

## Energy Emissions Worksheet

Type (Residential) or Principal Activity (Commercial)	Energy consumption per building per year (million Btu)	Carbon Coefficient for Buildings	MTCO <sub>2</sub> e per building per year	Floorspace per Building (thousand square feet)	MTCE per thousand square feet per year	MTCO <sub>2</sub> e per thousand square feet per year	Average Building Life Span	Lifespan Energy Related MTCO <sub>2</sub> e emissions per unit	Lifespan Energy Related MTCO <sub>2</sub> e emissions per thousand square feet
Single-Family Home.....	107.3	0.108	11.61	2.53	4.6	16.8	57.9	672	266
Multi-Family Unit in Large Building .....	41.0	0.108	4.44	0.85	5.2	19.2	80.5	357	422
Multi-Family Unit in Small Building .....	78.1	0.108	8.45	1.39	6.1	22.2	80.5	681	489
Mobile Home.....	75.9	0.108	8.21	1.06	7.7	28.4	57.9	475	448
Education .....	2,125.0	0.124	264.2	25.6	10.3	37.8	62.5	16,526	646
Food Sales .....	1,110.0	0.124	138.0	5.6	24.6	90.4	62.5	8,632	1,541
Food Service .....	1,436.0	0.124	178.5	5.6	31.9	116.9	62.5	11,168	1,994
Health Care Inpatient .....	60,152.0	0.124	7,479.1	241.4	31.0	113.6	62.5	467,794	1,938
Health Care Outpatient .....	985.0	0.124	122.5	10.4	11.8	43.2	62.5	7,660	737
Lodging .....	3,578.0	0.124	444.9	35.8	12.4	45.6	62.5	27,826	777
Retail (Other Than Mall).....	720.0	0.124	89.5	9.7	9.2	33.8	62.5	5,599	577
Office .....	1,376.0	0.124	171.1	14.8	11.6	42.4	62.5	10,701	723
Public Assembly .....	1,338.0	0.124	166.4	14.2	11.7	43.0	62.5	10,405	733
Public Order and Safety .....	1,791.0	0.124	222.7	15.5	14.4	52.7	62.5	13,928	899
Religious Worship .....	440.0	0.124	54.7	10.1	5.4	19.9	62.5	3,422	339
Service .....	501.0	0.124	62.3	6.5	9.6	35.1	62.5	3,896	599
Warehouse and Storage .....	764.0	0.124	95.0	16.9	5.6	20.6	62.5	5,942	352
Other .....	3,600.0	0.124	447.6	21.9	20.4	74.9	62.5	27,997	1,278
Vacant .....	294.0	0.124	36.6	14.1	2.6	9.5	62.5	2,286	162

**Sources**

All data in black text

King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

Energy consumption for residential buildings

2007 Buildings Energy Data Book: 6.1 Quad Definitions and Comparisons (National Average, 2001)

Table 6.1.4: Average Annual Carbon Dioxide Emissions for Various Functions

<http://buildingsdatabook.eren.doe.gov/>Data also at: [http://www.eia.doe.gov/emeu/recs/recs2001\\_ce/ce1-4c\\_housingunits2001.html](http://www.eia.doe.gov/emeu/recs/recs2001_ce/ce1-4c_housingunits2001.html)

Energy consumption for commercial buildings and floorspace per building

EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003)

Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003

[http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed\\_tables\\_2003/2003set9/2003excel/c3.xls](http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls)

Note: Data in plum color is found in both of the above sources (buildings energy data book and commercial buildings energy consumption survey).

Carbon Coefficient for Buildings

Buildings Energy Data Book (National average, 2005)

Table 3.1.7. 2005 Carbon Dioxide Emission Coefficients for Buildings (MMTCE per Quadrillion Btu)

[http://buildingsdatabook.eere.energy.gov/?id=view\\_book\\_table&TableID=2057](http://buildingsdatabook.eere.energy.gov/?id=view_book_table&TableID=2057)

Note: Carbon coefficient in the Energy Data book is in MTCE per Quadrillion Btu.

To convert to MTCO<sub>2</sub>e per million Btu, this factor was divided by 1000 and multiplied by 44/12.

Residential floorspace per unit

2001 Residential Energy Consumption Survey (National Average, 2001)

Square footage measurements and comparisons

<http://www.eia.doe.gov/emeu/recs/sqft-measure.html>

average life span of buildings,  
estimated by replacement time method

	Single Family Homes	Multi-Family Units in Large and Small Buildings	All Residential Buildings
New Housing Construction, 2001	1,273,000	329,000	1,602,000
Existing Housing Stock, 2001	73,700,000	26,500,000	100,200,000
Replacement time:	57.9	80.5	62.5

(national  
average, 2001)

Note: Single family homes calculation is used for mobile homes as a best estimate life span.

Note: At this time, KC staff could find no reliable data for the average life span of commercial buildings.

Therefore, the average life span of residential buildings is being used until a better approximation can be ascertained.

Sources:

New Housing  
Construction,

2001 Quarterly Starts and Completions by Purpose and Design - US and Regions (Excel)

[http://www.census.gov/construction/quarterly\\_starts\\_completions\\_cust.xls](http://www.census.gov/construction/quarterly_starts_completions_cust.xls)

See also: <http://www.census.gov/construction/newresconstindex.html>

Existing  
Housing Stock,

2001 Residential Energy Consumption Survey (RECS) 2001

Tables HC1:Housing Unit Characteristics, Million U.S. Households 2001

Table HC1-4a. Housing Unit Characteristics by Type of Housing Unit, Million U.S. Households, 2001

Million U.S. Households, 2001

[http://www.eia.doe.gov/emeu/recs/recs2001/hc\\_pdf/housunits/hc1-4a\\_housingunits2001.pdf](http://www.eia.doe.gov/emeu/recs/recs2001/hc_pdf/housunits/hc1-4a_housingunits2001.pdf)

Transportation Emissions Worksheet

Type (Residential) or Principal Activity (Commercial)	# people/ unit or building	# thousand sq feet/ unit or building	# people or employees/ thousand square feet	vehicle related GHG emissions (metric tonnes CO2e per person per year)	MTCO2e/ year/ unit	MTCO2e/ year/ thousand square feet	Average Building Life Span	Life span transportation related GHG emissions (MTCO2e/ per unit)	Life span transportation related GHG emissions (MTCO2e/ thousand sq feet)
Single-Family Home.....	2.8	2.53	1.1	4.9	13.7	5.4	57.9	792	313
Multi-Family Unit in Large Building .....	1.9	0.85	2.3	4.9	9.5	11.2	80.5	766	904
Multi-Family Unit in Small Building .....	1.9	1.39	1.4	4.9	9.5	6.8	80.5	766	550
Mobile Home.....	2.5	1.06	2.3	4.9	12.2	11.5	57.9	709	668
Education .....	30.0	25.6	1.2	4.9	147.8	5.8	62.5	9247	361
Food Sales .....	5.1	5.6	0.9	4.9	25.2	4.5	62.5	1579	282
Food Service .....	10.2	5.6	1.8	4.9	50.2	9.0	62.5	3141	561
Health Care Inpatient .....	455.5	241.4	1.9	4.9	2246.4	9.3	62.5	140506	582
Health Care Outpatient .....	19.3	10.4	1.9	4.9	95.0	9.1	62.5	5941	571
Lodging .....	13.6	35.8	0.4	4.9	67.1	1.9	62.5	4194	117
Retail (Other Than Mall).....	7.8	9.7	0.8	4.9	38.3	3.9	62.5	2394	247
Office .....	28.2	14.8	1.9	4.9	139.0	9.4	62.5	8696	588
Public Assembly .....	6.9	14.2	0.5	4.9	34.2	2.4	62.5	2137	150
Public Order and Safety .....	18.8	15.5	1.2	4.9	92.7	6.0	62.5	5796	374
Religious Worship .....	4.2	10.1	0.4	4.9	20.8	2.1	62.5	1298	129
Service .....	5.6	6.5	0.9	4.9	27.6	4.3	62.5	1729	266
Warehouse and Storage .....	9.9	16.9	0.6	4.9	49.0	2.9	62.5	3067	181
Other .....	18.3	21.9	0.8	4.9	90.0	4.1	62.5	5630	257
Vacant .....	2.1	14.1	0.2	4.9	10.5	0.7	62.5	657	47

**Sources**

All data in black text

King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

# people/ unit

Estimating Household Size for Use in Population Estimates (WA state, 2000 average)  
 Washington State Office of Financial Management  
 Kimpel, T. and Lowe, T. Research Brief No. 47, August 2007  
<http://www.ofm.wa.gov/researchbriefs/brief047.pdf>  
 Note: This analysis combines Multi Unit Structures in both large and small units into one category; the average is used in this case although there is likely a difference

Residential floorspace per unit

2001 Residential Energy Consumption Survey (National Average, 2001)  
 Square footage measurements and comparisons  
<http://www.eia.doe.gov/emeu/recs/sqft-measure.html>

# employees/thousand square feet

Commercial Buildings Energy Consumption Survey commercial energy uses and costs (National Median, 2003)  
 Table B2 Totals and Medians of Floorspace, Number of Workers, and Hours of Operation for Non-Mail Buildings, 2003  
[http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed\\_tables\\_2003/2003set1/2003excel/b2.xls](http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set1/2003excel/b2.xls)

Note: Data for # employees/thousand square feet is presented by CBECS as square feet/employee.  
 In this analysis employees/thousand square feet is calculated by taking the inverse of the CBECS number and multiplying by 1000.

## vehicle related GHG emissions

Estimate calculated as follows (Washington state, 2006)\_

56,531,930,000 2006 Annual WA State Vehicle Miles Traveled

Data was daily VMT. Annual VMT was 365\*daily VMT.

<http://www.wsdot.wa.gov/mapsdata/tco/annualmileage.htm>

6,395,798 2006 WA state population

<http://quickfacts.census.gov/qfd/states/53000.html>

8839 vehicle miles per person per year

0.0506 gallon gasoline/mile

This is the weighted national average fuel efficiency for all cars and 2 axle, 4 wheel light trucks in 2005. This includes pickup trucks, vans and SUVs. The 0.051 gallons/mile used here is the inverse of the more commonly known term "miles/per gallon" (which is 19.75 for these cars and light trucks).  
 Transportation Energy Data Book. 26th Edition. 2006. Chapter 4: Light Vehicles and Characteristics. Calculations based on weighted average MPG efficiency of cars and light trucks.

[http://cta.ornl.gov/data/tedb26/Edition26\\_Chapter04.pdf](http://cta.ornl.gov/data/tedb26/Edition26_Chapter04.pdf)

Note: This report states that in 2005, 92.3% of all highway VMT were driven by the above described vehicles.

[http://cta.ornl.gov/data/tedb26/Spreadsheets/Table3\\_04.xls](http://cta.ornl.gov/data/tedb26/Spreadsheets/Table3_04.xls)

24.3 lbs CO2e/gallon gasoline

The CO2 emissions estimates for gasoline and diesel include the extraction, transport, and refinement of petroleum as well as their combustion.

Life-Cycle CO2 Emissions for Various New Vehicles. RENew Northfield.

Available: <http://renewnorthfield.org/wpcontent/uploads/2006/04/CO2%20emissions.pdf>

Note: This is a conservative estimate of emissions by fuel consumption because diesel fuel, with a emissions factor of 26.55 lbs CO2e/gallon was not estimated.

2205

4.93 lbs/metric tonne

vehicle related GHG emissions (metric tonnes CO2e per person per year)

average life span of buildings, estimated  
 by replacement time method

See Energy Emissions Worksheet for Calculations

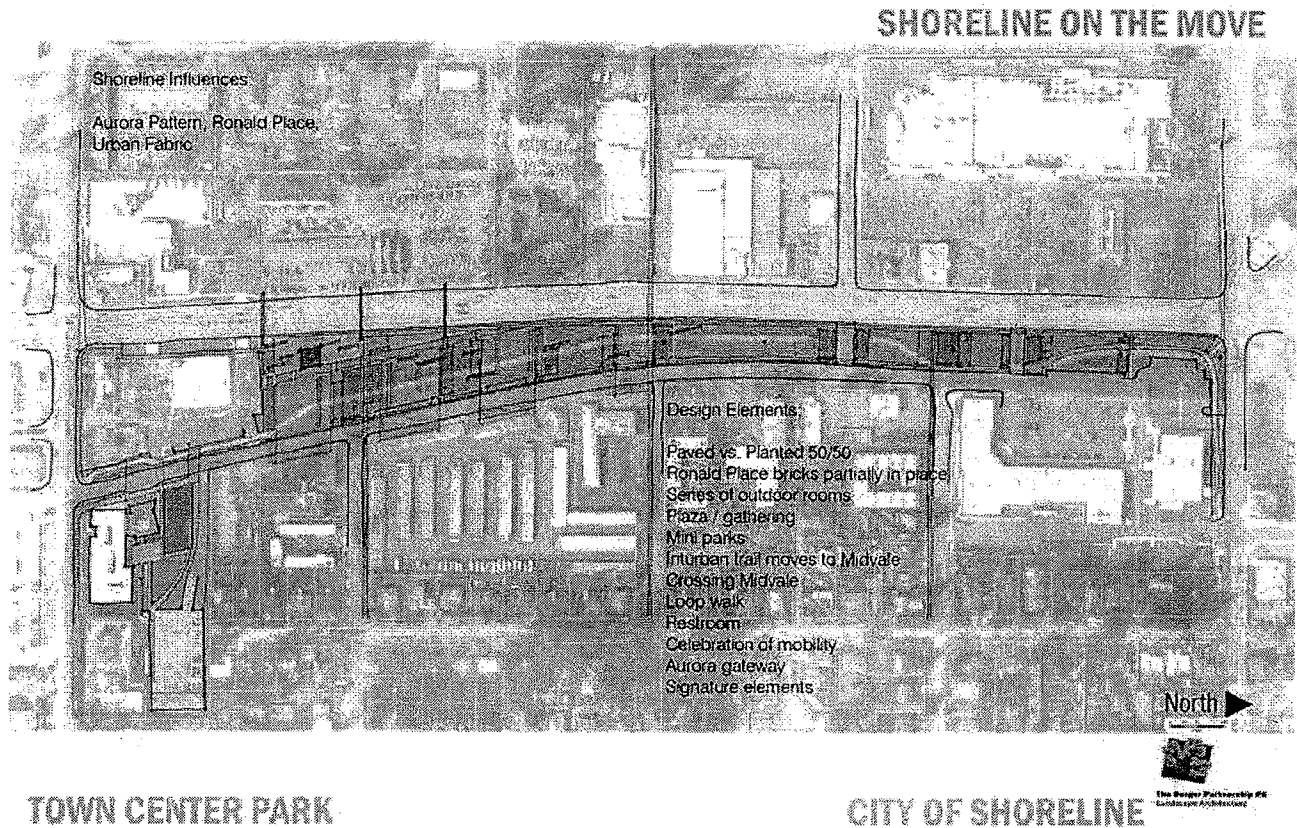
Commercial floorspace per unit

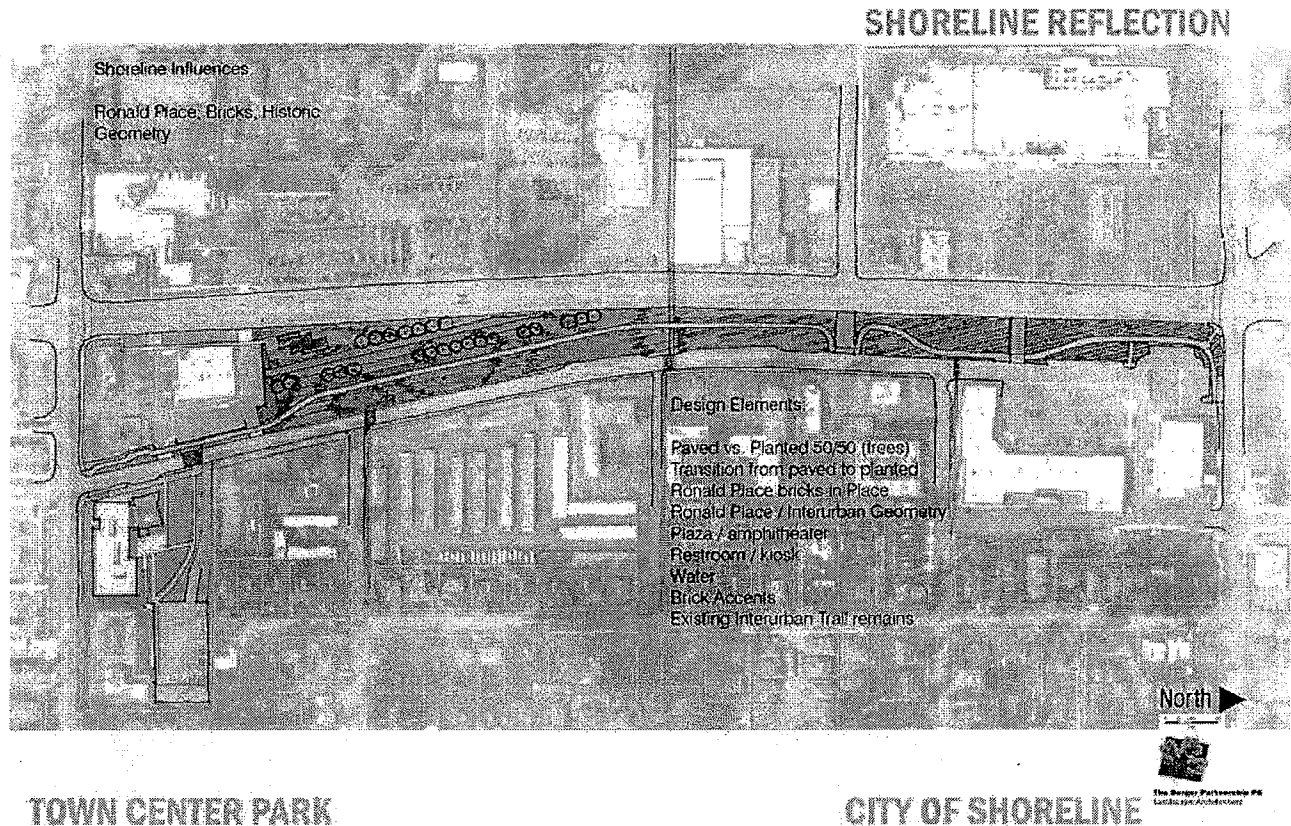
EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003)

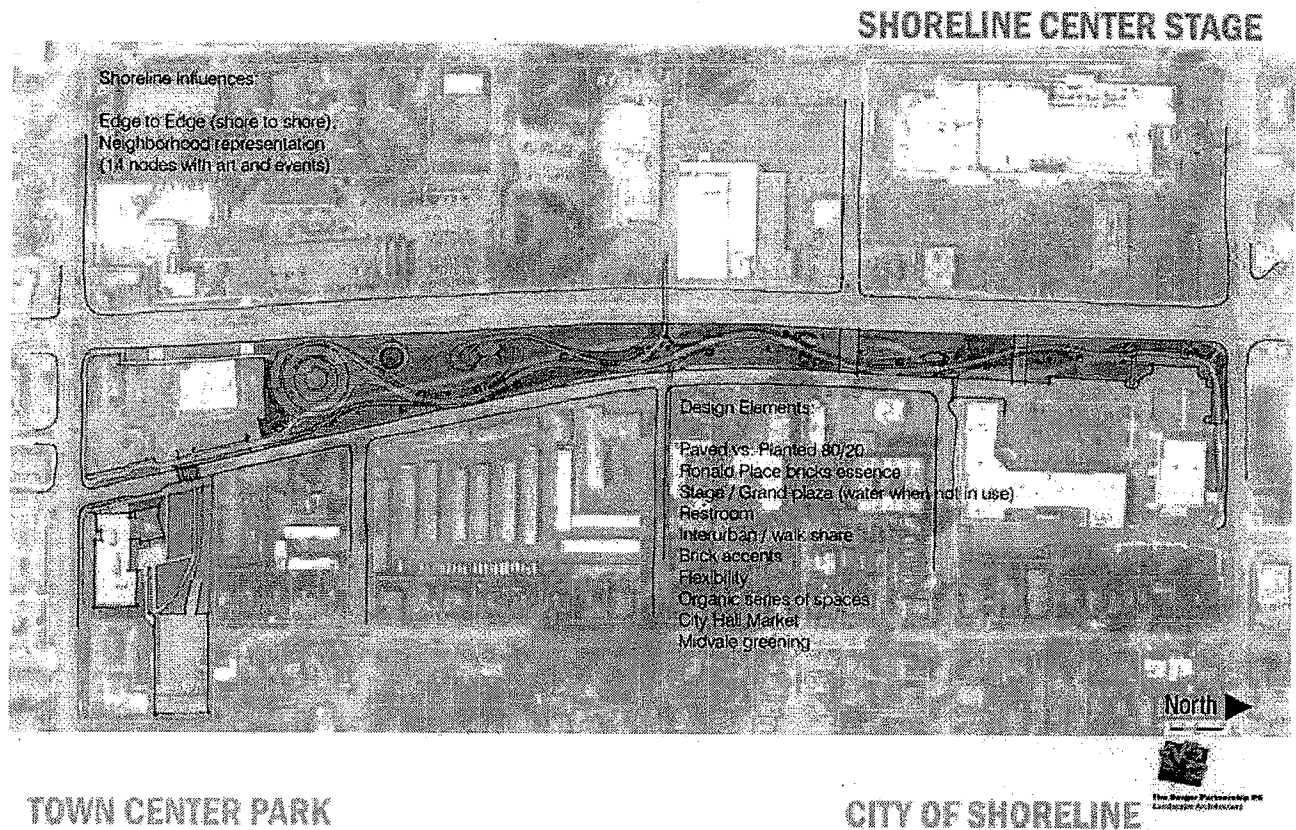
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[http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed\\_tables\\_2003/2003set9/2003excel/c3.xls](http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls)

# Appendix B - Park at Town Center Design Alternatives Attachment E









# Appendix C: Tax Parcel Numbers & Potentially Eligible Properties

## Map #1: N 165th Street to N 175th Street

Attachment E

