

# Net Zero Energy Residential Development on Beverley St

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## Problem Statement

200 Beverley Street is a 5.2 hectare brownfield in Guelph, Ontario. Brownfields are defined as properties that are vacant or underutilized but have been impacted negatively by the previous uses of the site. The redevelopment of brownfields is important as it can lead to significant economic, environmental and social benefits in the area where the brownfield is located.

## Objectives

The objective of this project is to prepare a post-remediation design plan for a net zero energy medium density residential neighborhood. This includes the following:

- Designing site-specific sustainable energy generation
- Determining target energy conservation requirements needed and select methods to achieve net zero energy
- Implementing on-site facilities in accordance with City of Guelph by-laws

## Design Solution

The design solution revolved around the general principal of energy conservation. The design maximized the generation of clean energy through the use of photovoltaic solar panels while minimizing the energy usage by designing the apartment complexes to be more efficient. Thicker insulation, energy-saving appliances, triple glazed windows, and a drain water heat recovery system were all used to aid in conserving energy.

## Results

### Energy Generation

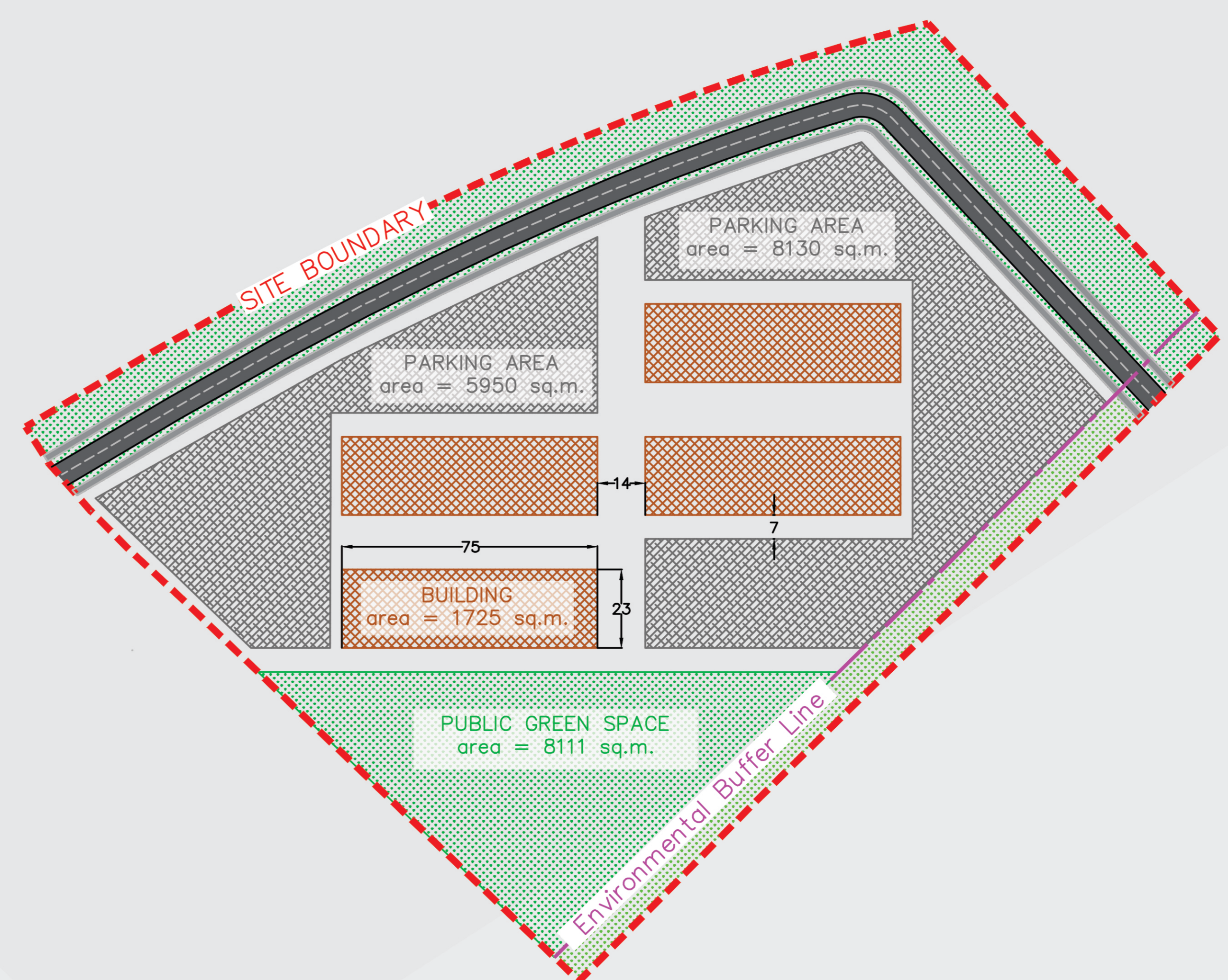
Location	# of Solar Panels	Energy Generation (GJ)	Energy Generation (kWh)
Rooftop	2484	2528	702 222
Parking Lot	3440	3498	971 666
Apartment Walls	904	647	179 722

### Energy Conservation

Usage Component	Energy Usage (GJ)	Energy Usage (kWh)	Reduction (%)
Space Heating	1647	457 559	75
Water Heating	2676	743 258	32
Appliances	962	267 206	59
Lighting	124	34 320	42
Space Cooling	123	34 294	60

### Energy Balance

Energy Generated (GJ)	Energy Used (GJ)	Difference (GJ)	Reduction (%)
6673	5532	1141	58.5



## Conclusion

In conclusion, the development has the potential for a positive net energy output of 1141 GJ. This is achieved through the use of photovoltaic solar panels in combination with various energy conservation methods.

City of Guelph, "Section 4 - General Provisions," 1995. [Online]. Available: <https://guelph.ca/wp-content/uploads/Section4GeneralProvisions.pdf>. [Accessed 14 Jan 2019]. City of Guelph, "Section 5 - Residential Zones," 1995. [Online]. Available: <https://guelph.ca/wp-content/uploads/Section5ResidentialZones.pdf>. [Accessed 12 Jan 2019]. Ministry of the Environment, Conservation and Parks, "Brownfields redevelopment," 24 January 2019. [Online]. Available: <https://www.ontario.ca/page/brownfields-redevelopment>. [Accessed 12 February 2019]. Natural Resources Canada, "Survey of Household Energy Use 2011 - Detailed Statistical Report," 2011. [Online]. Available: <http://oee.nrcan.gc.ca/publications/statistics/sheu/2011/pdf/sheu2011.pdf>. [Accessed 12 Feb 2019].