

# SIP Dwelling Type Analysis

# THE SOCIAL INNOVATION PROJECT

Local community organizations have big goals and projects that help our community. However, the lack of time and financial resources are often barriers that limit these community organizations from exploring new opportunities or innovative ideas that can help further fuel their operations.

The Social Innovation Project aims to overcome that barrier by pairing a team of student volunteers with various local community organizations to help solve a problem identified by a community organization over a 16-week period.

## THE CCET

The Centre for Community Energy Transformation (CCET) is a non-profit organization created to provide homeowners and businesses with the tools, education, and resources needed for energy-efficient installations and retrofits throughout the region of Peel.

The CCET's mission is to promote and accelerate the move to a low-carbon emission future in Ontario communities. By providing a One-Stop Window and an Energy Coach, residents and businesses can transition through the retrofit, rebate, and financial process with ease for an energy-efficient future.

## OUR GOAL

Alongside the CCET, our team was tasked to create a dwelling-type analysis to assist homeowners in their energy retrofit journey. This data will be used to market the CCET's home retrofit program for the region of Peel and help accelerate the pace of home energy audits and retrofits done per year.

## CHALLENGES

As a very data driven project, a key challenge our team faced was the lack of open data with the required data fields for the region of Peel. A common problem was that most of the publicly accessible datasets we found covered an area too large for our project goals. We needed data for neighbourhoods within the Peel region, but many datasets we found were for Census Tracts or the entire province of Ontario.

With the help of Tony Iacobelli, the Executive Director for the CCET, we were able to gain access to Municipal Property Assessment

Corporation (MPAC) datasets for the City of Mississauga.

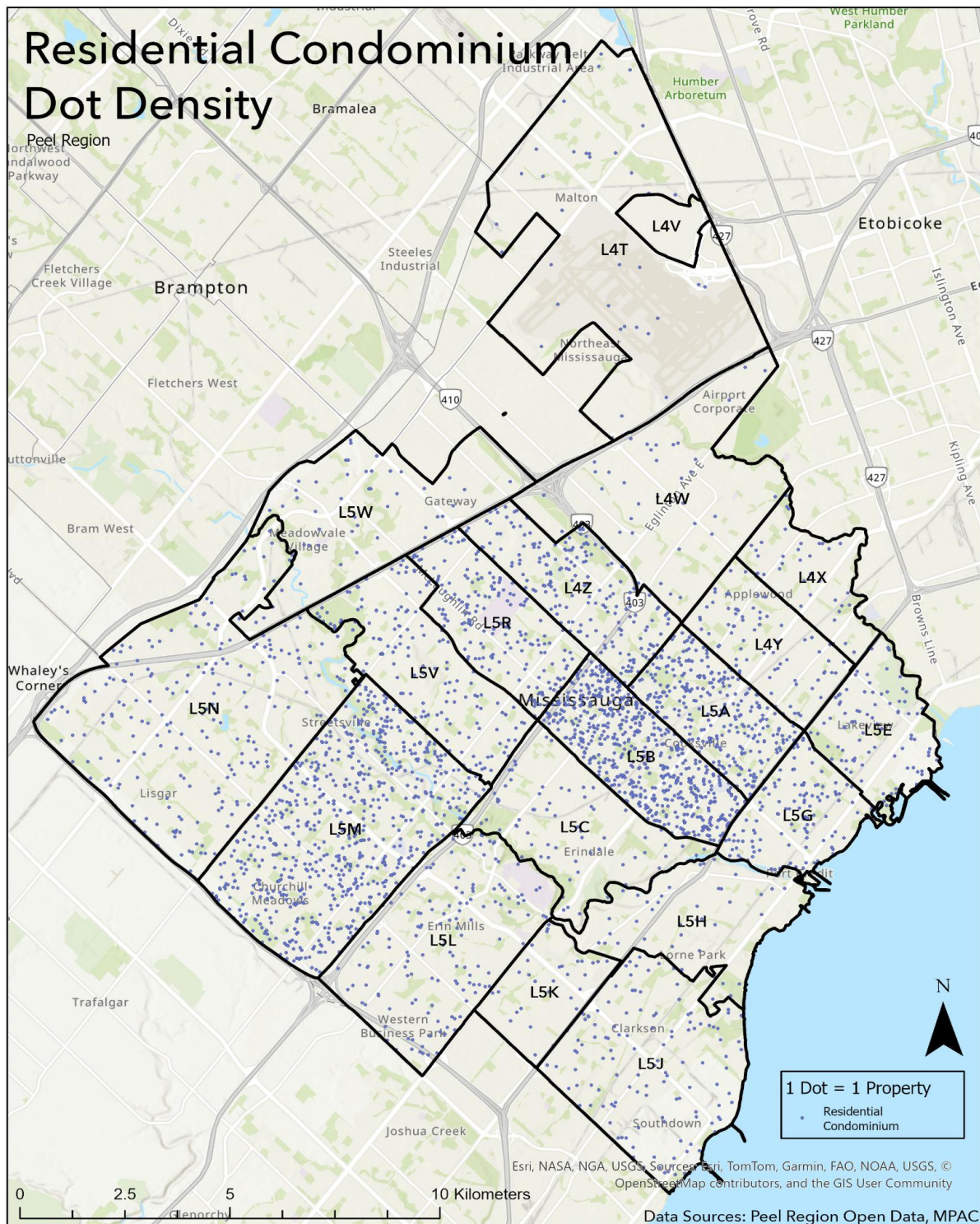
Unfortunately, we were only able to gain access during the last 3 weeks of the SIP term which limited the amount of work and time we had to process and visualize the data.



# DELIVERABLES

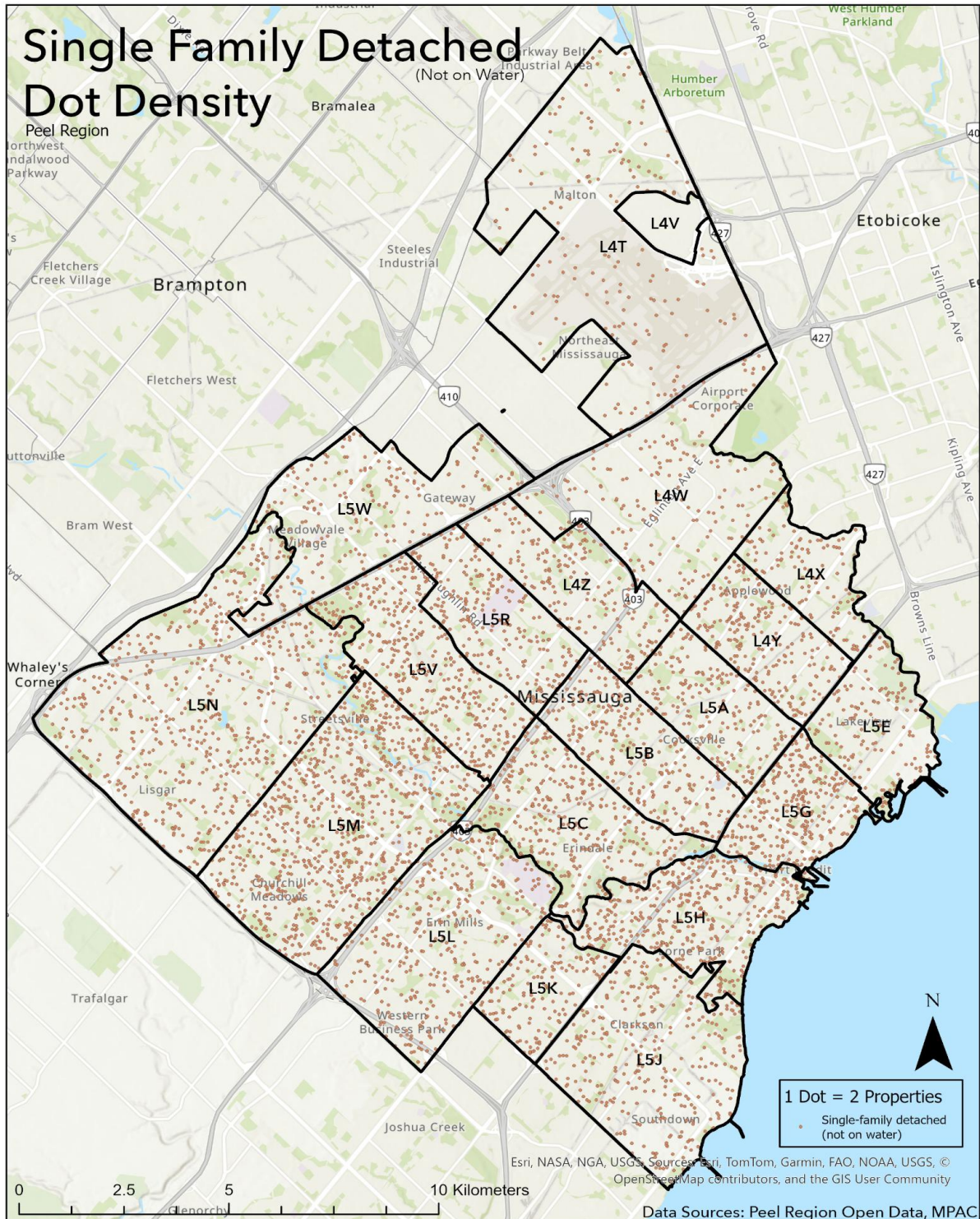
## RESIDENTIAL CONDOMINIUM

## DOT DENSITY MAP

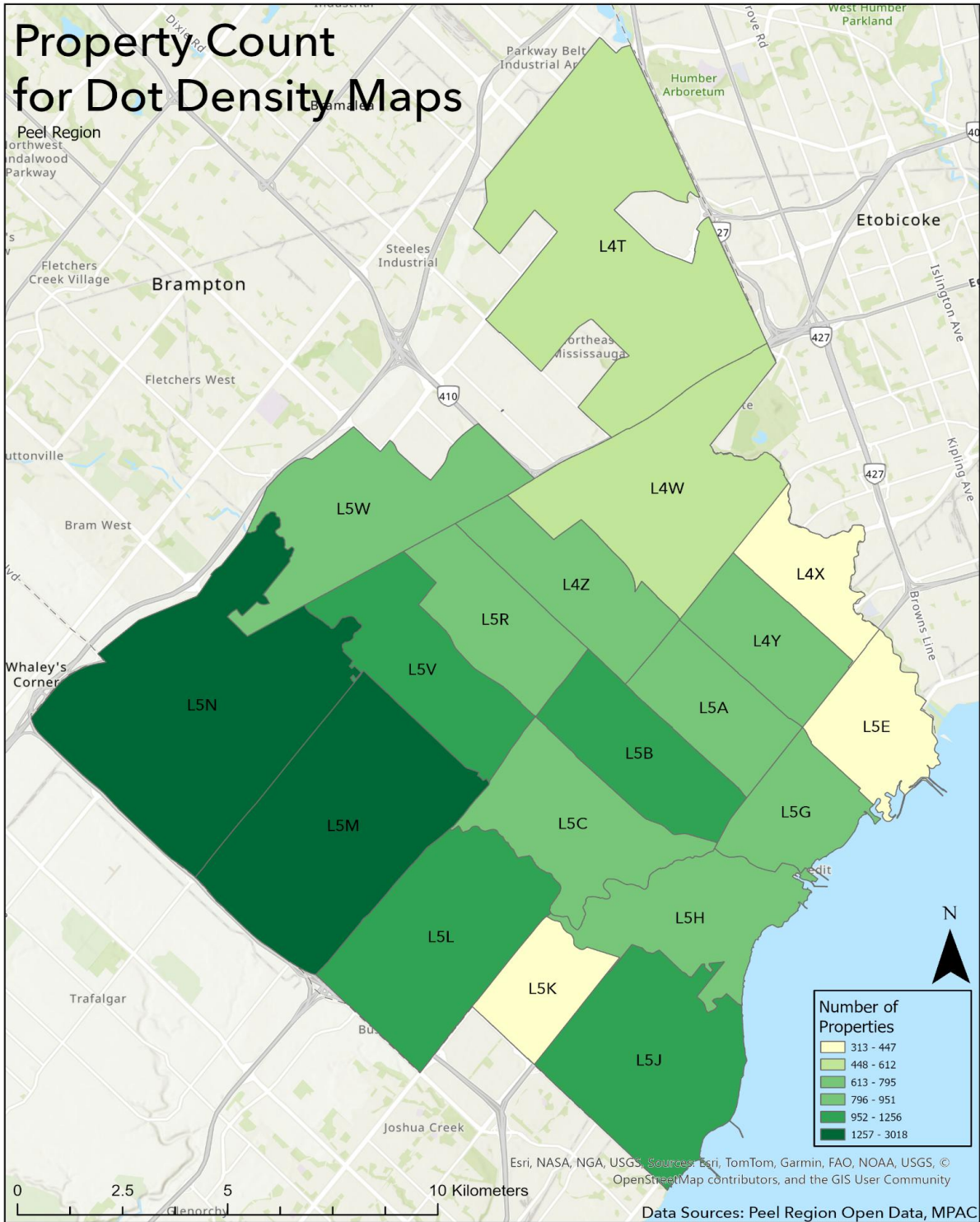




# SINGLE-FAMILY DETACHED DOT DENSITY MAP

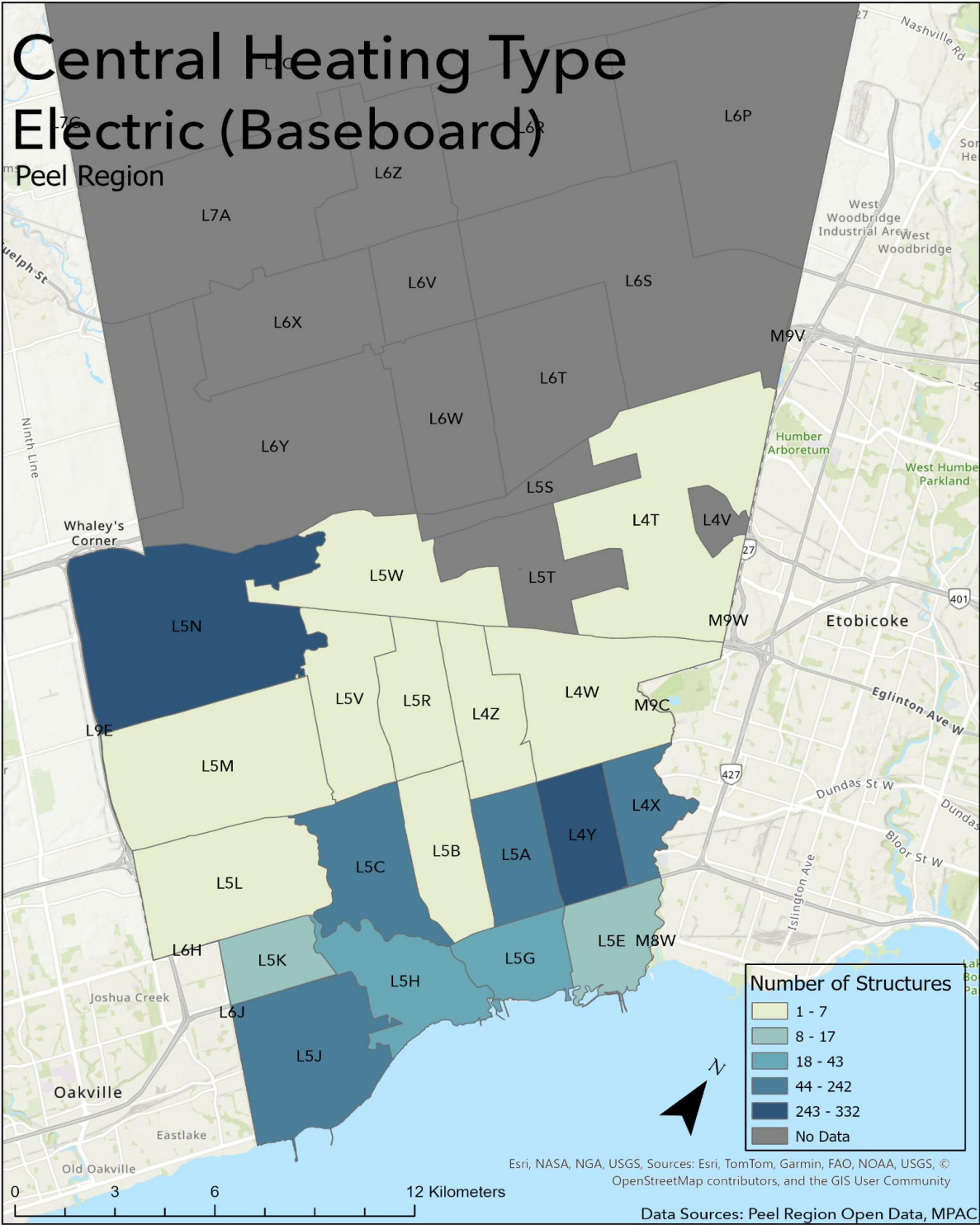


# PROPERTY COUNT FOR DOT DENSITY MAPS





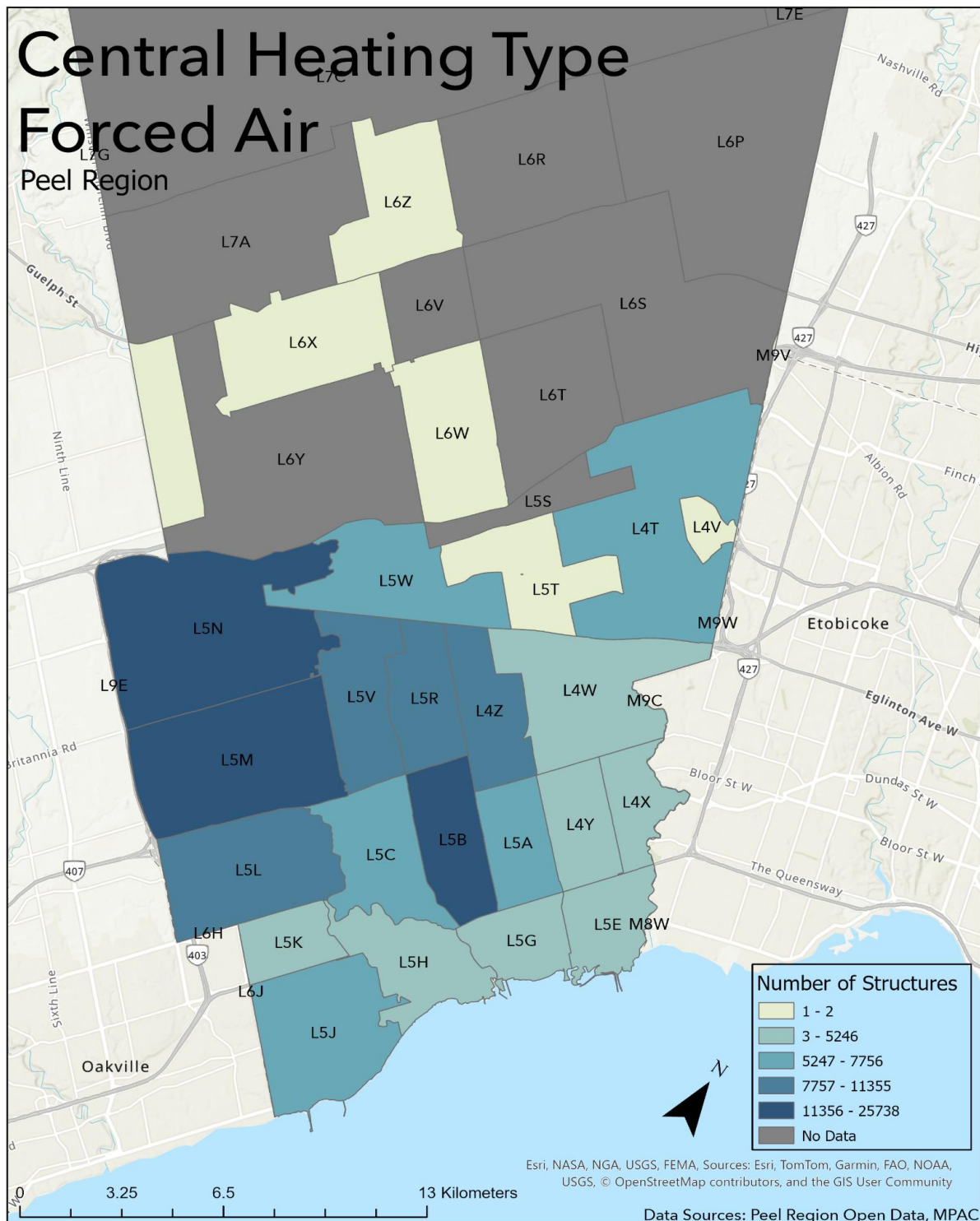
# ELECTRIC (BASEBOARD) CENTRAL HEATING MAP



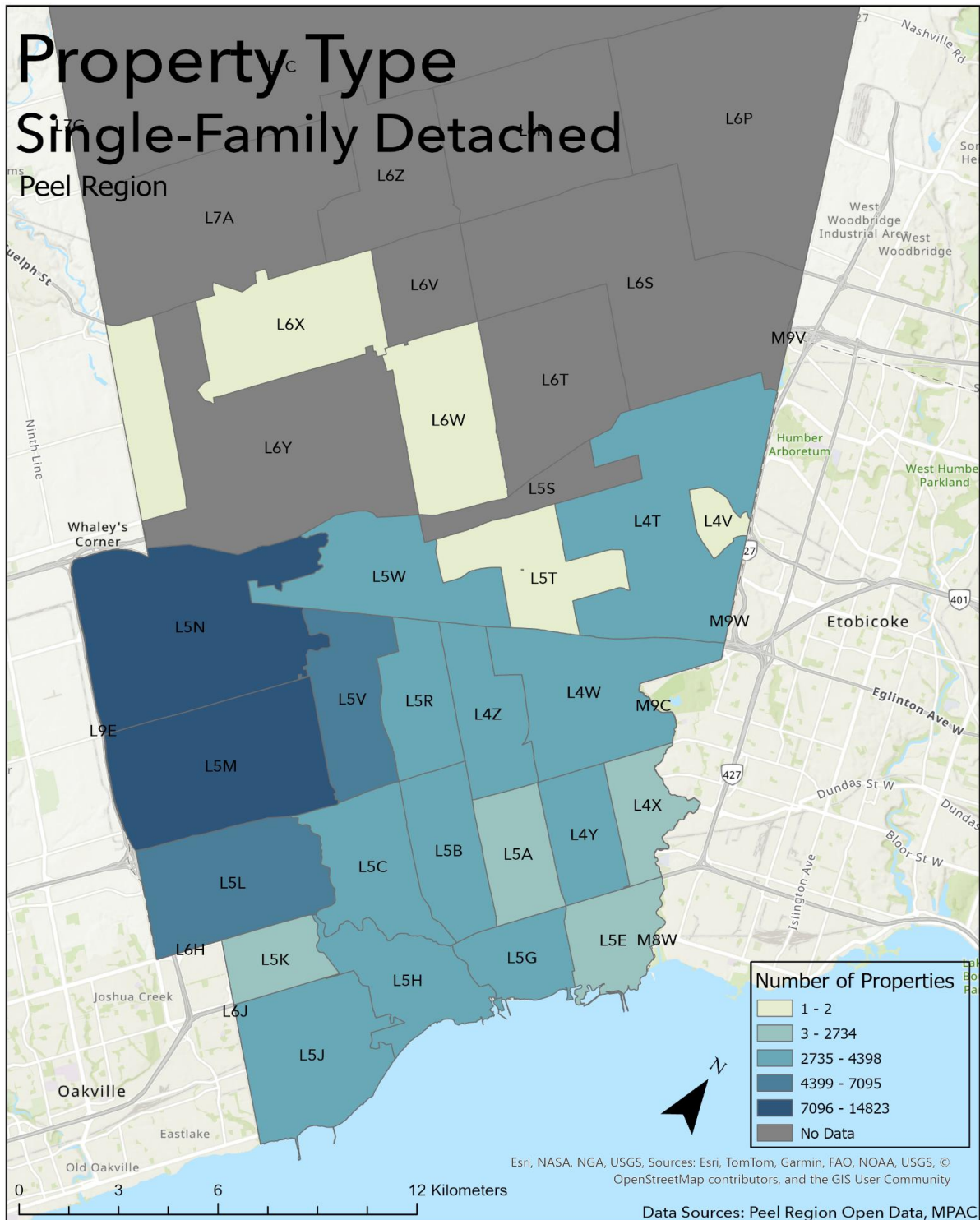


# FORCED AIR

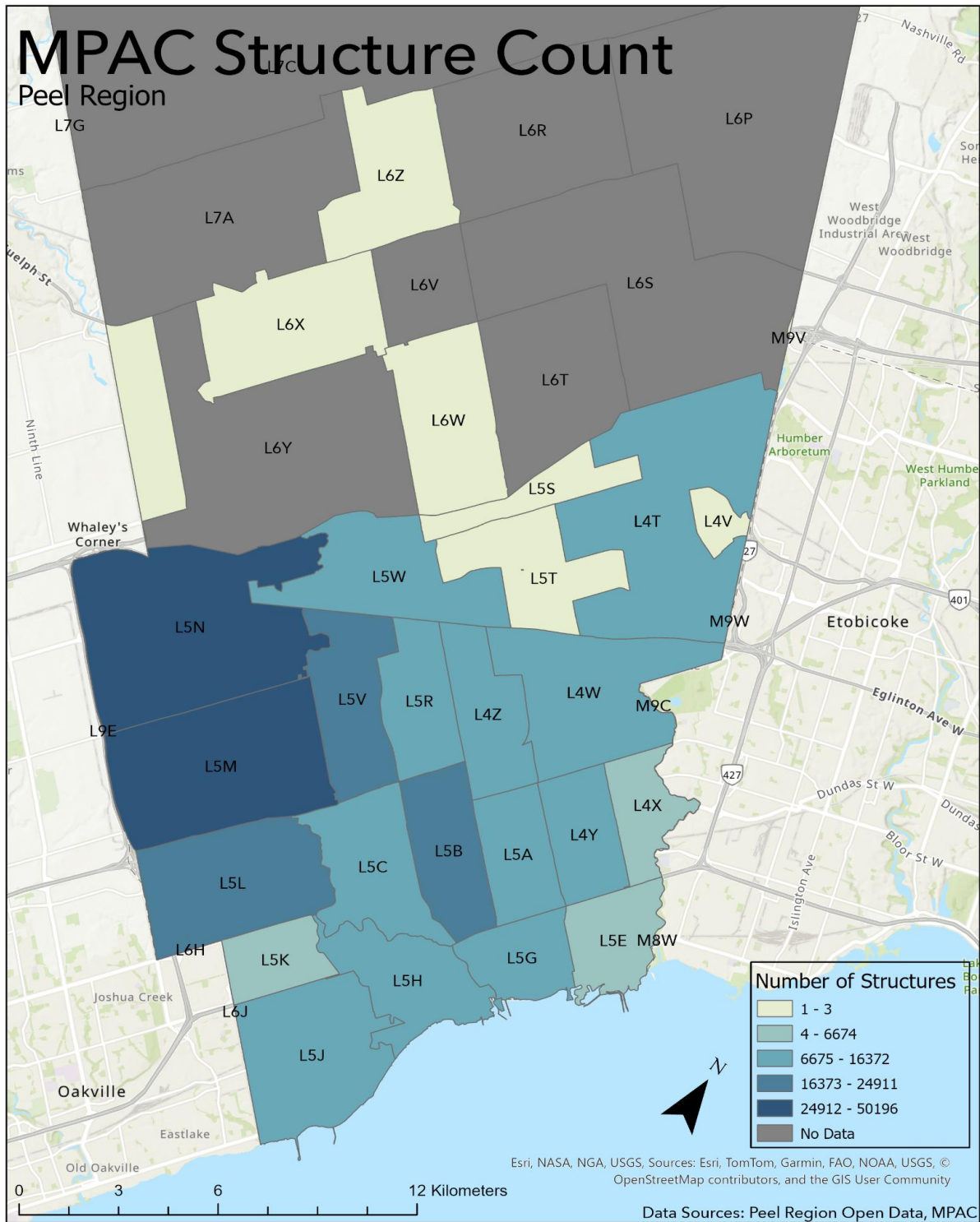
## CENTRAL HEATING MAP



SINGLE-FAMILY DETACHED  
PROPERTY TYPE



# MPAC STRUCTURE/PROPERTY COUNT MAP

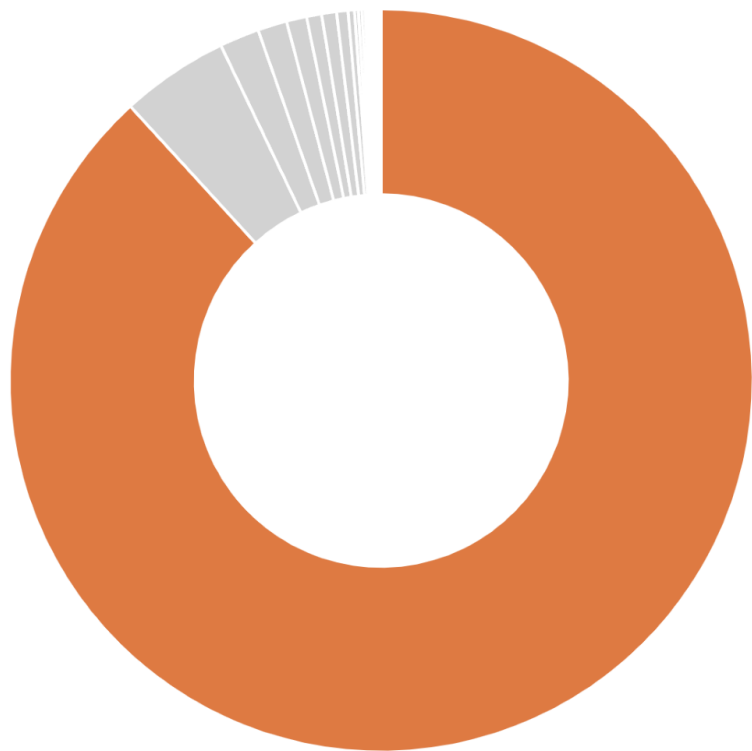




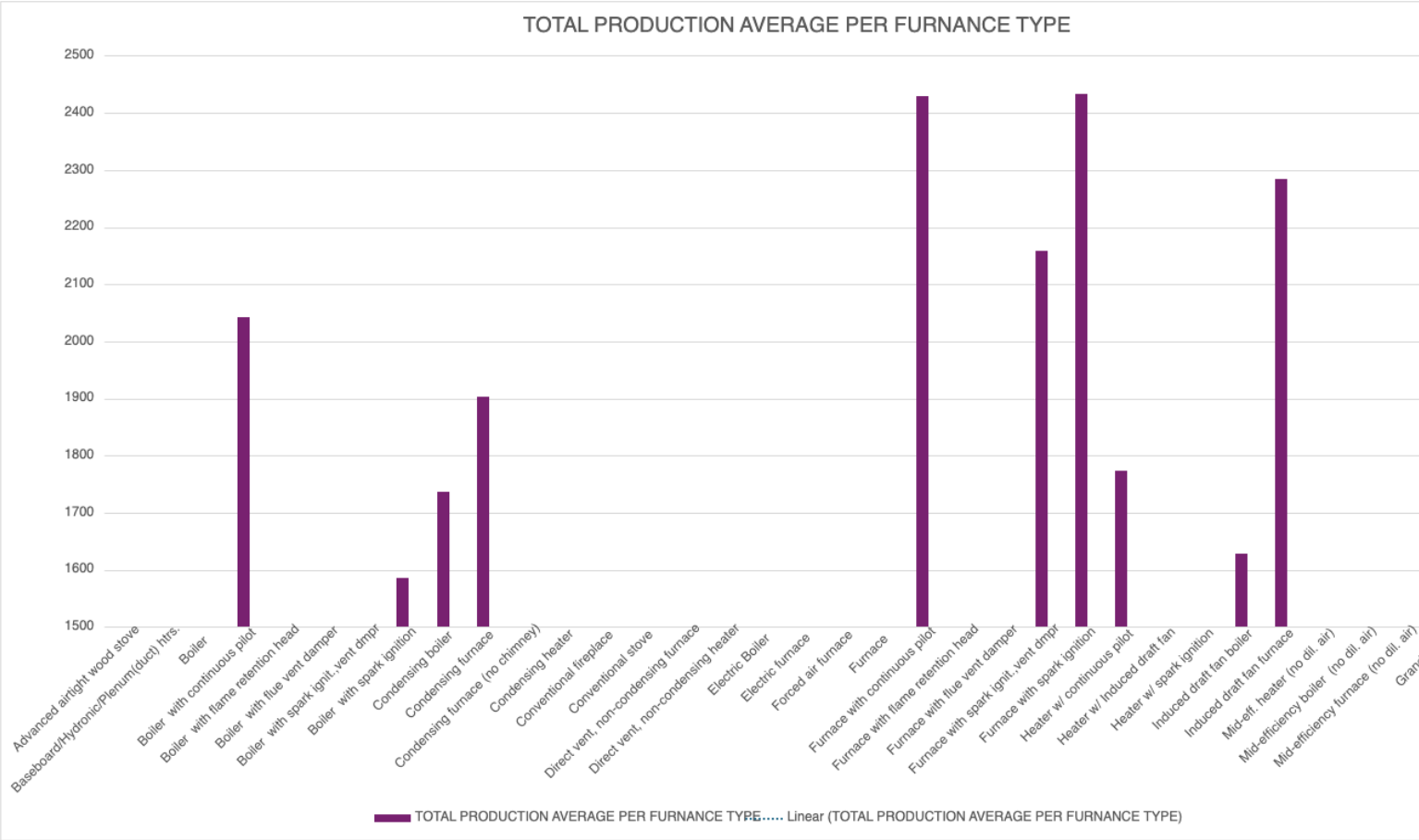
# CONDENSING FURNACE

## DATA SPREAD

'UGRFURNACETYP': Condensing furnace accounts for the majority of 'EGHFCONELEC'.



# PRODUCTION AVERAGE PER FURNACE TYPE



# Home Energy Retrofits: A Data-Driven Approach to Alleviating Energy Poverty in Peel Region

A Report Prepared for the Centre for Community Energy Transformation (CCET)

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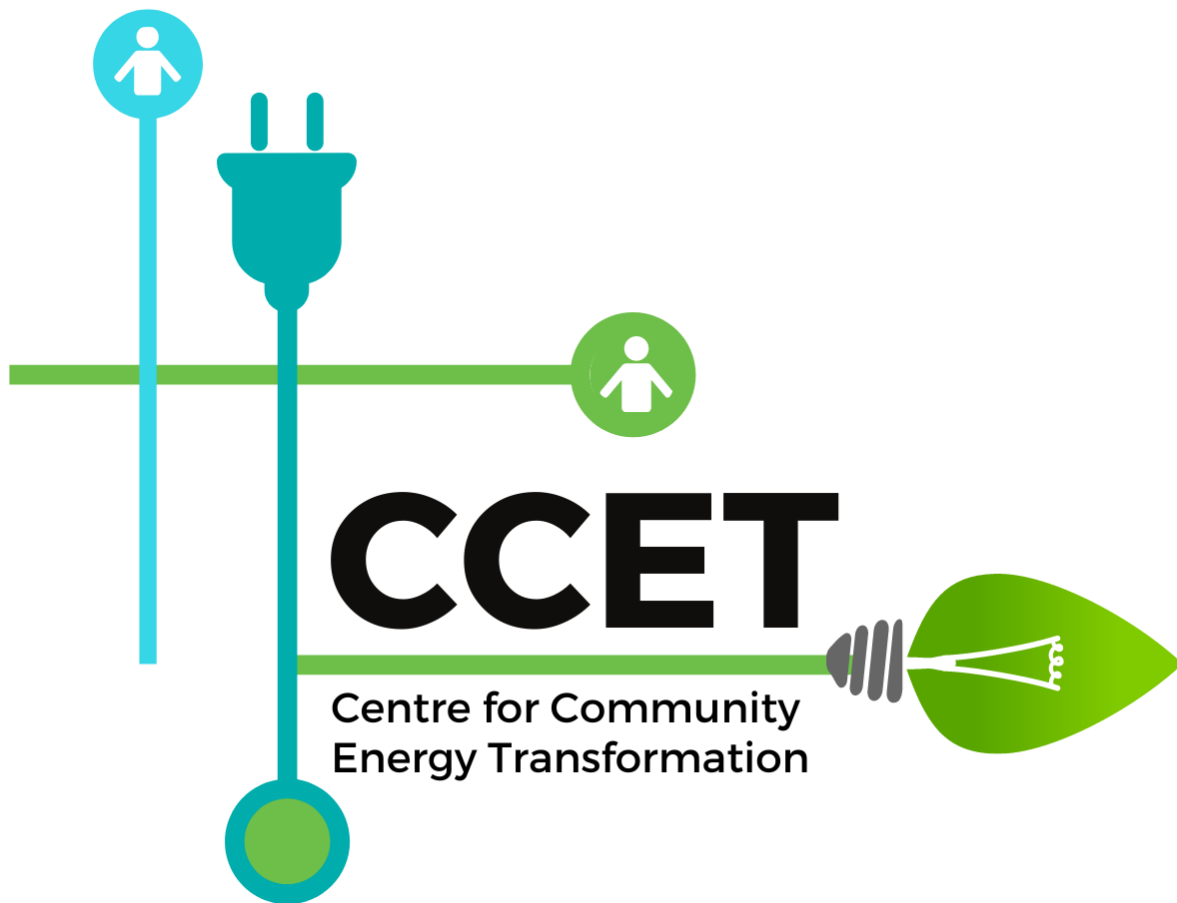
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Date: March 2<sup>nd</sup>, 2025





## Introduction:

Residential energy use is a major expense for households and a significant contributor to greenhouse gas emissions. In Canada, studies have shown that a considerable portion of low-income households struggle to pay their energy bills—for example, 43% of Nova Scotians face energy poverty (Colton, 2024). Similar challenges are evident in Ontario and other regions. In Chicago, NREL & Elevate demonstrated that advanced retrofit packages can cut energy use by over 50% in older homes, potentially saving citywide energy costs by up to \$217 million annually and reducing CO<sub>2</sub> emissions by 2.5 million metric tons (NREL & Elevate, 2022). An analysis of energy poverty initiatives in Ontario from the University of Sussex further supports the view that integrated, data-driven retrofit programs—which combine financial relief, technical upgrades, and policy advocacy—are necessary to alleviate the disproportionate energy burden on vulnerable households (Das et al., 2020).

The present study of Peel Region’s energy burden employs Geographic Information System (GIS) visualizations and a detailed dwelling-type analysis to build an evidence-based case for targeted home energy retrofits. Figures 1 and 2 illustrate property distributions for single-family detached and condominium dwellings, while

Figure 3 provides a property-type map of single-family detached homes. These visualizations are intended to highlight areas of high energy consumption and to inform strategic interventions that reduce energy costs and improve living conditions.

#### Quantifying the Energy Burden in Residential Housing:

GIS analysis of Peel Region indicates that single-family detached homes are densely located in the western part of Peel (Figure 1). These dwellings often feature older construction and less efficient building envelopes. According to the Canada Energy Regulator (2020), households in similar Canadian regions spend a higher-than-average share of their income on energy, which disproportionately affects low-income families. The Pembina Institute's Better Buildings for All likewise emphasizes that inadequate building efficiency contributes to elevated utility bills, while Nova Scotia's A Way Forward identifies that 43% of residents struggle with energy costs (Colton, 2024). The findings suggest that many single-family detached homes in Peel likely share these inefficiencies, making them prime candidates for retrofitting programs aimed at reducing energy consumption and alleviating energy poverty.

#### Data-Driven Retrofit Strategies and Their Potential Impact:

The Chicago case study by NREL & Elevate (2022) demonstrates how strategic, data-driven retrofits in older housing stock can yield over 50% energy savings. Their ResStock™ energy modeling approach showed that five prioritized housing types—comprising over 75% of Chicago's residential buildings—could deliver annual energy savings of up to 50 million mmBTUs, reduce utility bills by as much as \$1,500 per household, and cut CO<sub>2</sub> emissions by 2.5 million metric tons. Das et al. (2020) further note that successful retrofit programs in Ontario incorporate both financial support and community prioritization, ensuring that the most vulnerable households receive immediate and meaningful benefits. Applying similar methodologies in Peel Region could help identify neighborhoods with the greatest need, as shown in Figures 2 and 3, and facilitate targeted retrofits capable of producing measurable reductions in both costs and emissions.

#### Detailed Energy Burden Analysis by Dwelling Type in Peel Region:

Using data from Statistics Canada (Table 25-10-0061-01), analysis was performed on household energy consumption across various dwelling types in Peel Region. The data categorizes residential units into single-detached homes, duplexes, row or terrace houses, low-rise and high-rise apartments, mobile homes, and other unclassified structures. Our analysis focused on the average annual electricity (in gigajoules, GJ) and gas consumption (in GJ) for each category. For instance, single-detached homes were found to consume an average of 36.1 GJ of electricity and 86.5 GJ of gas annually, which is significantly higher than that of high-rise apartments (20 GJ

electricity and 72.7 GJ gas). These consumption patterns reflect the impact of building age, construction type, and heating method on energy demand.

To translate these consumption figures into economic terms, we applied cost calculations based on regional billing methods. Electricity costs were computed using a formula derived from Alectra's billing method for the Brampton area—ensuring consistency across Peel Region—while gas costs were calculated using the Ontario Energy Board's (OEB) natural gas bill calculator, which reflects Enbridge's pricing. These methods allowed us to estimate the energy cost burden per household. Our findings indicate that the higher consumption observed in single-detached homes, largely due to their reliance on gas-fired hot water heating systems, places a disproportionate financial burden on low-income households. This detailed analysis is consistent with the evidence presented in Nova Scotia's *A Way Forward* (Colton, 2024) and the Pembina Institute's *Better Buildings for All*, both of which underscore that inefficient, older dwellings contribute significantly to elevated energy expenses. Moreover, the Chicago case study by NREL & Elevate (2022) reinforces that targeted retrofits can deliver substantial savings—upwards of 50% energy reductions—which supports the argument for implementing similar programs in Peel. Das et al. (2020) further highlight that integrated approaches combining technical upgrades with financial support are critical to addressing energy poverty, a finding that is borne out by our cross-sectional data.

#### Conclusion:

The evidence suggests that older, single-family detached dwellings in Peel Region are likely to incur disproportionately high energy costs, mirroring findings from Nova Scotia's *A Way Forward* (Colton, 2024), the Pembina Institute's *Better Buildings for All*, and NREL & Elevate's (2022) Chicago case study. GIS visualizations and consumption data point to significant opportunities for targeted retrofit programs that focus on older building envelopes and outdated heating systems. Retrofits informed by robust data—such as the approaches outlined by Das et al. (2020)—have the potential to reduce energy consumption by more than 50%, yielding substantial cost savings and carbon emission reductions.

These findings provide a strong foundation for the Centre for Community Energy Transformation (CCET) to pursue funding for large-scale retrofit initiatives. By identifying the specific dwelling types and neighborhoods that stand to benefit most, policymakers and stakeholders can implement equitable, cost-effective programs. Such efforts are essential for improving living conditions, alleviating the financial strain of energy bills on vulnerable populations, and advancing regional climate objectives.







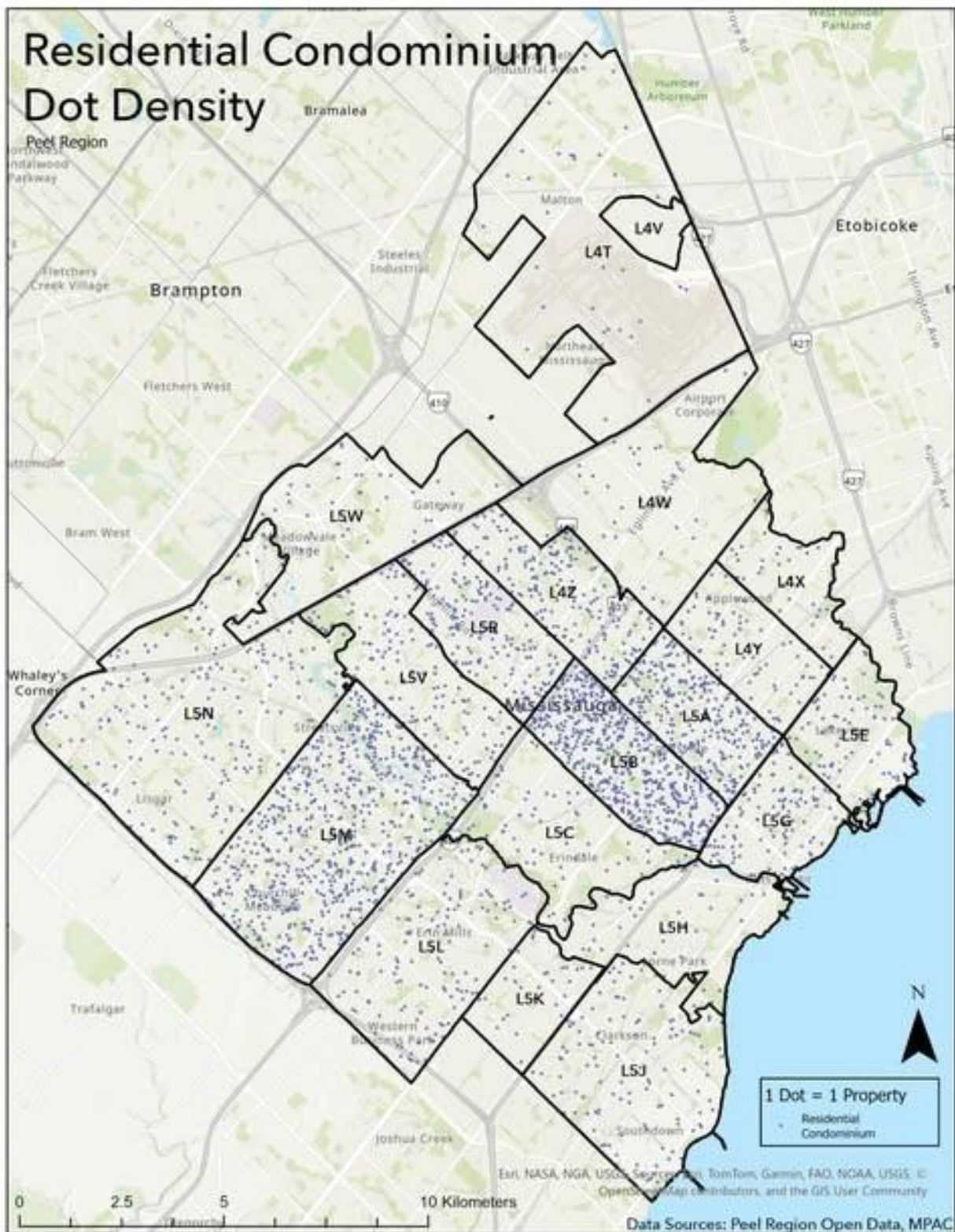


Figure 2

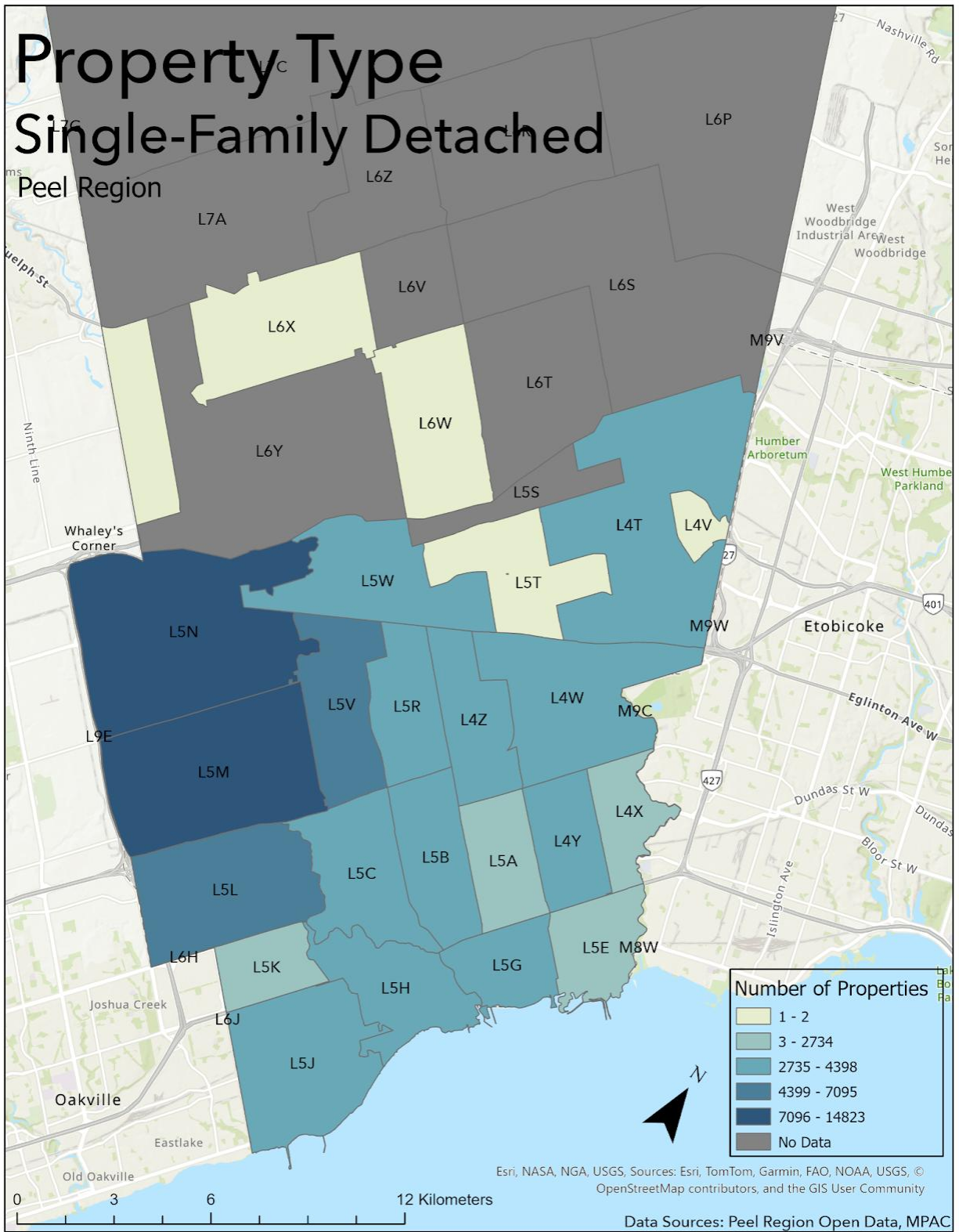


Figure 3



## References

Canada Energy Regulator. (2020). *Market Snapshot: Household Energy Expenditures Vary Significantly by Province/Territory*. <https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2020/market-snapshot-household-energy-expenditures-vary-significantly-province-territory.html>

Colton, R. (2024). *A Way Forward: A Made-in-Nova Scotia Home Energy Affordability Program*.

Das, R. R., Martiskainen, M., Bertrand, L. M., & MacArthur, J. L. (2020). *A Review and Analysis of Initiatives Addressing Energy Poverty and Vulnerability in Ontario, Canada*. University of Sussex.

NREL & Elevate. (2022). *Achieving 50% Energy Savings in Chicago Homes: A Case Study for Advancing Equity and Climate Goals*.

Pembina Institute. (2024). *Better Buildings for All*.

Statistics Canada. (n.d.). Table 25-10-0061-01: Household Energy Consumption by Type of Dwelling, Canada and Provinces. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2510006101>

# OUR PROJECT

## APPLICATION TO

## CCET

- Provide CCET with resources for grant proposal writing
- Highlight geographical areas to prioritize home retrofits
- Visualize the spread of dwelling types to cater home retrofits to the homeowner's needs

## FUTURE

## RECOMMENDATIONS

- Provide reference for future analysis
- Complete Caledon area analysis using similar steps and methodology
- Integrate the ArcGIS environment alongside current resources to visualize datasets in an easy to digest manner