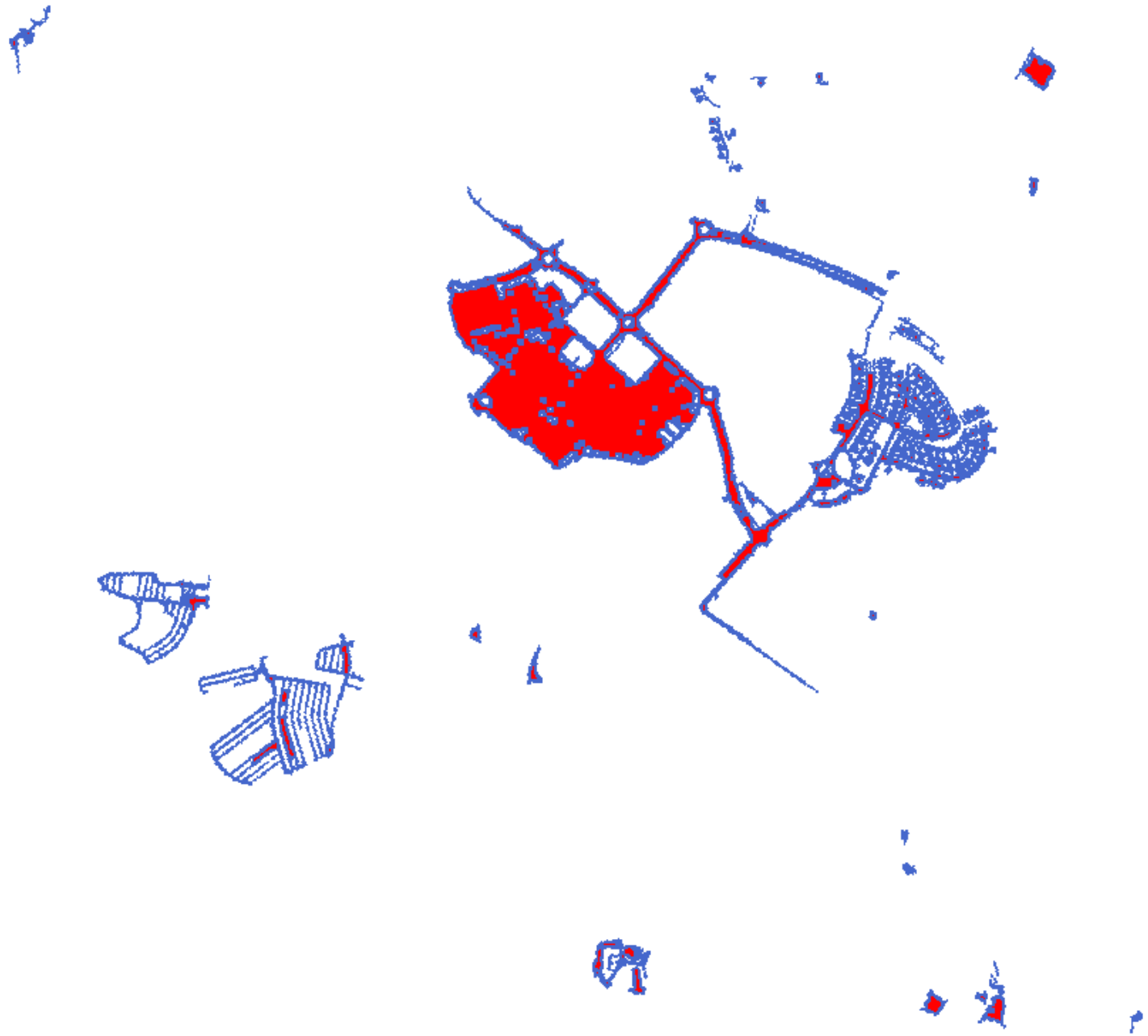


Data Preparation

Step 2: Shrink away the ‘noise’

Data Preparation

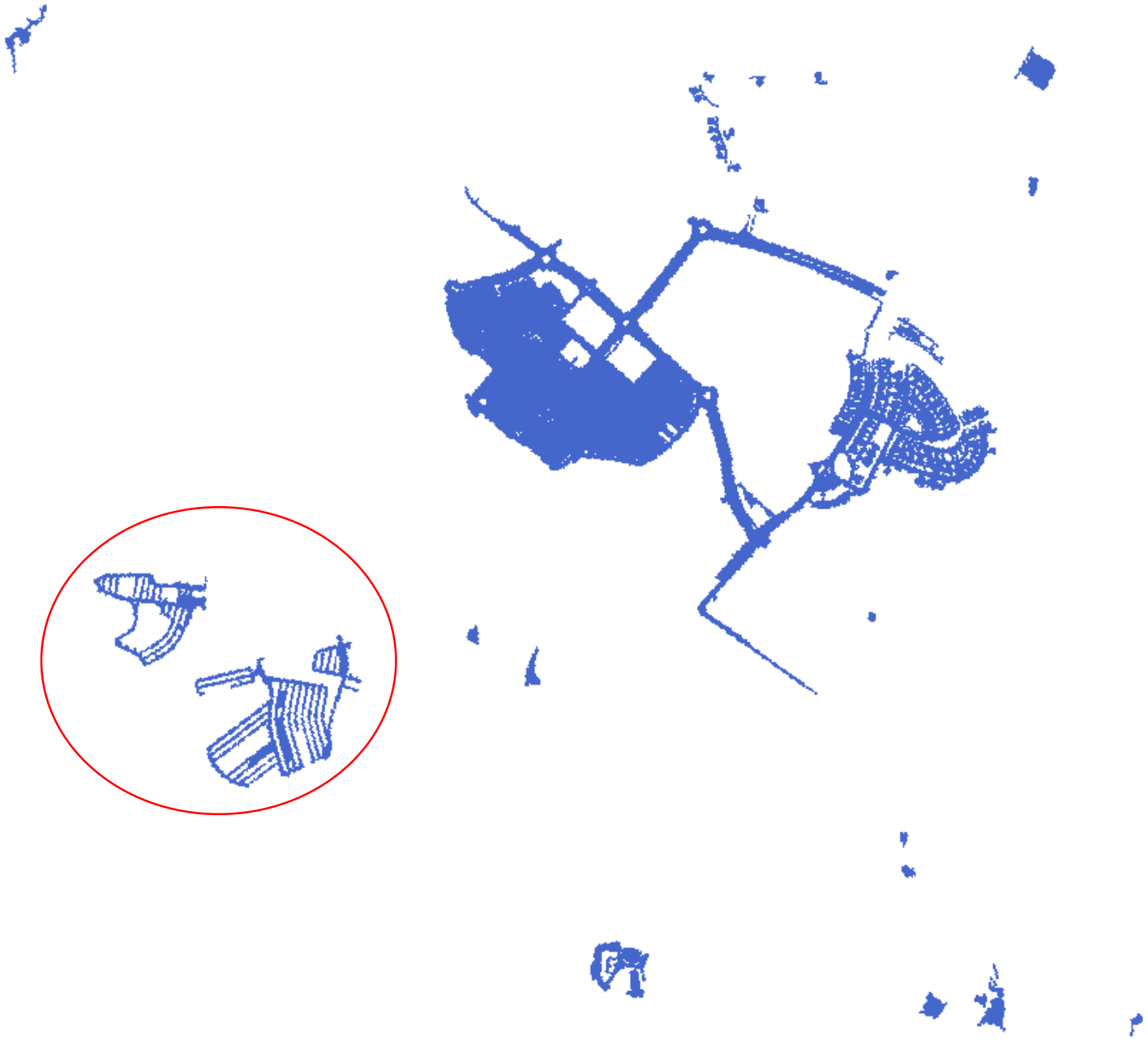
Step 3: Restore original extent of remaining change patches



Data Preparation

Step 3: Restore original extent of remaining patches of change

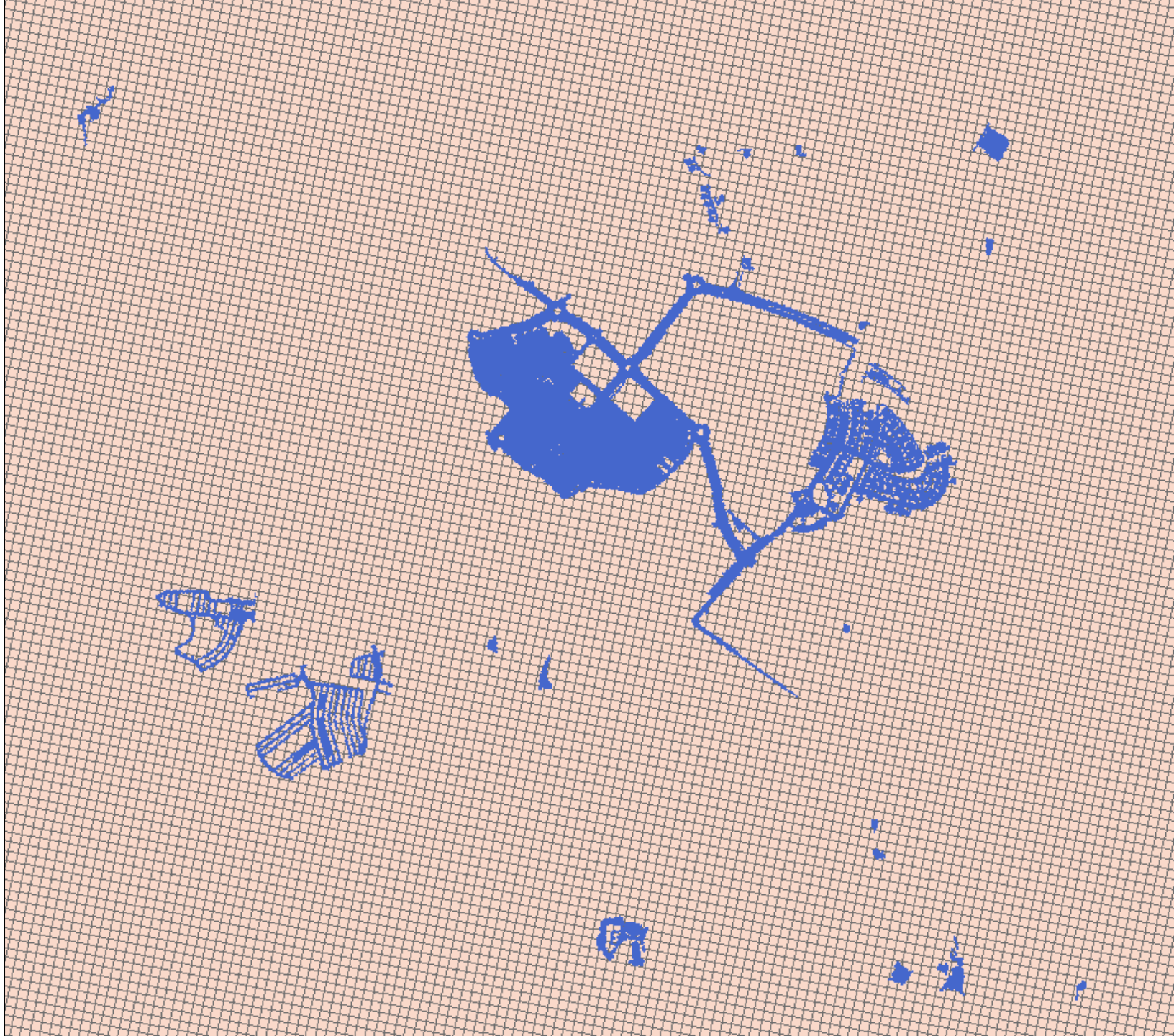
How do we differentiate persistent change?



Method 1: Aggregate the Change

Logic:
Persistent change more likely in dense clusters of change pixels

Create Fishnet (30m^2 cells)

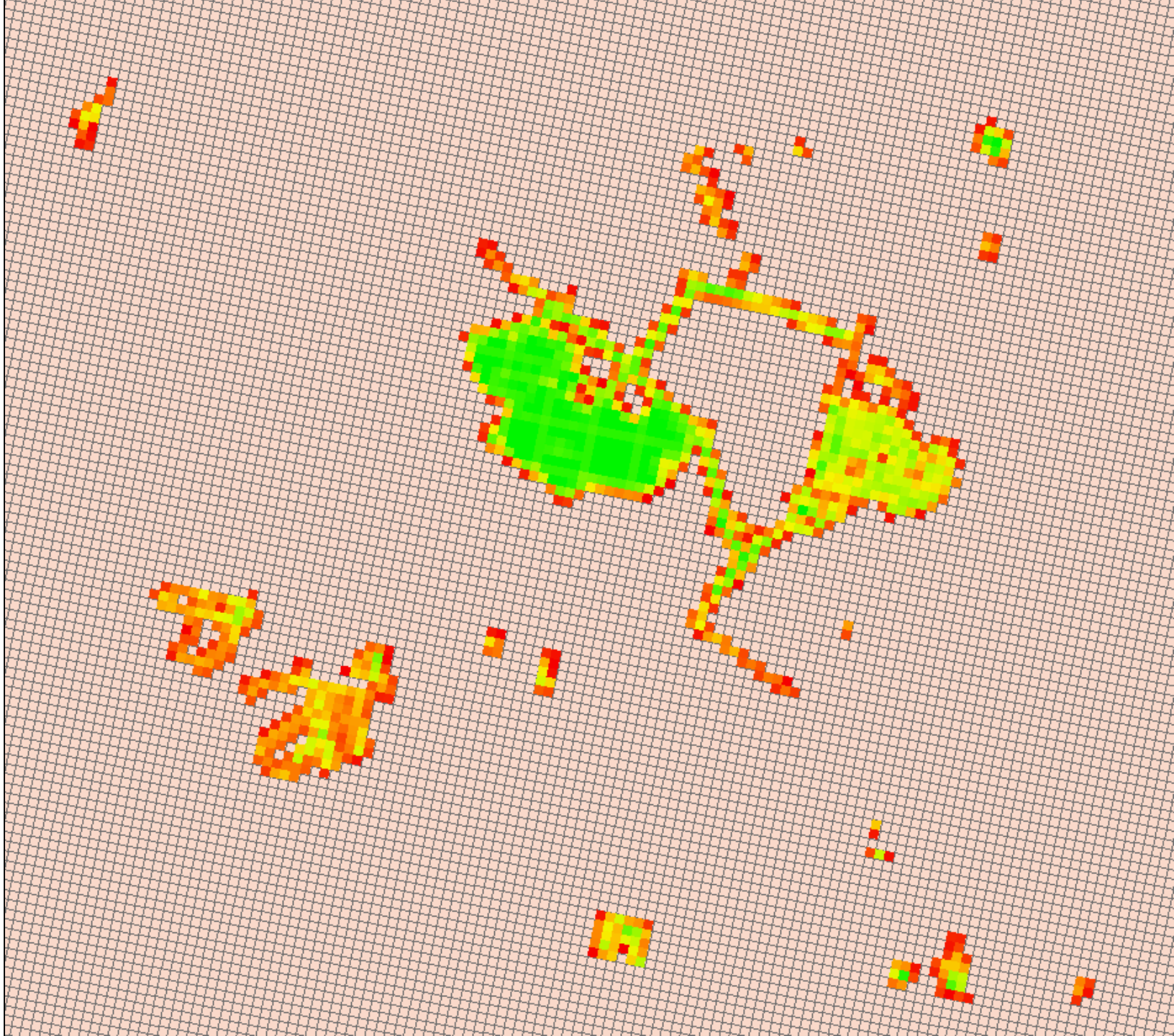


Method 1: Aggregate the Change

Zonal Statistics

Green indicates **higher** sum of change

Red indicates **lower** sum of change



Method 1: Aggregate the Change

Green indicates **higher** sum of change

Red indicates **lower** sum of change

Next step: Set minimum change sum threshold to filter out false change

Method 1: Aggregate the Change

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2009 Historical Imagery

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2014 Historical Imagery

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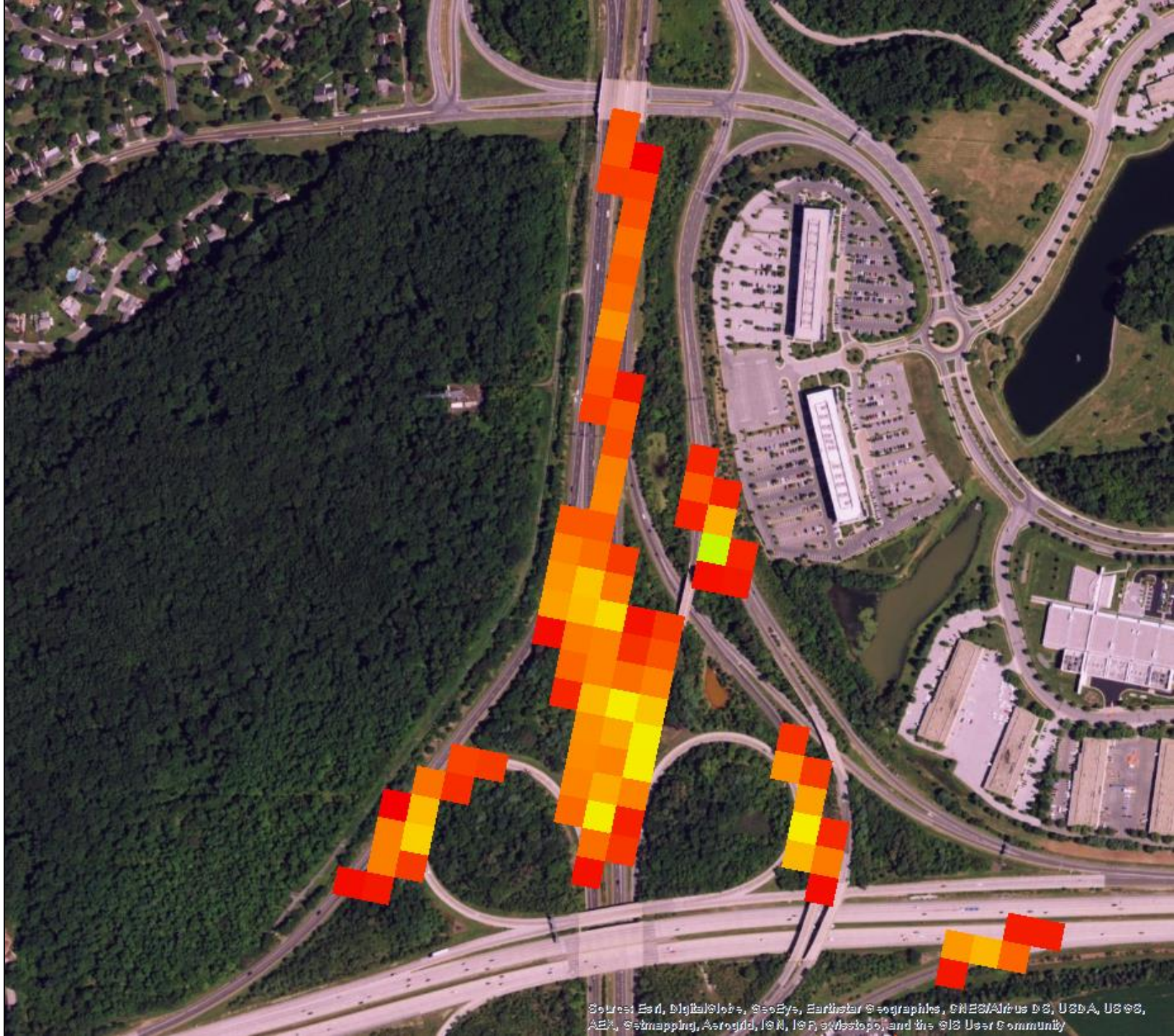
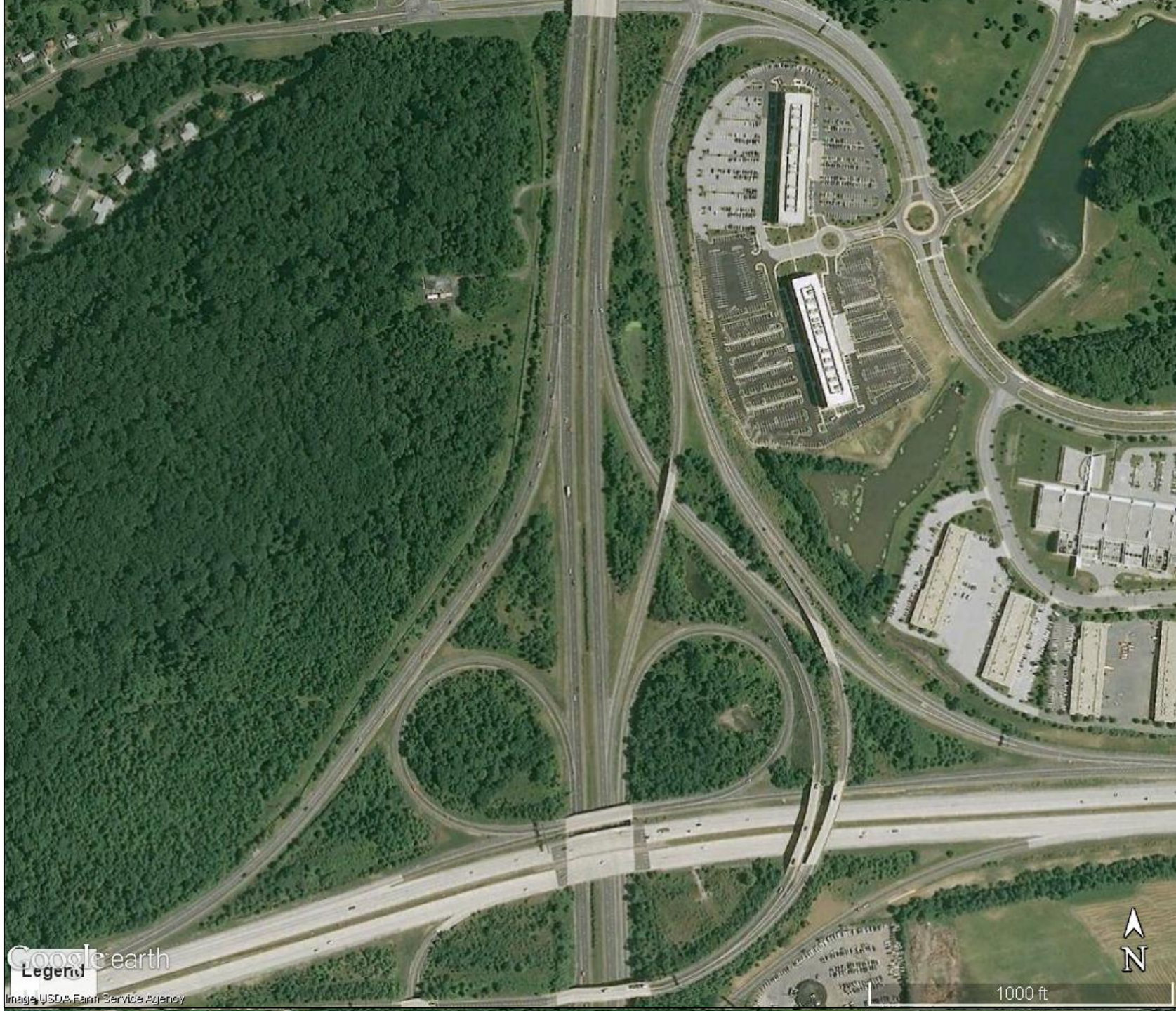
Small change is aggregated up to coarser, 30 m resolution



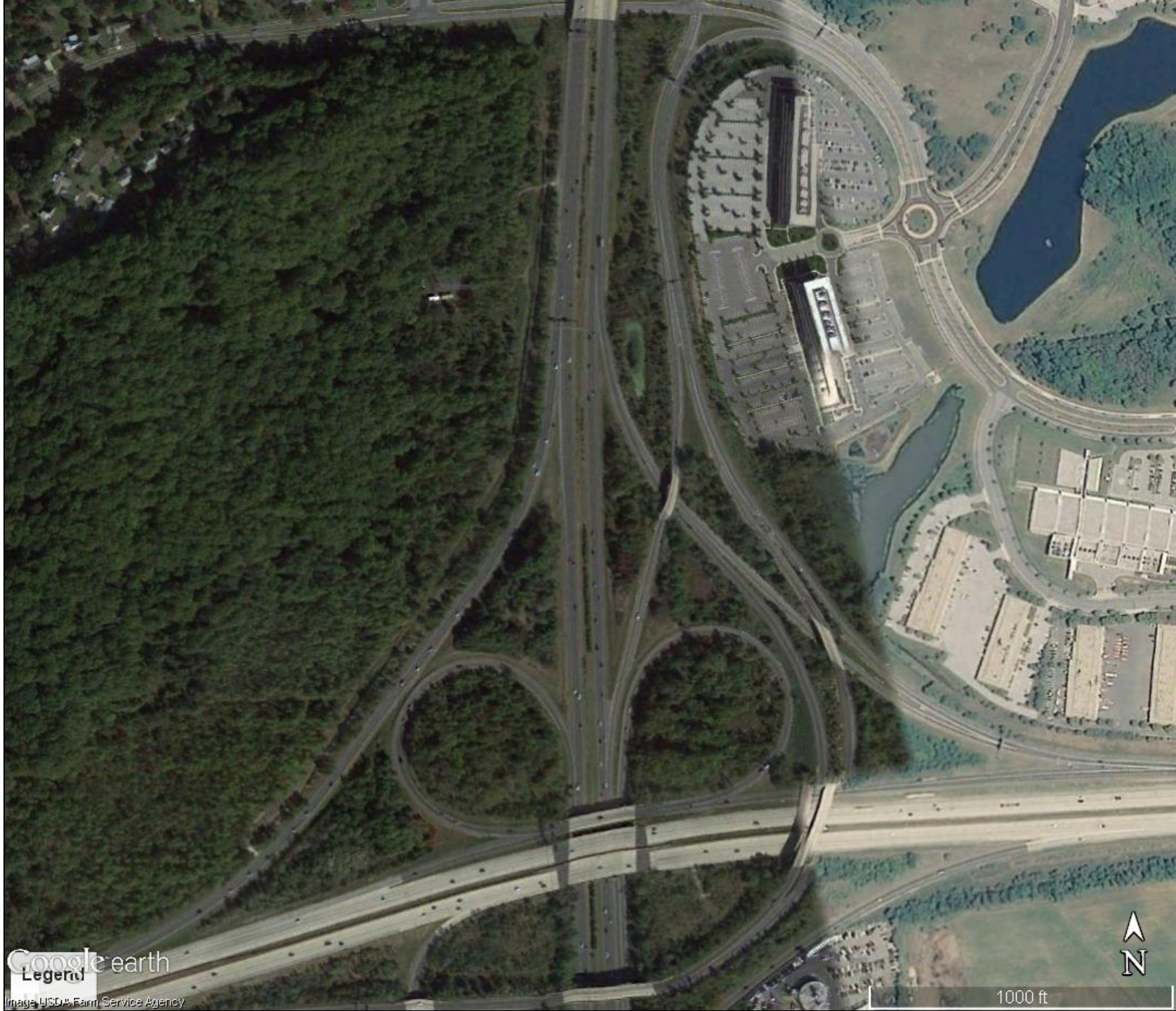
Method 1: Aggregate the Change

2009 Historical Imagery



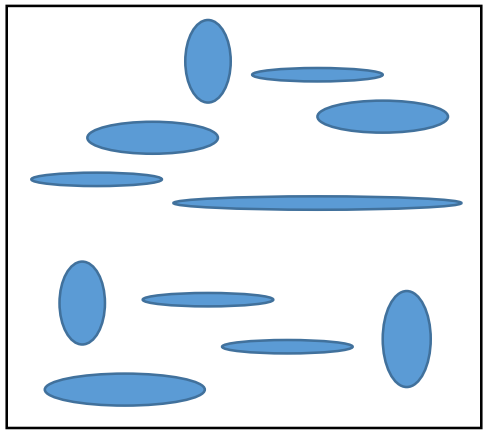
Method 1: Aggregate the Change

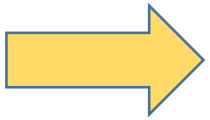
2014 Historical Imagery



Method 1: Aggregate the Change

Ephemeral and False Change (e.g., shadows, soil moisture, mis-registration, vehicles and boats, etc.)

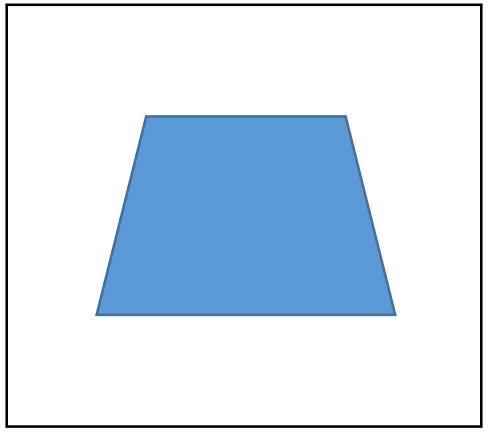


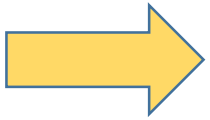


Ignore

Threshold:
40% impervious change within a 30m^2 pixel.

Persistent Change (e.g. new buildings, roads, etc.)





Keep

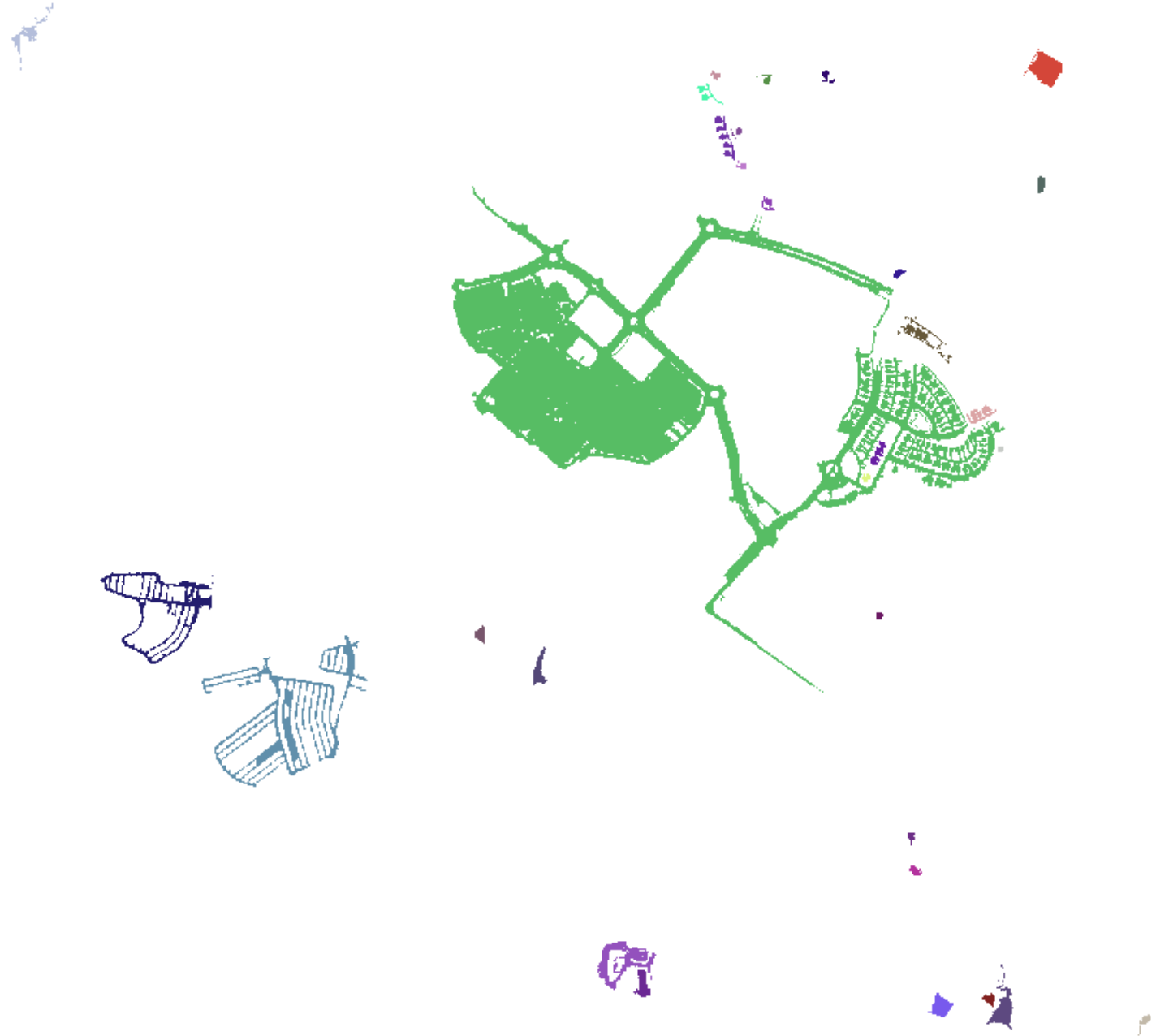
Method 2: Size and shape of change

Logic:
Persistent change more likely in large circle-like patches.

Method 2: Size and shape of change

Region Group

Convert to polygon



Method 2: Size and shape of change

Orange/Red indicates **higher** Area:Perimeter ratio (A:P ratio)

Blue/Grey indicates **lower** A:P ratio

Next step: Set minimum A:P ratio threshold to filter out false change

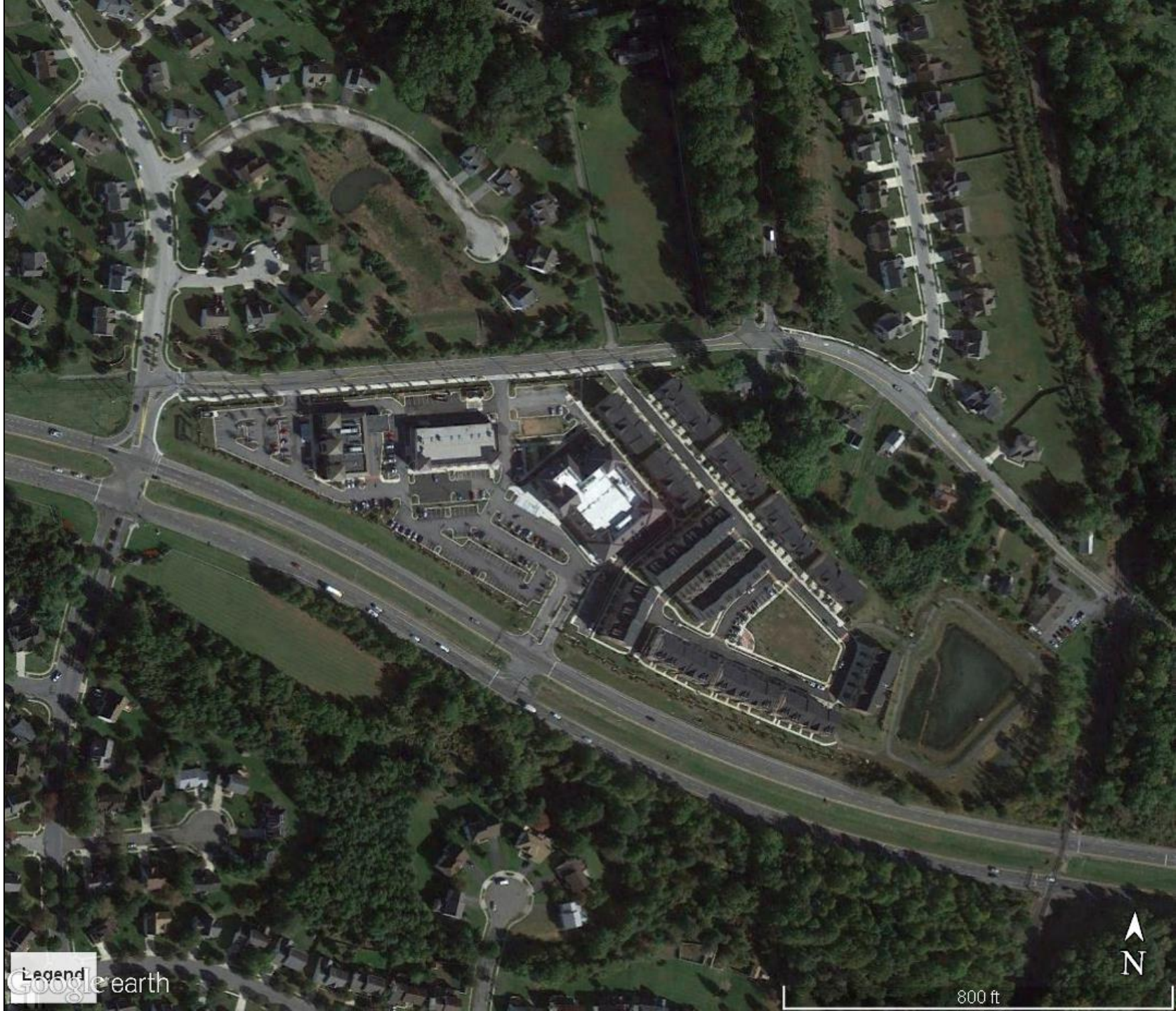
Method 2: Size and shape of change

Method 2: Size and shape of change

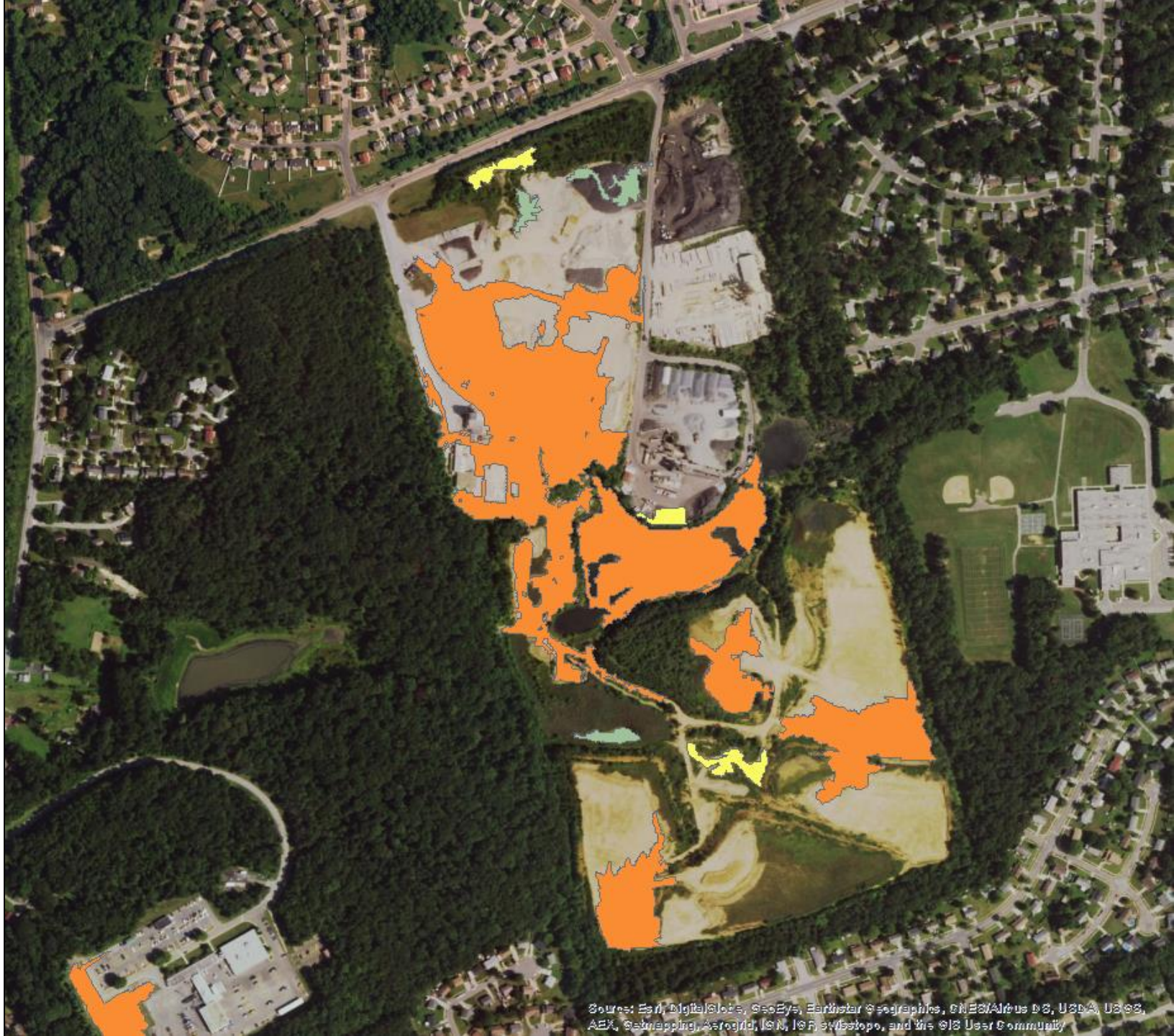
2009 Historical Imagery

Method 2: Size and shape of change

2014 Historical Imagery



Method 2: Size and shape of change



Method 2: Size and shape of change

2009 Historical Imagery

Method 2: Size and shape of change

2014 Historical Imagery

Wrap-Up

- High-res data provides great level of detail
- But there is a lot of ‘noise’ – shadows, alignment shifts, misclassification, ephemeral change
- Need further investigation of methods to filter out noise.
  - E.g., use Landsat change detection products, further refine size/shape analysis based on land use context- mining and agriculture.