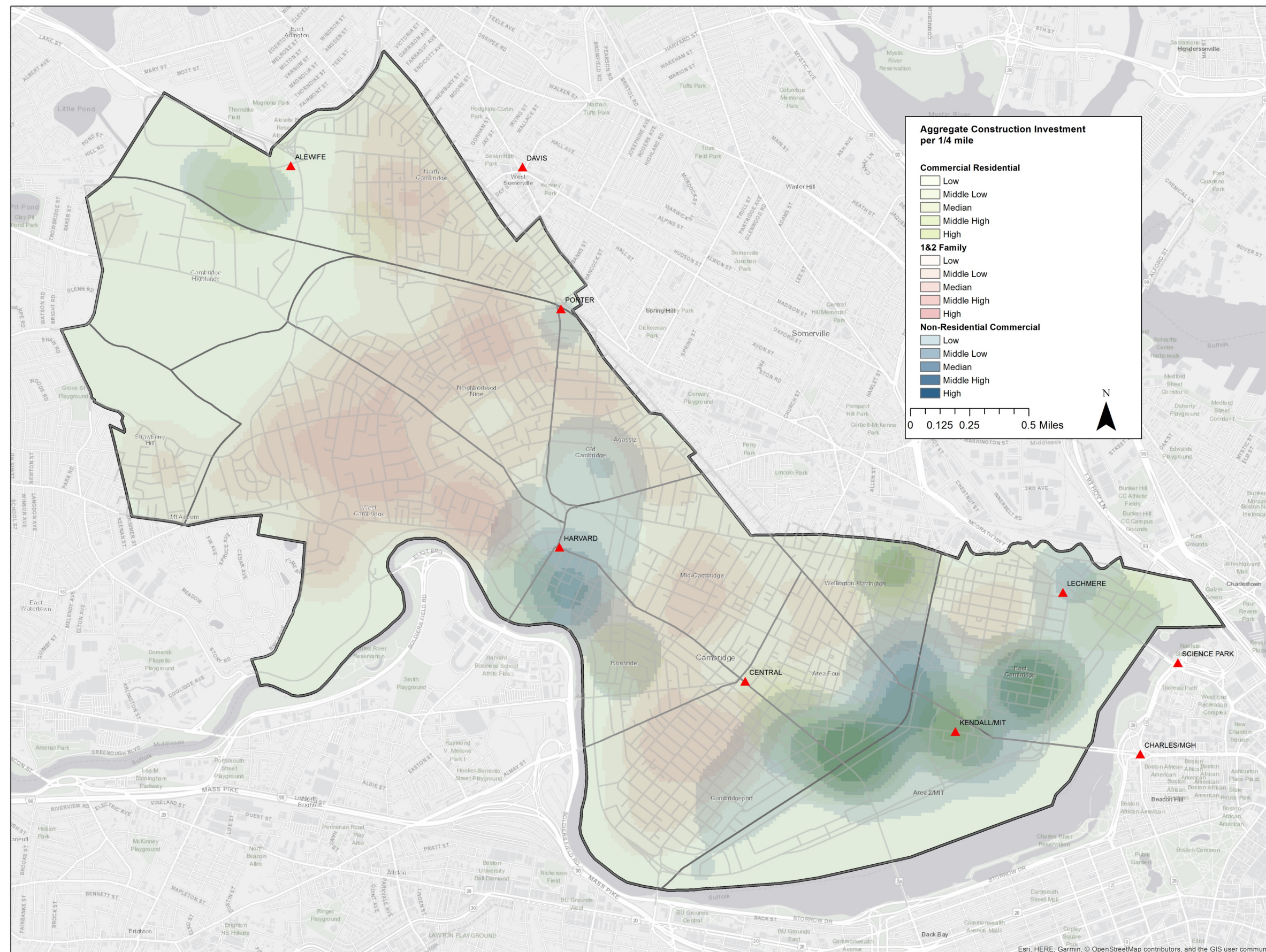# Visualizing Construction and Investment in Cambridge

Building Permit Data for Family, Multi-Residential, and Commercial Properties

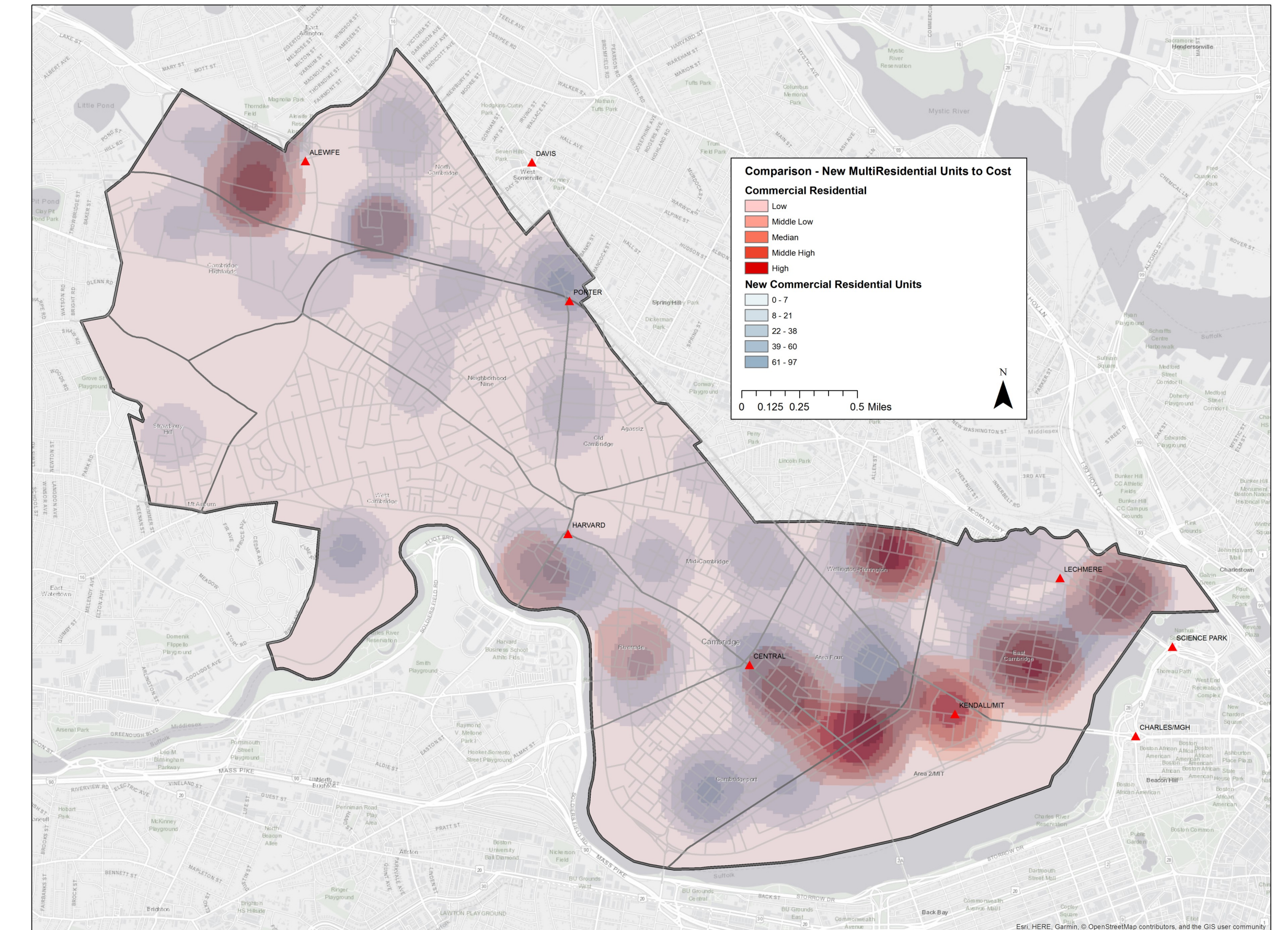### Construction Costs / Real Estate Investment

Costs to Unit Density Comparison

Introduction

The City of Cambridge maintains an extensive open data portal with information down to the parcel level from assessors and other city services. The building permit data in particular provide a window into construction timelines as well as investment through the construction costs involved. The current permitting data cover a five year period from the start of 2013 through the start of 2018, and come in two data sets, for 1 to 2 Family Home building permits and Commercial/Private Multi-Residential.

Details within these data sets include new construction and issues like LEED certifications, the type of flooring, siding, and heating systems involved, and more pertinently for this analysis, information on construction costs, class of construction or alteration, and addresses with GPS coordinates. This analysis divided the Commercial and Multi-Residential data by whether or not the property had dwellings currently, or the proposal involved the construction of new units of housing. From these three sets, 1-2 Family, Commercial, and Multi-Residential, new and renovation construction was selected out and mapped to Cambridge on a kernel density analysis, displayed in the three maps in the center of the lower section. A composite map was created using cost of construction as the indicator for capital investment in real estate improvement. Finally, low-cost multi-residential housing was identified by

Results, Advantages, and Limitations

By mapping data to GPS coordinates, a higher degree of accuracy was attainable than through census block level ACS or Census data. From the points, a kernel density analysis was conducted on a 1/4 mile search radius as an arbitrarily defined walk shed of 5 blocks in diameter. A distinct division became apparent between individual family residential neighborhoods and neighborhoods with high growth in commercial or multi-residential building permits. This analysis is limited as a 5-year aggregate, and more detailed information on a yearly basis could be mapped to show these neighborhood changes on a yearly basis.

To the right are three maps displaying kernel density for the permits generally in the case of 1-2 Family and Non-Residential Commercial permits, while the density of multi-residential commercial permits were mapped on a unit density basis, in order to show where multi-residential unit growth was most dense, for use in a later analysis comparing invested cost and number of units. The first composite map on the left above uses the cost of construction for commercial non-residential permits as a base, overlaying costs of multi-residential commercial and finally 1-2 Family (displayed on the left). Color scales were chosen so that their intersection would result in gradations of green, where the more deeply forest green coloration indicates a high concentration of multi-residential and non-residential commercial construction investment, and purple indicates an intersection of investment in the three sets. The second composite map displays cost of construction against number of dwelling units built in the multi-residential commercial context. Low-income housing would tend to display more blue, where a large number of units are built at low cost, while high-income housing displays as more red, where a high construction cost is invested per unit of housing.

To aid in analysis, T-station locations and neighborhood boundaries were mapped on in addition to the density surfaces. West Cambridge displayed the largest amount of new construction and renovation for individual domiciles, while Alewife and MIT/Kendall showed the largest growth in multi-residential commercial housing. Harvard and MIT/Kendall both saw an intensification of non-residential commercial investment.

Conclusions

Cambridge has a fairly distinct separation between one– and two-family residential neighborhoods, commercial areas, and multi-residential commercial properties. The MIT/Kendall area has a significant concentration of both high-end multi-residential properties (indicated by the second map showing significant cost per unit in construction) and non-residential commercial investment. Harvard has very little in the way of one– and two-family residential permitting, and even less multi-residential commercial investment. The area surrounding Harvard divides the broadly residential center of Cambridge as a commercial island. Alewife saw significant growth in multi-residential buildings, but at a lower cost per unit than the MIT/Kendall area. Several affordable housing non-profits operate large buildings near the station. More interestingly is the dearth of one– and two-family building construction or renovation in the neighborhood to the south-west of Alewife station and above Fresh Pond. This large and old neighborhood would appear to have been largely unaffected by the booming construction and renovation of West Cambridge.

To the north and south-west of Central Station, there are two primary loci of a high number of one– and two-family construction and renovation permits, as well as intensive cost of construction investment. Further analysis would be needed to investigate the reasons for these two pockets. Their proximity to the intensifying commercial and multi-residential buildings of MIT/Kendall might indicate these pockets as relatively close housing for the workers of the commercial district near the river, or perhaps displaced individuals from gentrifying neighborhoods near Kendall.

Design and Cartography: *Ian Davis*

Source: *City of Cambridge Open Data Portal*

Projection: *Massachusetts State Plan NAD 1983 (2011) FIPS US Feet*