

# **Haverhill**

# **Deliverable 2&3**

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# **1 Introduction**

The City of Haverhill aims to convert their 311 customer service data (QAlert) to best assist the city government in preparing for first responses to citizen requests. The city would like to map the data by wards and precincts to best predict and prepare for requests. The city would like to merge their existing databases with precinct and ward information in the GIS format with their 311 customer service data (QAlert) to gain further insights on customers. They would like to map this data and have us merge their databases together.

## **2 Techniques**

### **2.1 Geopandas**

GeoPandas is an open source project to make working with geospatial data in python easier. GeoPandas extends the datatypes used by pandas to allow spatial operations on geometric types. Geometric operations are performed by shapely.

### **2.2 Folium**

Folium makes it easy to visualize data that's been manipulated in Python on an interactive leaflet map. It enables both the binding of data to a map for choropleth visualizations as well as passing rich vector/raster/HTML visualizations as markers on the map.

The library has a number of built-in tilesets from OpenStreetMap, Mapbox, and Stamen, and supports custom tilesets with Mapbox or Cloudmade API keys. folium supports both Image, Video, GeoJSON and TopoJSON overlays.

## **3 Data Collection**

The client provides us with the geojson format files of the CDBG area, the precincts and wards, the refuse routes of Haverhill as well as a CSV format file storing QAlert requests data.

Figure 1: CDBG Json Format

K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
Request T	Request T	Request T	Departme	Departme	Address N	Street ID	Street	Address	Complete City	City ID	City	Cross Street	Cross Street	District ID	District	Escalation Priority	Longitude	Latitude		
330	Traffic/Str	FALSE	11	Highway	629	JUSTIN ST	JUSTIN ST	JUSTIN ST,	1	Haverhill	0	0	0	0	2	-71.1059	42.7655			
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
321	Snow Ren	FALSE	11	Highway	922	SOLITAIRE	SOLITAIRE	SOLITAIRE	1	Haverhill	0	0	0	0	2	-71.0737	42.80426			
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
330	Traffic/Str	FALSE	11	Highway	659	LAKEVIEW	LAKEVIEW	LAKEVIEW	1	Haverhill	777	NORTH AV	0	0	2	-71.0834	42.796			
302	Poor Prop	FALSE	Please de	6 Inspector	44	611 JACKSON	44 JACKSC	44 JACKSC	1	Haverhill	0	0	0	0	2	-71.0915	42.77037			
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
291	Highway -	FALSE	<p>Pleas	11 Highway	114- 116	308 BOARDMA	114- 116 B	114- 116 B	1	Haverhill	0	0	0	0	2	-71.0617	42.7742			
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
343	Trash - En	FALSE	Please de	6 Inspector	2	1153 H Street	12 H Street	2 H Street	1	Haverhill	0	0	12	Polygon 0	0	2	-71.1085	42.47425		
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
274	School De	FALSE	0		685	1036 WASHING	685 WASH	685 WASH	1	Haverhill	0	0	0	0	2	-71.1032	42.77021			
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
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901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
901	A - Inform	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				
902	A - Transf	FALSE	8	311 Call Center	0		, Haverhill	1	Haverhill	0	0	0	0	2	0	0				

Figure 2: Part of Request CSV File

## 4 Data Processing

#### 4.1 Draw the CDBG area

- (1) Use "geopandas" package of Python to read the "Hav\_CDBG\_Area\_WGS84.json" file and then transform the coordinates stored in it from "espg:3857" format to "epsg:4326" format.

- (2) Utilize "folium" package of Python to draw the boundaries of the CDBG area and set up the background color.
- (3) Generate a HTML file and store the result in the file.

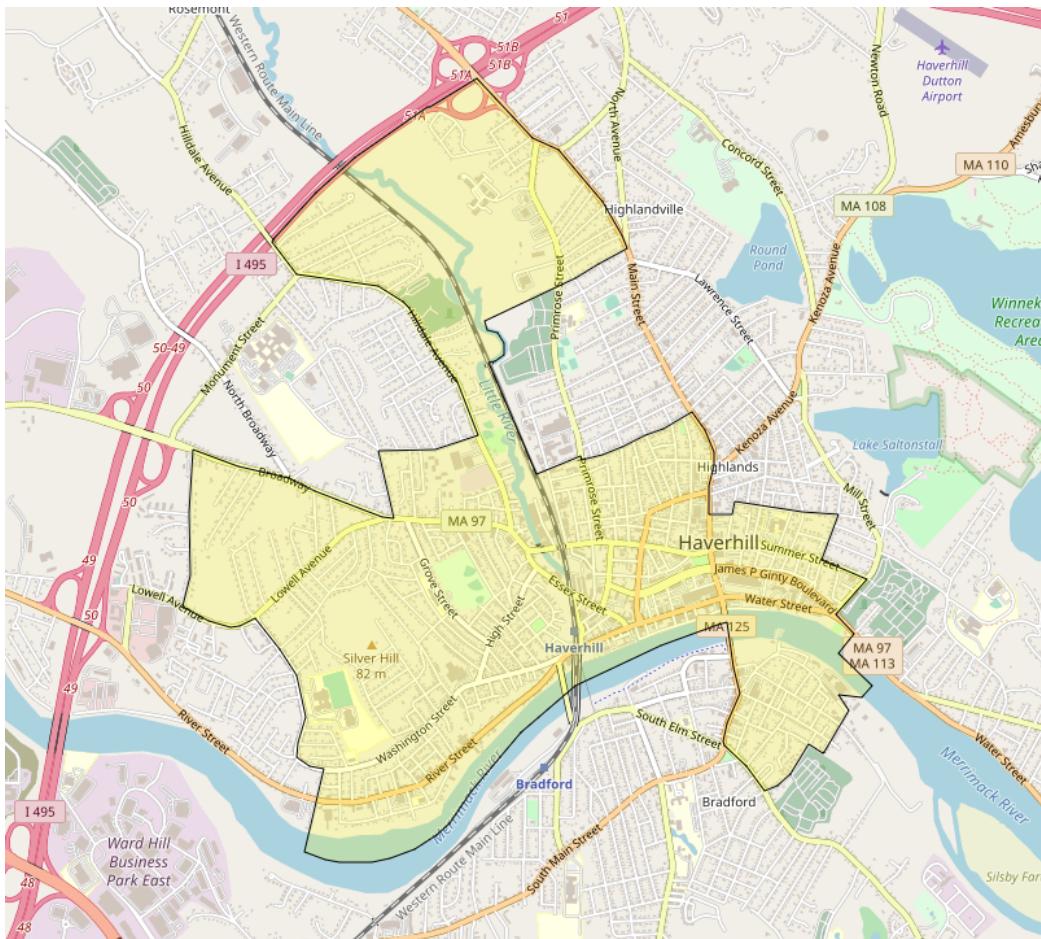


Figure 3: CDBG Area

## 4.2 Draw the precincts and wards

- (1) Remove the data entries representing the old geological data of 2003 in the file.
- (2) Use "geopandas" package of Python to read the "Hav\_Precincts\_Wards\_WGS84.json" file and then transform the coordinates stored in it from "espg:3857" format to "epsg:4326" format.

- (3) Utilized "folium" package of Python to draw the boundaries of each precinct respectively.
- (4) Generate a HTML file and store the result in the file.

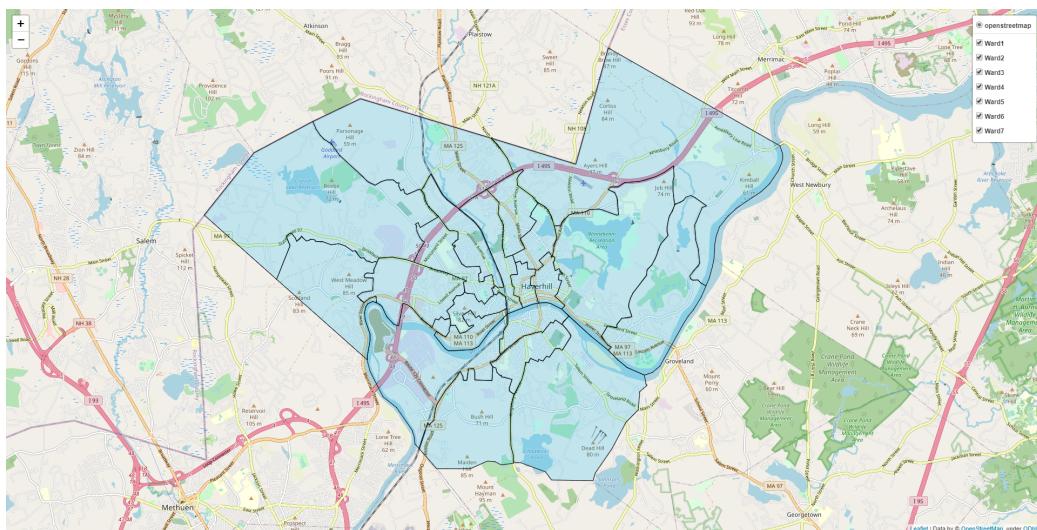


Figure 4: Wards and Precincts

You can see the layer control on the side, so that you can choose to show or hide some of the wards as below.

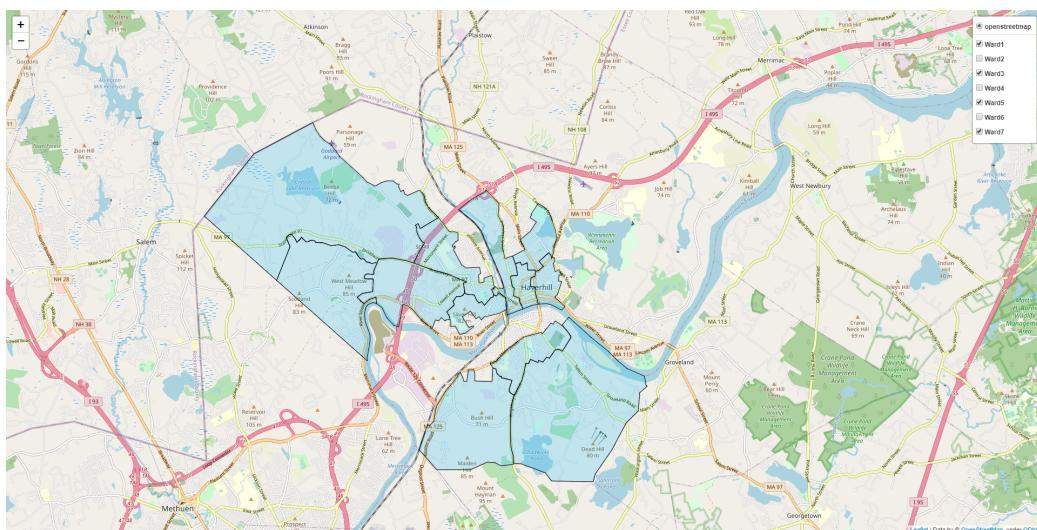


Figure 5: Selected Wards and Precincts

### 4.3 Map the QAlert requests data(CSV format)

- (1) Use the "pandas" package of Python to read the "haverhill-request\_updated.csv" file into the python to process the data.
- (2) Remove all the entries that do not have address or their latitude or longitude equal to 0. Then we can get the valid data.
- (3) Traverse the file and get all types of requests.
- (4) Group the coordinates of all requests by their request types.
- (5) Use "folium" package in Python to map the requests and generate the HTML file.

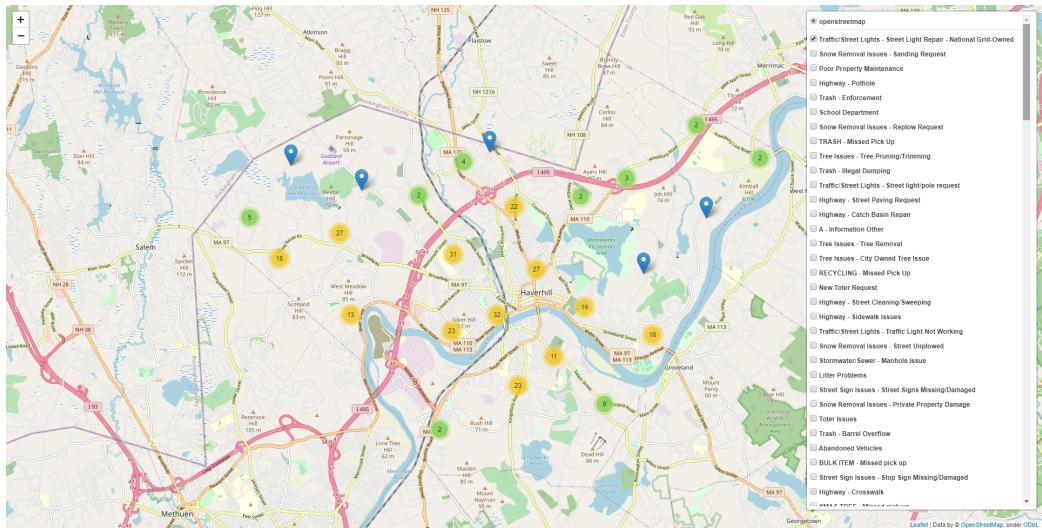


Figure 6: Requests on the map

Also, you can choose to show or hide some types of requests. What's more, you could click on the marker clusters, then zoom in the map. The marker clusters will become separate markers. When you click on the marker, you will see some detailed information of the marker like address and request type as below.

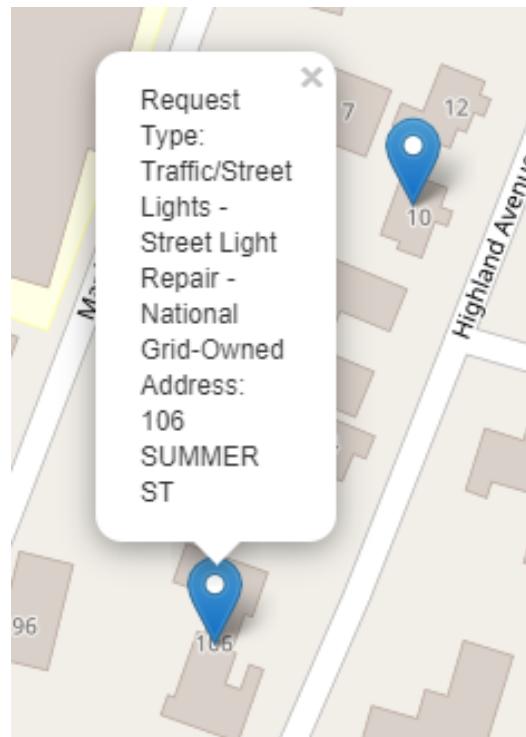


Figure 7: Marker Information

## 5 Plan

- (1) Draw the map of refuse routes.
- (2) Combine the map of the CDBG area, wards and precincts, QAlert requests data into one HTML file.
- (3) Combine the map of the CDBG area, wards and precincts, refuse routes into one HTML file.
- (4) Design and implement a GUI software that can accept a CSV format file storing the QAlert requests data and a g