



# CanmetENERGY

*Leadership in ecoInnovation*

## THE URBAN ARCHETYPES PROJECT

### Community Case Study: The City of Lethbridge

The Urban Archetypes Project, initiated by Natural Resources Canada's CanmetENERGY in Ottawa, investigated 31 neighbourhoods<sup>1</sup> in 8 communities<sup>2</sup> to explore the linkages among urban form, lifestyle patterns of residents and energy consumption.

The project developed energy profiles for average households within each neighbourhood for personal vehicles, household heat, hot water, and electricity for lighting and appliances. It also investigated the influence of urban design, neighbourhood location and lifestyle variables on average household vehicle travel and associated energy consumption. Communities in the project reflected a range of sizes, geographical regions, climates, energy sources and energy efficiency issues.



This fact sheet, one in a series of eight **community case studies**, presents the results for four neighbourhoods in the city of Lethbridge as studied in 2007: London Road, Paradise Canyon, Park Meadows and Tudor Estates.

This research project used *The Urban Archetypes Project Methodology*,<sup>3</sup> which allows for a comparative analysis of energy consumption of typical households in different neighbourhoods in the same community. A further analysis of all of the project's neighbourhoods (31) will be presented in *The Urban Archetypes Project Analysis*. These documents will be posted to [www.canmetenergy.nrcan.gc.ca](http://www.canmetenergy.nrcan.gc.ca) as they become available.

The Urban Archetypes Project is among the first to explore, in an integrated fashion, the energy implications of land use, infrastructure and building decisions through case studies that present quantitative energy information in a neighbourhood context. In so doing, this project begins to address a significant gap in Canadian community energy-planning practice. Building on the findings of this project, CanmetENERGY, with project collaborators, will continue to work to provide energy information to assist Canadian communities in making strategic energy-planning decisions.

The **city of Lethbridge** is located in southern Alberta at 49°31'38" north latitude and 112°49'58" west longitude, approximately 100 kilometres (km) from the U.S. border. Covering just under 125 km<sup>2</sup>, the city is divided geographically by the Oldman River. Lethbridge traces its beginnings to the mid-19th century with the founding of the Fort Hamilton, or Fort Whoop-Up, trading post, followed by coal mining

and agriculture in the 20th century. Today, Lethbridge has a population of 83 960 and is the commercial, financial and industrial hub of southern Alberta.<sup>4</sup>

The city has a moderate continental climate, with an average maximum temperature of 12.3°C in July and an average minimum temperature of -1.0°C in January. With 264 dry days on average, Lethbridge is the second driest city in Canada.

<sup>1</sup> The term neighbourhood, as used in this project, denotes an area approximately 300 dwelling units in size and of relatively homogenous urban form; a neighbourhood could vary in size geographically.

<sup>2</sup> The term community, as used in this project, refers to the same scale as the municipality.

<sup>3</sup> Definitions of measures and indicators can be found in *The Urban Archetypes Project Methodology*. [www.canmetenergy.nrcan.gc.ca](http://www.canmetenergy.nrcan.gc.ca)

<sup>4</sup> Lethbridge. [www.lethbridge.ca/home/default.htm](http://www.lethbridge.ca/home/default.htm) and [en.wikipedia.org/wiki/Lethbridge](http://en.wikipedia.org/wiki/Lethbridge)

It is also the second windiest city in the country, due to the average 116 days when wind speeds are 40 km/h or higher. Its high elevation of 929 metres (m) and close proximity to the Rocky Mountains give Lethbridge cooler summers than elsewhere in the Prairies. In contrast, winters in Lethbridge are among the warmest in the region, with strong northwest and southwest winds contributing to chinooks that reduce the frequency and duration of cold periods.

Most houses rely on natural gas for space and water heating, and most electricity is generated by natural gas or coal. In 2006, Lethbridge became a partner in the Southern Alberta Alternative Energy Partnership, which promotes business in the region related to alternative energy, including wind power, solar power and biofuels.

## NEIGHBOURHOOD DESCRIPTIONS

### LONDON ROAD



**London Road** boasts some of Lethbridge's oldest dwellings, many from the late 19th and early 20th centuries. Located on the south side of Lethbridge, the neighbourhood is considered an attractive central residential area, being close to downtown with an eclectic mix of housing ranging in age, size, setback and condition. Within the neighbourhood, the study area is bounded by 10th Street South to the west, 6th Avenue South to the north, 13th Street South to the east and 9th Avenue South to the south. Homes were built and in-filled during each decade of the 1900s, including multi-unit dwellings in later years. Many of the older, larger homes have been divided into multiple-unit apartment buildings or renovated to contain basement or upper suites, often unpermitted. With the increase in housing prices, many older homes have been renovated inside and out.

The conventional grid layout includes sidewalks along both sides of each street. The roads and sidewalks are generally in good condition. Back alleys characterize the area, with small garages tucked into the backs of homes. There are several pocket or corner parks and one larger central park with tennis courts, a playground and a neighbourhood grocery across the road. Mature vegetation and impressive tree-lined streets with elms and ash dominate. Recent studies indicate that the trees are important to residents. The neighbourhood varies socio-economically, ranging from renters to long-established families and retirees. Schools are generally within walking distance.

### PARADISE CANYON



**Paradise Canyon** is located in the extreme southwest of Lethbridge, several kilometres from the nearest suburban development. It is surrounded by agricultural areas and is uniquely situated beside the Oldman River. The study area consists of homes on Canyon Boulevard West and Canyon Close West. The neighbourhood includes homes constructed since the mid-1990s and the Paradise Canyon Golf Course. Homes in the golf course area are fourplex and duplex condos, while those located upland are large single-family homes and duplexes. Other than the public restaurant in the golf clubhouse, there are no services or schools. Retail, recreation centres and institutions are several kilometres away.

Beautiful river-valley canyon and prairie views are enhanced by the exterior finishes of homes that mimic the surrounding sand and dry prairie vegetation. A main boulevard leads through the upland subdivision, with culs-de-sac and crescents providing access to properties off this main road. There are park areas off the main roadways and along culs-de-sac. Because the neighbourhood is new, the infrastructure is in excellent condition. In keeping with naturally dry prairie conditions, some good examples of xeriscaping can be seen. The area residents have higher-than-average incomes and rates of home ownership.

## PARK MEADOWS



Constructed in the 1970s, homes in **Park Meadows** consist of smaller single-family dwellings and duplexes, bordered by multi-unit town homes along the main surrounding streets. Park Meadows Boulevard provides access to the neighbourhood's crescents and culs-de-sac. This roadway sweeps from the western part of the neighbourhood – where there is a major commercial hub of grocery stores, retail stores, recreational facilities and a large high school – to the arterial road at the eastern edge of the neighbourhood, which separates the subdivision from the city's major industrial area. Within Park Meadows, the study area is bounded to the west by 23rd Street North, to the north by Eagle Road North, to the east by 28th Street North and to the south by Honeysuckle Road North.

Trees in Park Meadows are becoming larger, although most of these are in yards, rather than along public road rights-of-way or parkland. Housing conditions are generally good, but up keep ranges widely. The demographic profile of the neighbourhood includes a higher proportion of renters than in newer areas of the city, with some residents identifying proximity to work in the industrial park as a primary reason for choosing the neighbourhood.

## TUDOR ESTATES

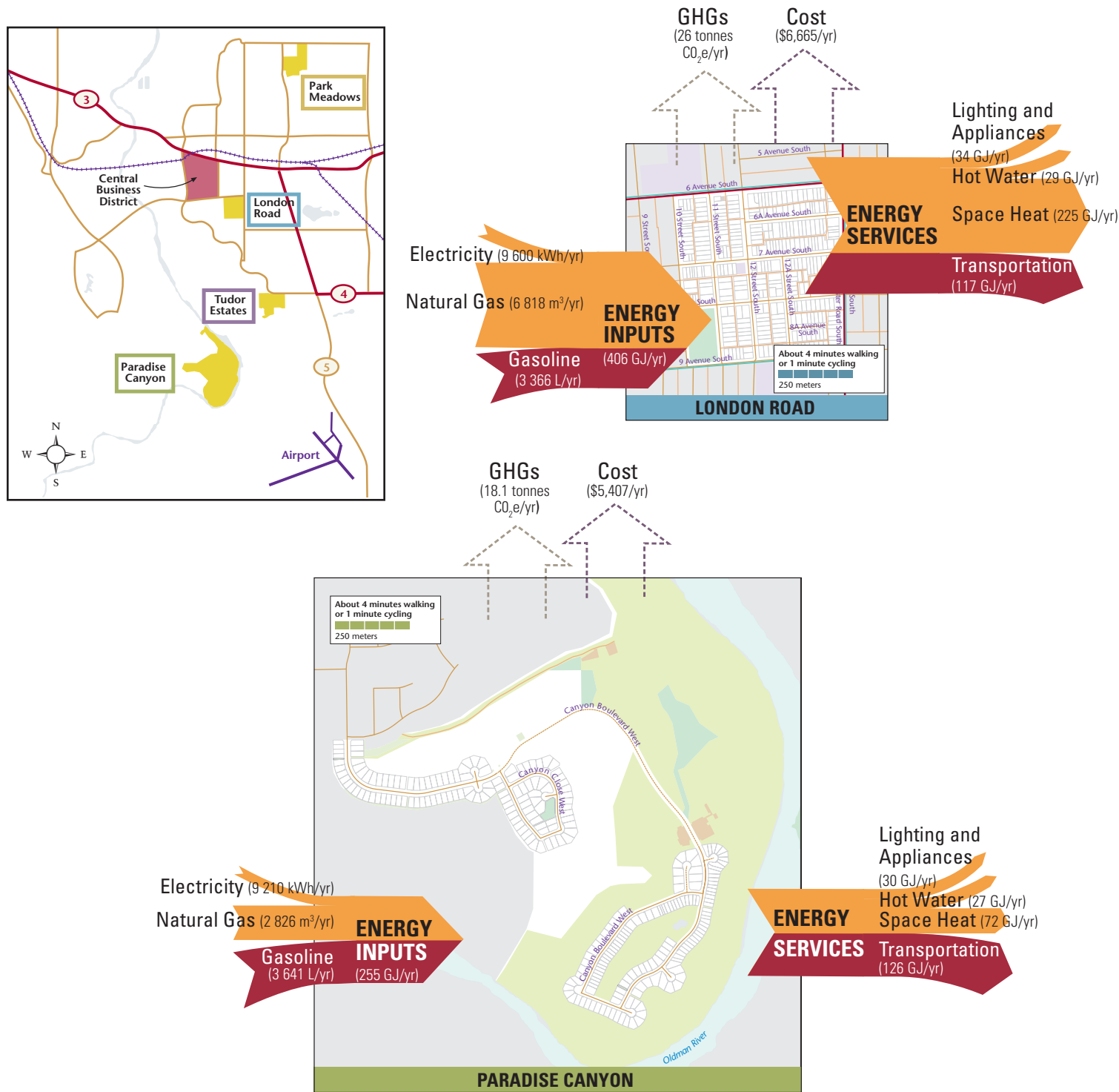


As its name implies, this planned neighbourhood from the mid-1980s is characterized by large single-family dwellings of post-and-beam construction, with stucco facades, wood features and accessory buildings. **Tudor Estates** is adjacent to the river valley coulees, resulting in expansive prairie and river-valley views to the south and west, and abuts Lethbridge College and the city's major sports complex to the south and east. North of the subdivision, separated by one of the city's major thoroughfares, are older neighbourhoods. The study area is bounded by Kings Road South to the west, Scenic Drive South to the north, College Drive South to the east and Tudor Boulevard South and Kings Crescent South to the south.

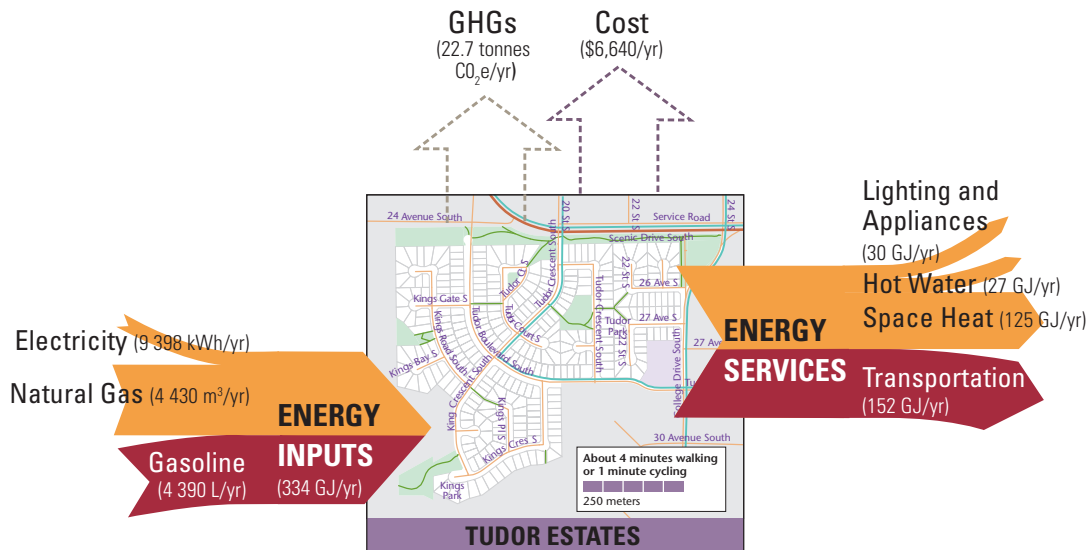
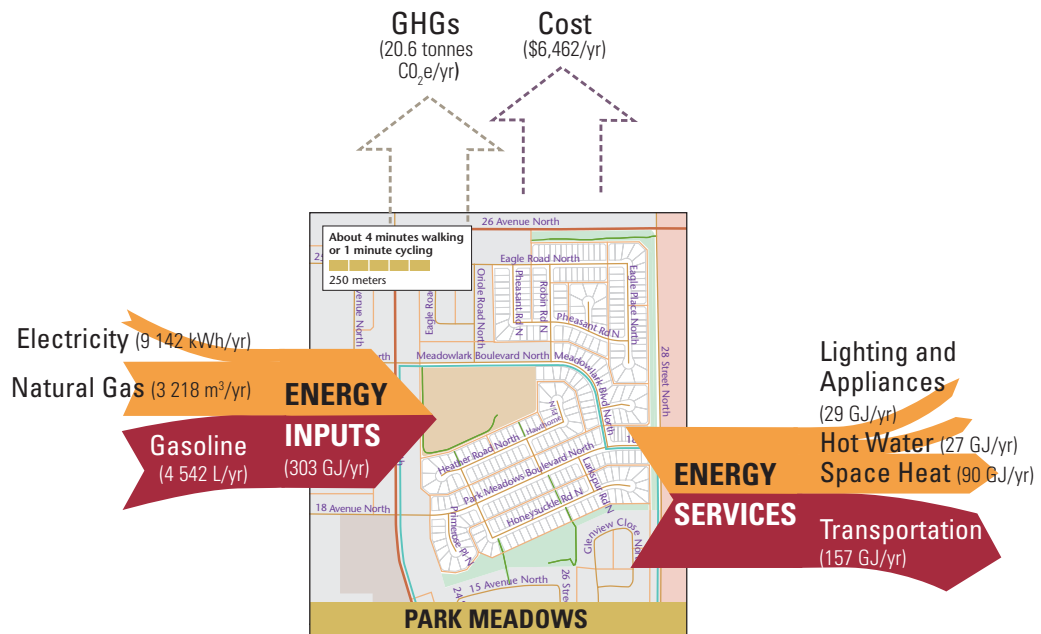
Tudor Estates has a church and several small playground-parks. It is about 5 km from some of the city's major commercial big-box stores and strip malls with motels, restaurants and retail services. Tudor Boulevard loops its way through the subdivision, with curving crescents and culs-de-sac leading from this main roadway. The area is well kept, with renovations to yards and exteriors beginning to be evident. Residents are relatively affluent, with an increasing number of empty nesters as older children leave home. Despite proximity to Lethbridge College, the area does not generally provide student accommodation because there are no multi-units and few rentals. The local elementary school is within walking distance, although the most direct route is across a major arterial road.

### SUMMARY OF ENERGY INPUTS AND SERVICES

The Sankey-style graphics summarize a representative household’s annual energy inputs and services.<sup>5</sup> The proportional scale between neighbourhoods is accurate and is reflected in the different sizes of the maps and arrows. More detailed source data for housing and transportation follow.



<sup>5</sup> Values in the Sankey diagrams correspond with total household energy consumption modelled for the following representative house types in Lethbridge: London Road B, Paradise Canyon A, Park Meadows A, Tudor Estates A.



**Legend for Area Maps**

- |                                  |                   |              |                            |                         |
|----------------------------------|-------------------|--------------|----------------------------|-------------------------|
| Residential                      | Retail/Commercial | Municipal    | Arterial (with sidewalks)  | Roads without sidewalks |
| Study area with residential lots | Industrial        | Recreational | Collector (with sidewalks) | Alleys                  |
|                                  | Institutional     | Parkland     | Local (with sidewalks)     | Pathways                |
|                                  |                   | Water        |                            | Bike lanes, bike paths  |
|                                  |                   |              |                            | Bus routes              |

## ENERGY USE IN HOUSES

The amount of energy used to provide the energy services of space heating, domestic water heating, lighting and appliances can vary substantially from house to house. Factors influencing household energy consumption include levels of insulation and air tightness, efficiency of mechanical systems for space heating

and hot water, choice of lighting and appliances, size of house, and occupant lifestyles.

Energy use in common house types<sup>6</sup> found within the study areas in Lethbridge ranged from 100 gigajoules (GJ) to 289 GJ per year.



<sup>6</sup>Analysis was derived from ecoENERGY Retrofit – Homes (formerly EnerGuide for Houses) records within the study areas. A generalized profile for each representative house type was simulated using HOT2000\* software and compared with the regional building archetype. Default values for house temperature and internal gains were used, and occupancy was determined by interview; Parekh, Anil. 2005. "Development of Archetypes of Building Characteristics Libraries for Simplified Energy Use Evaluation of Houses." Ninth International Building Performance Simulation Association Conference, Montréal.

\*HOT2000 is an official mark of Natural Resources Canada.

For homes heated with natural gas, this use ranged from 2033 to 6818 cubic metres per year for space heating and hot water. Electricity use ranged from 8965 to 9600 kilowatt hours per year for lighting and appliances. Given this consumption,

energy costs<sup>7</sup> ranged from \$1,570 to \$3,353 per year for the combined use of natural gas and electricity. Associated greenhouse gas (GHG) emissions<sup>8</sup> ranged from 8.0 tonnes to 17.9 tonnes of carbon dioxide equivalent (CO<sub>2</sub>e) per year.



<sup>7</sup> Average costs were calculated using available price data for Alberta: natural gas (33.258 ¢/m<sup>3</sup>, 2007 average) and electricity (11.52¢/kWh, 2006 average).

<sup>8</sup> GHG emissions were determined using the marginal fuel factors for the region developed by Environment Canada, as used in HOT2000.

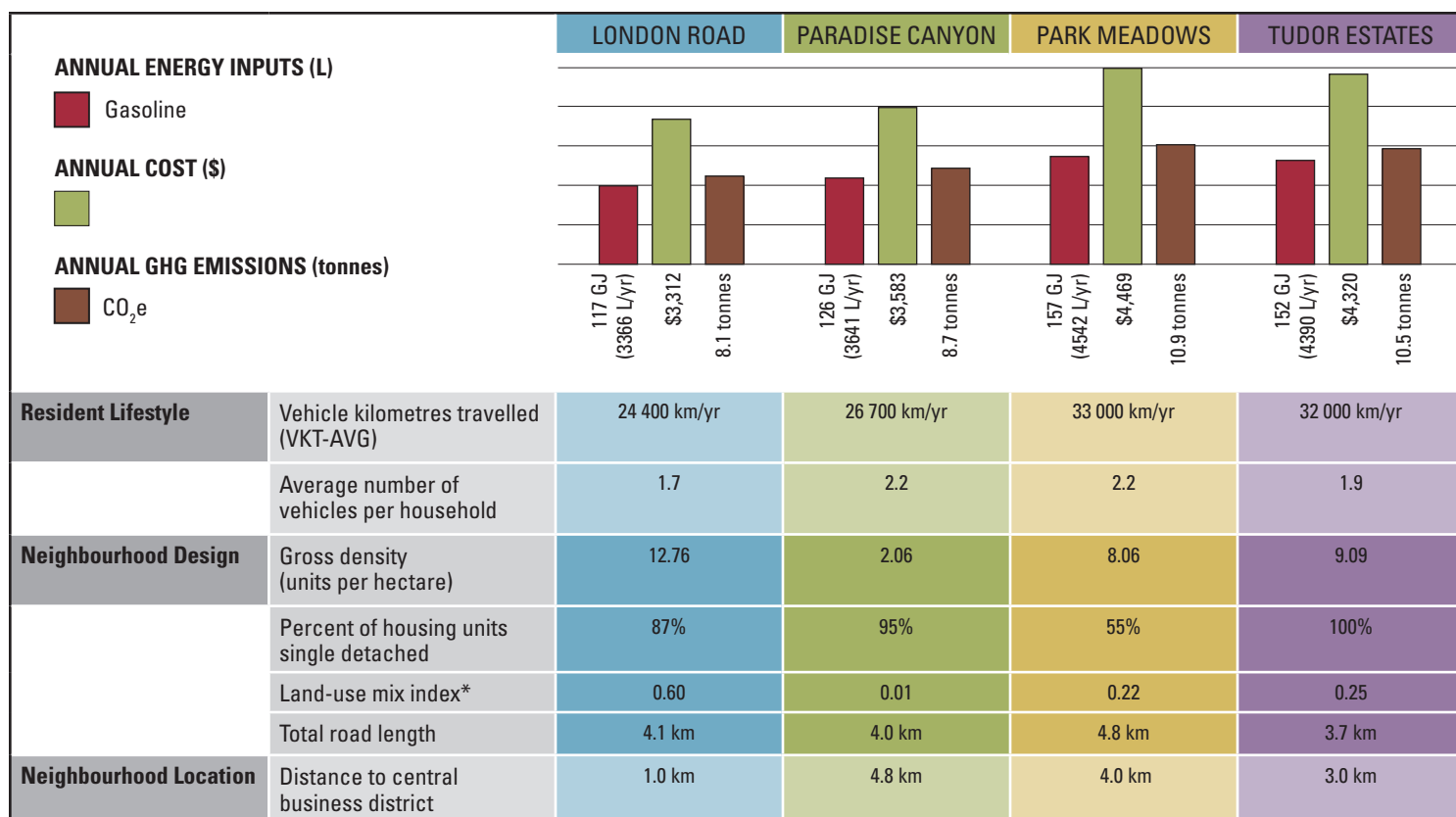
## ENERGY USE FOR PERSONAL VEHICLE TRANSPORTATION

Personal transportation helps Canadians accomplish a wide variety of activities and is essential for the functioning of our communities. Personal vehicles are the predominant form of personal transportation, accounting for 78 percent of total passenger transportation energy end-use in Canada in 2005.<sup>9</sup> The Urban Archetypes Project calculated energy consumption for personal vehicles<sup>10</sup> and examined public transit and the active modes of walking and cycling.

The factors that influence transportation energy consumption for personal vehicles include distance travelled, vehicle

type and fuel efficiency. Furthermore, the influence of neighbourhood design characteristics, location and lifestyle for all 31 study neighbourhoods was analysed and will be presented in *The Urban Archetypes Project Analysis*.

In the Lethbridge study areas, average annual household Vehicle Kilometres Travelled (VKT-AVG)<sup>11</sup> ranged from 24 400 to 33 000 km. In 2006, the average study-area household consumed between 3366 and 4542 litres (L) of gasoline that cost<sup>12</sup> between \$3,312 and \$4,469 and produced GHG emissions of between 8.1 and 10.9 tonnes of CO<sub>2</sub>e.



\*Land-use mix variables include the number of retail/commercial units, retail/commercial buildings, industries, institutions and municipal buildings. The higher the score, the more mixed the land use in the neighbourhood.

## PROJECT COLLABORATION

Natural Resources Canada recognizes the contribution of the City of Lethbridge and its electric utility, as well as ATCO Gas.

## FOR MORE INFORMATION

To learn more about the Urban Archetypes Project or to access companion documents (methodology, analysis and case studies), visit [www.canmetenergy.nrcan.gc.ca](http://www.canmetenergy.nrcan.gc.ca) (Building & Communities, Communities section) or contact Jessica Webster by telephone at 613-992-9532 or by e-mail at [jessica.webster@nrcan.gc.ca](mailto:jessica.webster@nrcan.gc.ca).

<sup>9</sup> Passenger Transportation Secondary Energy Use by Energy Source and Transportation Mode. [oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/tran\\_00\\_4\\_e\\_2.cfm?attr=0](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/tran_00_4_e_2.cfm?attr=0)

<sup>10</sup> Personal vehicles include small and large cars and light trucks.

<sup>11</sup> Based on total estimated household Vehicle Kilometres Travelled (VKT) data collected from the study areas' residents in 2007. To account for possible under-reporting, neighbourhood household average VKT was substituted in cases of non-response, producing the Vehicle Kilometres Travelled-Average (VKT-AVG) figure. See *The Urban Archetypes Project Methodology* for more details.

<sup>12</sup> Average costs were calculated using available price data for Lethbridge: gasoline (\$0.984/L, 2007 average).