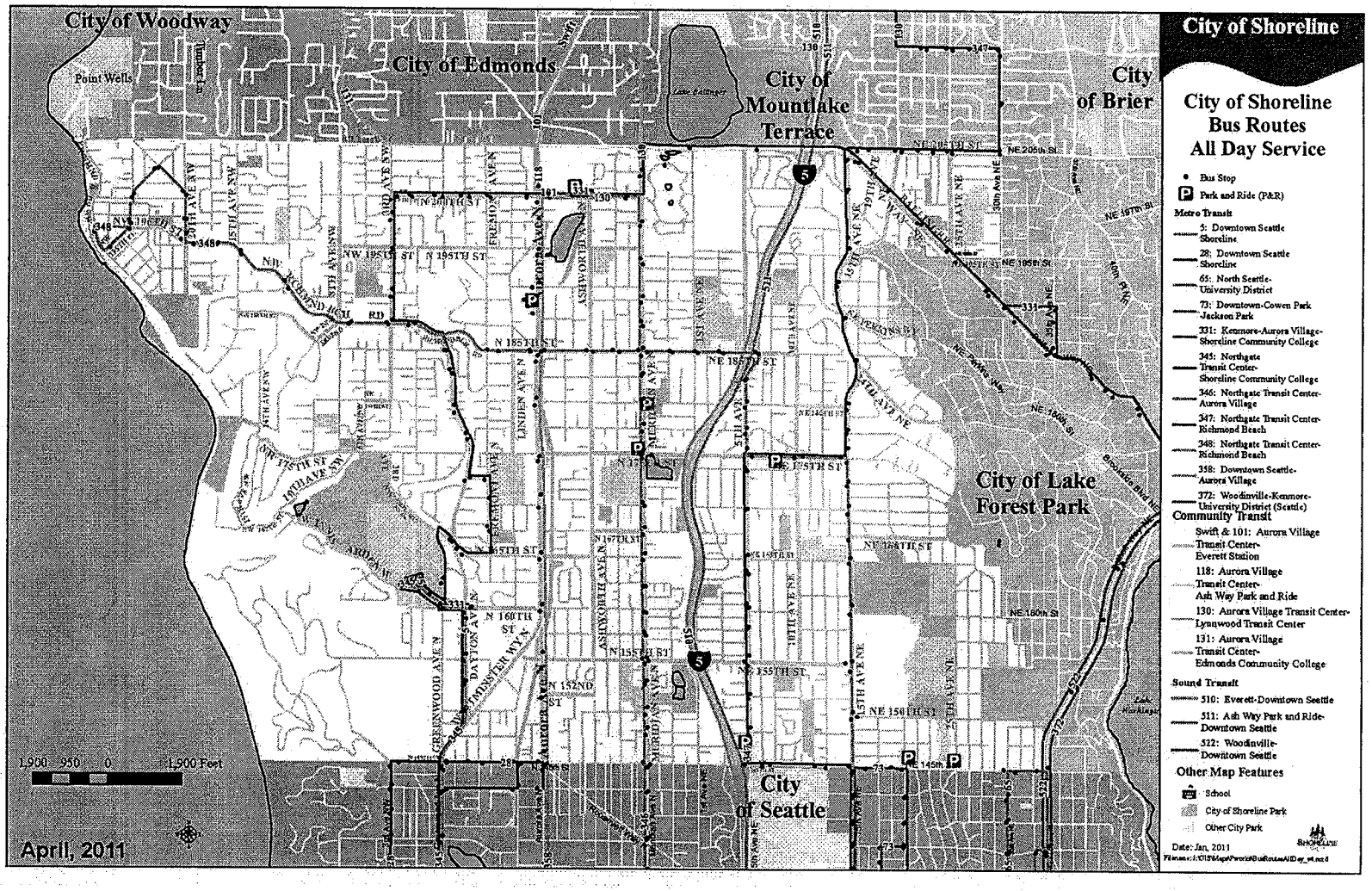


Figure 8-15: Existing All Day Bus Service for the City of Shoreline

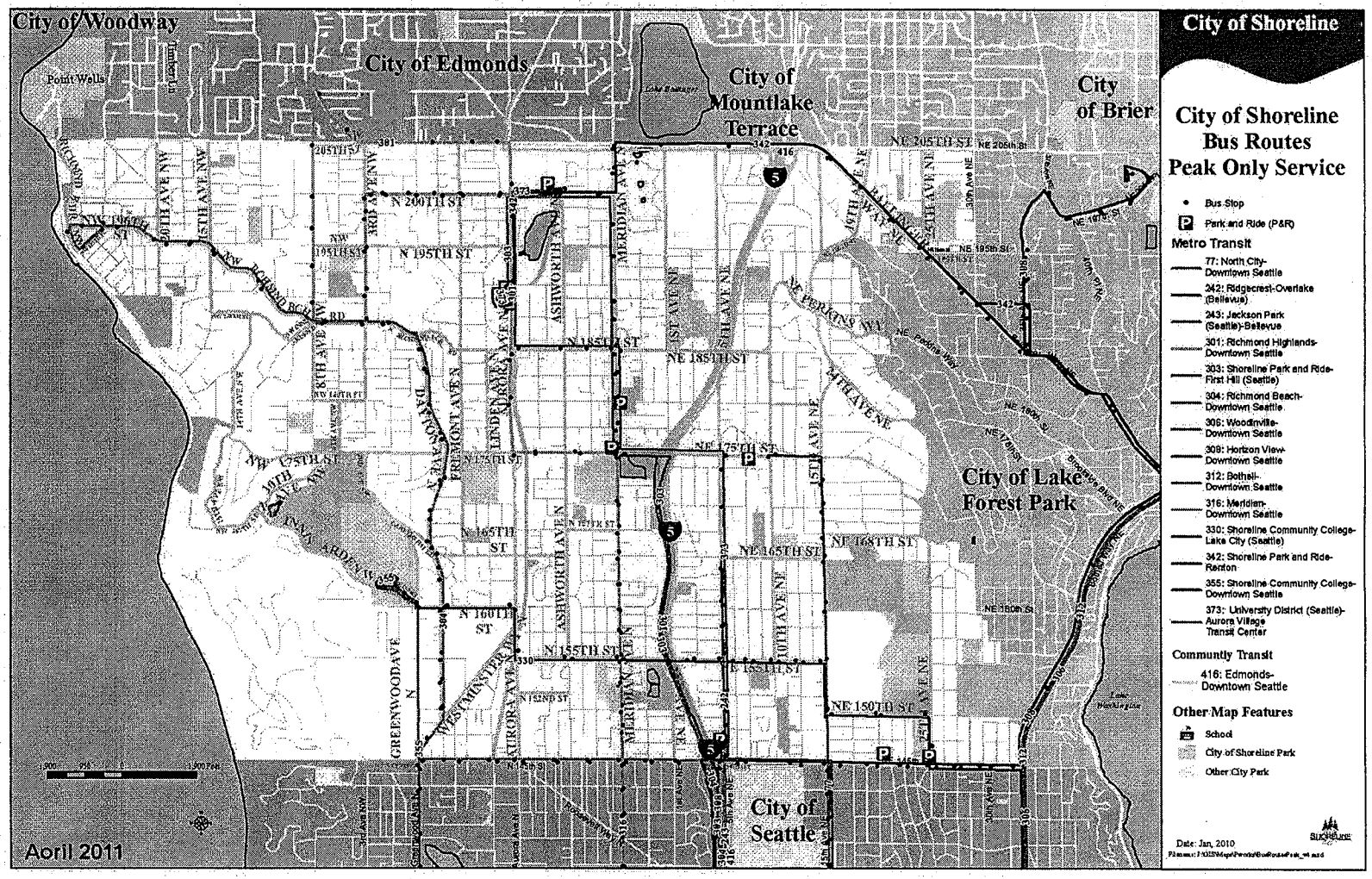


Figure 8-16- Existing Peak Hour Bus Service for the City of Shoreline

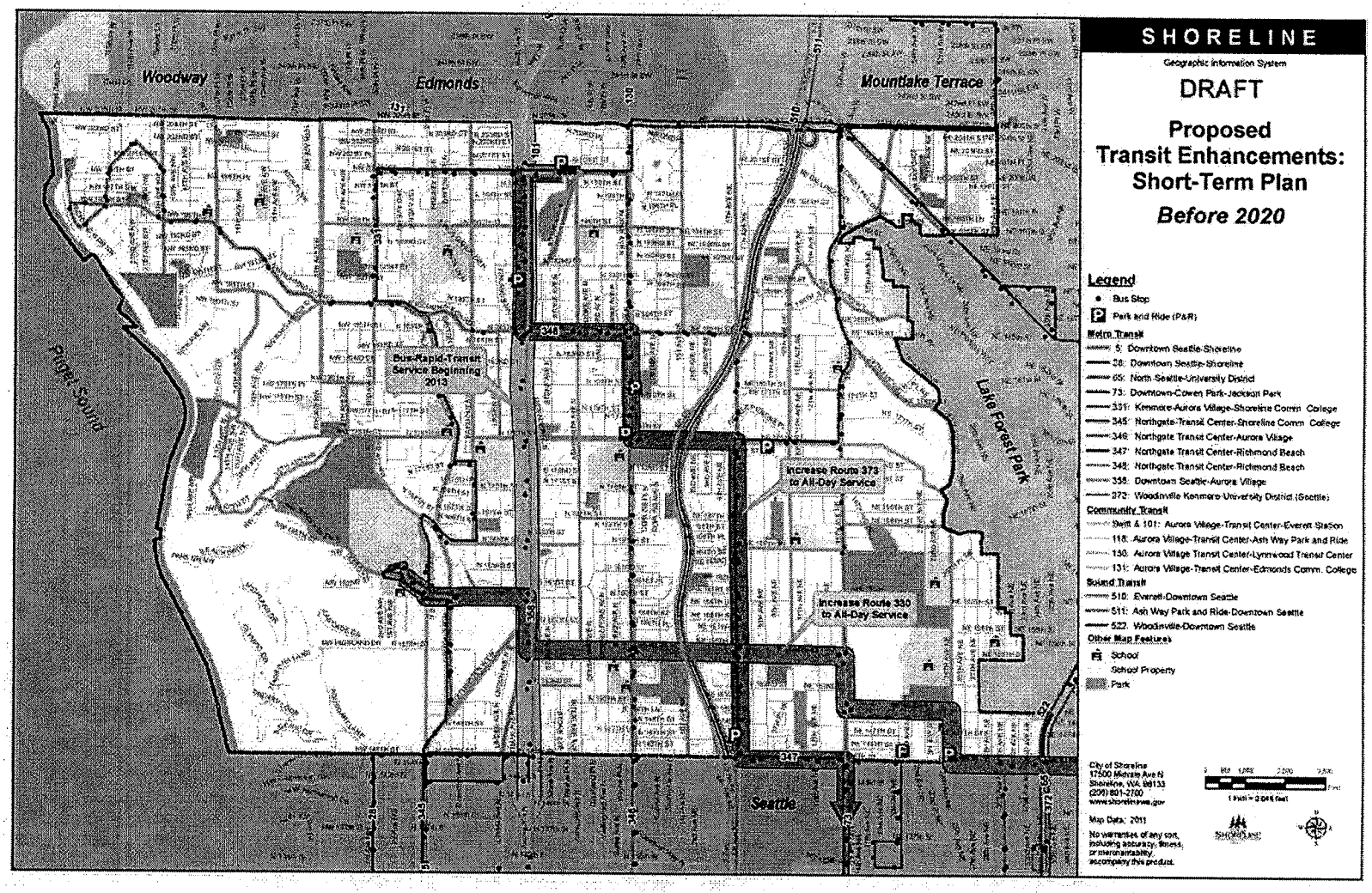


Figure 8-17: Proposed Short-Term Transit Improvements

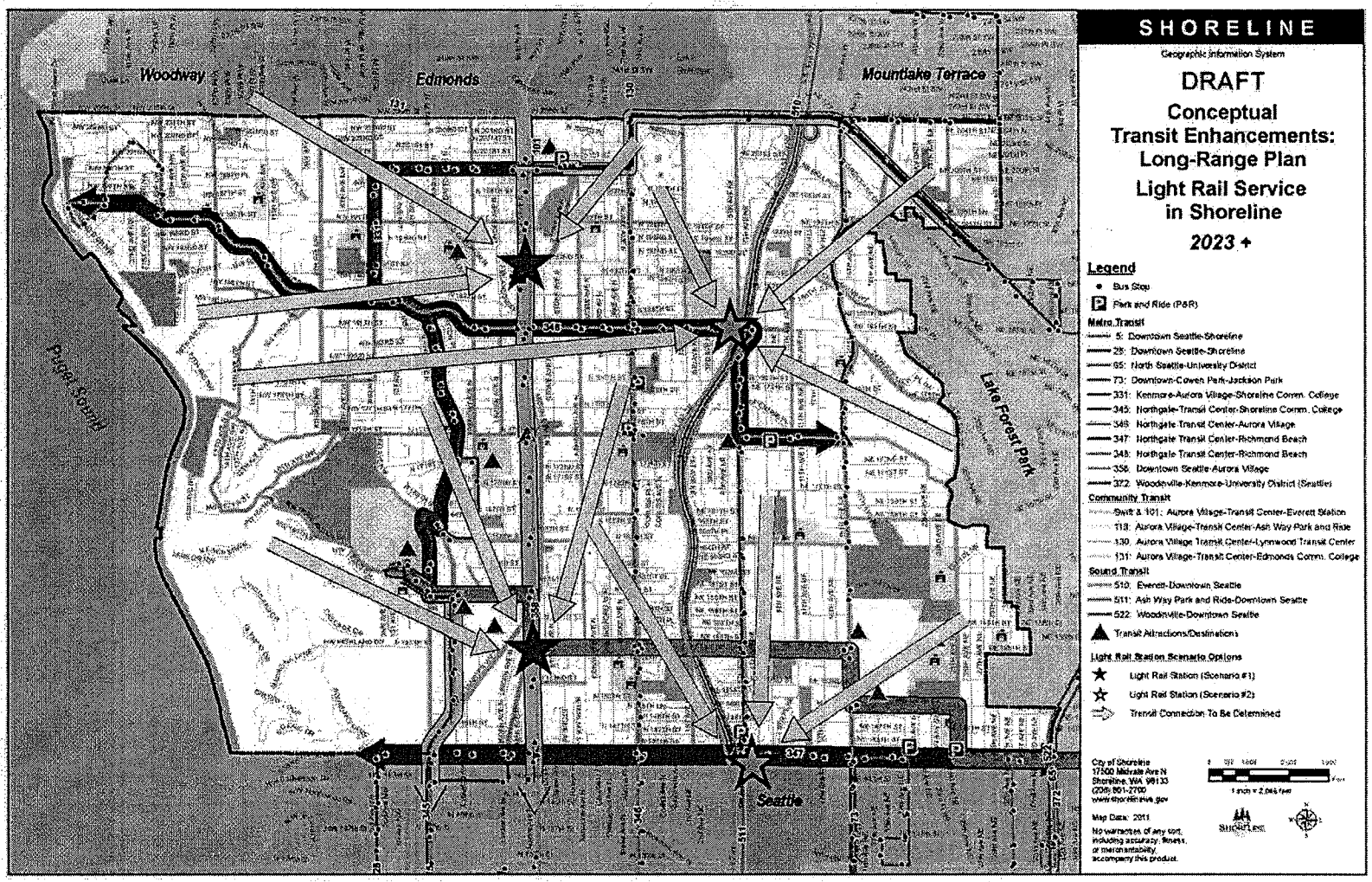


Figure 8-18: Proposed Long Term Transit Improvements

*8.1.5 Parking*

As previously discussed, a common theme found throughout the Town Center Subarea Plan is to reduce the area's historic reliance on automobiles, and increase the number of pedestrians, bicyclists, and transit users. With that being said, providing an adequate and appropriate amount of parking will be an important element to creating and supporting the mix of uses that contribute to a vibrant Town Center.

SMC 20.50.390 details the existing minimum off-street parking requirements for the City of Shoreline. For residential uses, single family residences require a minimum of 2 parking spaces, while apartments and condominiums require between 1.2 (for studios) and 2 (three bedrooms or larger) spaces per unit. Commercial, office, and retail uses require 1 parking space per 300 square feet of floor area. There are a number of standards and requirements related to surface parking lot standards, access, landscaping, and lighting, as well as the potential for a 20% reduction in required parking spaces when a project proposes a coordinated design and shared access to consolidated parking areas linked by pedestrian walkways.

The proposed Site Design Standards of the Town Center Code (20.92.060) includes a number of design standards related to parking, which expand on the current Development Code requirements. These standards require safe routes for pedestrians across parking lots, to building entries, and between buildings (through pathways, lighting, and landscaping requirements), and limit the amount of surface parking areas that can be located along the site frontages of Storefront/Greenlink Streets (65 lineal feet) and Boulevard Streets (50% of the site frontage), with parking internalized on sites so as to maximize building street frontage.

The parking ratios in the Town Center Code have been simplified to include just a few uses, with residential units requiring 0.75 spaces/bedroom, retail uses requiring 1 space/400 net square feet, and civic/office uses requiring 1 space/500 net square feet. These standards are lower than the existing Code requirements, as the Town Center Subarea Plan and Development Code anticipate a higher number of pedestrians, bicyclists, and transit users. The proposed parking standards are closer to those established for the North City Subarea District (SMC 20.90.080), which requires between 1 and 1.6 parking spaces per residential unit, and one parking space per 500 square feet of gross floor area.

In addition, the Town Center Code allows the Planning Director to approve reductions of up to 50% in parking requirements for projects that meet criteria such as provision of on-street parking along the parcel's street frontage, proximity (1/4 mile) to a transit stop, a commute trip reduction program, or a shared parking agreement with adjoining parcels.

8.2 Impacts

Impacts Common to Both Alternatives

Impact 8.2.1: While not projected to exceed accepted level-of-service (LOS) standards, development consistent with the growth assumptions for the Town Center Subarea has the potential to result in additional vehicular traffic that could adversely impact the subarea's street system via cut-through traffic to adjacent neighborhoods.

Impact 8.2.2: Projected increases in vehicular traffic, coupled with the increased amount of pedestrian, bicycle, and transit use that typically accompany mixed-use development, has the potential to increase conflicts among the various users of Town Center.

Impacts for Proposed Action

Impact 8.2.3: The Town Center Code proposes to reduce the number of required parking spaces for residential, commercial, and office uses. This has the potential to result in spillover parking into the surrounding single family residential neighborhoods. Upon reducing the parking requirements in the North City Subarea District, the City of Shoreline experienced an increase in service requests and complaints related to spillover parking.

8.3 Mitigation Measures

Mitigation Measures for No Action Alternative

Mitigation Measure 8.3.1: Current Traffic Study Guidelines (SMC 20.60.140) for the City of Shoreline require that any development proposal that would generate 20 or more (net) PM peak hour trips to complete and submit a traffic study. Any large-scale redevelopment project within the Town Center subarea is likely to trigger this requirement.

Mitigation Measures for Proposed Action

Mitigation Measure 8.3.2: Section 20.92.040 of the Town Center Code requires that all developments shall complete a traffic study and implement mitigation measures to mitigate potential cut-through traffic or parking impacts to single-family neighborhoods. These could include traffic calming measures identified in the various NTAP's, partial street closures, and other topics addressed in the required traffic study.

Mitigation Measure 8.3.3- Should spillover parking continue to be a problem following implementation of traffic calming measures, surrounding neighborhoods may pursue the City's Residential Parking Zone (RPZ) program, which requires permits to park in certain areas of the City.

The RPZ program has identified proximity to a business district as an appropriate reason for implementing permit parking.

8.4 Significant Unavoidable Adverse Impacts

With implementation of the above mitigation measures, no significant unavoidable adverse impacts are anticipated related to transportation.

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# Chapter 9: References

CH2M Hill and Jones & Stokes. *Transportation Discipline Report: Aurora Corridor Improvement Project: N 165th Street-N 205th Street.* Prepared for City of Shoreline. September 2007.

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City of Shoreline. *Parks, Recreation and Open Space Plan.* Adopted May 2005.

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City of Shoreline. *Shoreline Municipal Code, Title 20: Development Code.* Accessed May 2011.

City of Shoreline. *Transportation Master Plan.* Adopted July 2005.

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Puget Sound Clean Air Agency. *2008 Air Quality Data Summary.* October 2009.

Ronald Wastewater District. *Comprehensive Sewer Plan.* January 2010.

Seattle City Light. *Your Energy Future: Seattle City Light's Strategic Plan.* October 2008.

Seattle Public Utilities. *2007 Water System Plan.* November 2006.

Washington State Department of Ecology. *Draft Greenhouse Gas Emissions and SEPA Working Paper.* October 2010.

Western Shore Heritage Services, Inc. *Cultural Resources Assessment for the Aurora Avenue North Multimodal Corridor Project: North 165th Street to North 205th Street.* Prepared for City of Shoreline. August 2007.

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# Appendix A- Greenhouse Gas Emissions Worksheet

**King County Department of Development and Environmental Services**
**SEPA GHG Emissions Worksheet**
**Version 1.7 12/26/07**

Introduction

The Washington State Environmental Policy Act (SEPA) requires environmental review of development proposals that may have a significant adverse impact on the environment. If a proposed development is subject to SEPA, the project proponent is required to complete the SEPA Checklist. The Checklist includes questions relating to the development's air emissions. The emissions that have traditionally been considered cover smoke, dust, and industrial and automobile emissions. With our understanding of the climate change impacts of GHG emissions, King County requires the applicant to also estimate these emissions.

Emissions created by Development

GHG emissions associated with development come from multiple sources:

- The extraction, processing, transportation, construction and disposal of materials and landscape disturbance (Embodied Emissions)
- Energy demands created by the development after it is completed (Energy Emissions)
- Transportation demands created by the development after it is completed (Transportation Emissions)

GHG Emissions Worksheet

King County has developed a GHG Emissions Worksheet that can assist applicants in answering the SEPA Checklist question relating to GHG emissions.

The SEPA GHG Emissions worksheet estimates all GHG emissions that will be created over the life span of a project. This includes emissions associated with obtaining construction materials, fuel used during construction, energy consumed during a buildings operation, and transportation by building occupants.

Using the Worksheet

1. Descriptions of the different residential and commercial building types can be found on the second tabbed worksheet ("Definition of Building Types"). If a development proposal consists of multiple projects, e.g. both single family and multi-family residential structures or a commercial development that consists of more than on type of commercial activity, the appropriate information should be estimated for each type of building or activity.

2. For paving, estimate the total amount of paving (in thousands of square feet) of the project.

3. The Worksheet will calculate the amount of GHG emissions associated with the project and display the amount in the "Total Emissions" column on the worksheet. The applicant should use this information when completing the SEPA checklist.

4. The last three worksheets in the Excel file provide the background information that is used to calculate the total GHG emissions.

5. The methodology of creating the estimates is transparent; if there is reason to believe that a better estimate can be obtained by changing specific values, this can and should be done. Changes to the values should be documented with an explanation of why and the sources relied upon.

6. Print out the "Total Emissions" worksheet and attach it to the SEPA checklist. If the applicant has made changes to the calculations or the values, the documentation supporting those changes should also be attached to the SEPA checklist.

**Section I: Buildings**

| Type (Residential) or Principal Activity (Commercial) | # Units | Square Feet (in thousands of square feet) | Emissions Per Unit or Per Thousand Square Feet (MTCO2e) Embodied | Energy | Transportation | Lifespan Emissions (MTCO2e) |
|---|---|---|---|---|---|---|
| Single-Family Home | 50 | | 98 | 672 | 792 | **78,092** |
| Multi-Family Unit in Large Building | 1000 | | 33 | 357 | 766 | **1,155,694** |
| Multi-Family Unit in Small Building | 150 | | 54 | 681 | 766 | **225,027** |
| Mobile Home | 0 | | 41 | 475 | 709 | **0** |
| Education | | 0.0 | 39 | 646 | 361 | **0** |
| Food Sales | | 0.0 | 39 | 1,541 | 282 | **0** |
| Food Service | | 0.0 | 39 | 1,994 | 561 | **0** |
| Health Care Inpatient | | 0.0 | 39 | 1,938 | 582 | **0** |
| Health Care Outpatient | | 0.0 | 39 | 737 | 571 | **0** |
| Lodging | | 0.0 | 39 | 777 | 117 | **0** |
| Retail (Other Than Mall) | | 200.0 | 39 | 577 | 247 | **172,551** |
| Office | | 200.0 | 39 | 723 | 588 | **269,869** |
| Public Assembly | | 0.0 | 39 | 733 | 150 | **0** |
| Public Order and Safety | | 0.0 | 39 | 899 | 374 | **0** |
| Religious Worship | | 0.0 | 39 | 339 | 129 | **0** |
| Service | | 0.0 | 39 | 599 | 266 | **0** |
| Warehouse and Storage | | 0.0 | 39 | 352 | 181 | **0** |
| Other | | 0.0 | 39 | 1,278 | 257 | **0** |
| Vacant | | 0.0 | 39 | 162 | 47 | **0** |

**Section II: Pavement**

| | | | | | | |
|---|---|---|---|---|---|---|
| Pavement | | 0.00 | | | | **0** |

**Total Project Emissions:** **1,901,233**

Definition of Building Types

| Type (Residential) or Principal Activity (Commercial) | Description |
|---|---|
| Single-Family Home | Unless otherwise specified, this includes both attached and detached buildings |
| Multi-Family Unit in Large Building | Apartments in buildings with more than 5 units |
| Multi-Family Unit in Small Building | Apartments in building with 2-4 units |
| Mobile Home | |
| Education | Buildings used for academic or technical classroom instruction, such as elementary, middle, or high schools, and classroom buildings on college or university campuses. Buildings on education campuses for which the main use is not classroom are included in the category relating to their use. For example, administration buildings are part of "Office," dormitories are "Lodging," and libraries are "Public Assembly." |
| Food Sales | Buildings used for retail or wholesale of food. |
| Food Service | Buildings used for preparation and sale of food and beverages for consumption. |
| Health Care Inpatient | Buildings used as diagnostic and treatment facilities for inpatient care. |
| Health Care Outpatient | Buildings used as diagnostic and treatment facilities for outpatient care. Doctor's or dentist's office are included here if they use any type of diagnostic medical equipment (if they do not, they are categorized as an office building). |
| Lodging | Buildings used to offer multiple accommodations for short-term or long-term residents, including skilled nursing and other residential care buildings. |
| Retail (Other Than Mall) | Buildings used for the sale and display of goods other than food. |
| Office | Buildings used for general office space, professional office, or administrative offices. Doctor's or dentist's office are included here if they do not use any type of diagnostic medical equipment (if they do, they are categorized as an outpatient health care building). |
| Public Assembly | Buildings in which people gather for social or recreational activities, whether in private or non-private meeting halls. |
| Public Order and Safety | Buildings used for the preservation of law and order or public safety. |
| Religious Worship | Buildings in which people gather for religious activities, (such as chapels, churches, mosques, synagogues, and temples). |
| Service | Buildings in which some type of service is provided, other than food service or retail sales of goods |
| Warehouse and Storage | Buildings used to store goods, manufactured products, merchandise, raw materials, or personal belongings (such as self-storage). |
| Other | Buildings that are industrial or agricultural with some retail space; buildings having several different commercial activities that, together, comprise 50 percent or more of the floorspace, but whose largest single activity is agricultural, industrial/ manufacturing, or residential; and all other miscellaneous buildings that do not fit into any other category. |
| Vacant | Buildings in which more floorspace was vacant than was used for any single commercial activity at the time of interview. Therefore, a vacant building may have some occupied floorspace. |

Sources:

Residential 2001 Residential Energy Consumption Survey
Square footage measurements and comparisons
http://www.eia.doe.gov/emeu/recs/sqft-measure.html

Commercial Commercial Buildings Energy Consumption Survey (CBECS),
Description of CBECS Building Types
http://www.eia.doe.gov/emeu/cbecs/pba99/bldgtypes.html

Embodied Emissions Worksheet

**Section I: Buildings**

| Type (Residential) or Principal Activity (Commercial) | # thousand sq feet/ unit or building | Life span related embodied GHG missions (MTCO2e/ unit) | Life span related embodied GHG missions (MTCO2e/ thousand square feet) - See calculations in table below |
|---|---|---|---|
| Single-Family Home | 2.53 | 98 | 39 |
| Multi-Family Unit in Large Building | 0.85 | 33 | 39 |
| Multi-Family Unit in Small Building | 1.39 | 54 | 39 |
| Mobile Home | 1.06 | 41 | 39 |
| Education | 25.6 | 991 | 39 |
| Food Sales | 5.6 | 217 | 39 |
| Food Service | 5.6 | 217 | 39 |
| Health Care Inpatient | 241.4 | 9,346 | 39 |
| Health Care Outpatient | 10.4 | 403 | 39 |
| Lodging | 35.8 | 1,386 | 39 |
| Retail (Other Than Mall) | 9.7 | 376 | 39 |
| Office | 14.8 | 573 | 39 |
| Public Assembly | 14.2 | 550 | 39 |
| Public Order and Safety | 15.5 | 600 | 39 |
| Religious Worship | 10.1 | 391 | 39 |
| Service | 6.5 | 252 | 39 |
| Warehouse and Storage | 16.9 | 654 | 39 |
| Other | 21.9 | 848 | 39 |
| Vacant | 14.1 | 546 | 39 |

**Section II: Pavement**

| | | | |
|---|---|---|---|
| All Types of Pavement | | | 50 |

| | Columns and Beams | Intermediate Floors | Exterior Walls | Windows | Interior Walls | Roofs | | |
|---|---|---|---|---|---|---|---|---|
| Average GWP (lbs CO2e/sq ft): Vancouver, Low Rise Building | 5.3 | 7.8 | 19.1 | 51.2 | 5.7 | 21.3 | | |
| Average Materials in a 2,272-square foot single family home | 0.0 | 2269.0 | 3206.0 | 236.0 | 6050.0 | 3103.0 | Total Embodied Emissions (MTCO2e) | Total Embodied Emissions (MTCO2e/ thousand sq feet) |
| MTCO2e | 0.0 | 8.0 | 27.8 | 6.6 | 15.6 | 30.0 | 88.0 | 38.7 |

**Sources**

All data in black text — King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

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

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

Average GWP (lbs CO2e/sq ft): Vancouver, Low Rise Building — Athena EcoCalculator
Athena Assembly Evaluation Tool v2.3- Vancouver Low Rise Building
Assembly Average GWP (kg) per square meter
http://www.athenasmi.ca/tools/ecoCalculator/index.html
Lbs per kg 2.20
Square feet per square meter 10.76

Average Materials in a 2,272-square foot single family home — Buildings Energy Data Book: 7.3 Typical/Average Household
Materials Used in the Construction of a 2,272-Square-Foot Single-Family Home, 2000
http://buildingsdatabook.eren.doe.gov/?id=view_book_table&TableID=2036&t=xls
See also: NAHB, 2004 Housing Facts, Figures and Trends. Feb. 2004, p. 7.

Average window size — Energy Information Administration/Housing Characteristics 1993
Appendix B, Quality of the Data, Pg. 5.
ftp://ftp.eia.doe.gov/pub/consumption/residential/rec93hcr.pdf

Pavement Emissions Factors
MTCO2e/thousand square feet of asphalt or concrete pavement

50 (see below)

**Embodied GHG Emissions.....Worksheet Background Information**

*Buildings*
Embodied GHG emissions are emissions that are created through the extraction, processing, transportation, construction and disposal of building materials as well as emissions created through landscape disturbance (by both soil disturbance and changes in above ground biomass).

Estimating embodied GHG emissions is new field of analysis; the estimates are rapidly improving and becoming more inclusive of all elements of construction and development.

The estimate included in this worksheet is calculated using average values for the main construction materials that are used to create a typical family home. In 2004, the National Association of Home Builders calculated the average materials that are used in a typical 2,272 square foot single-family household. The quantity of materials used is then multiplied by the average GHG emissions associated with the life-cycle GHG emissions for each material.

This estimate is a rough and conservative estimate; the actual embodied emissions for a project are likely to be higher. For example, at this stage, due to a lack of comprehensive data, the estimate does not include important factors such as landscape disturbance or the emissions associated with the interior components of a building (such as furniture).

King County realizes that the calculations for embodied emissions in this worksheet are rough. For example, the emissions associated with building 1,000 square feet of a residential building will not be the same as 1,000 square feet of a commercial building. However, discussions with the construction community indicate that while there are significant differences between the different types of structures, this method of estimation is reasonable; it will be improved as more data become available.

Additionally, if more specific information about the project is known, King County recommends two online embodied emissions calculators that can be used to obtain a more tailored estimate for embodied emissions: www.buildcarbonneutral.org and www.athenasmi.ca/tools/ecoCalculator/.

*Pavement*
Four recent life cycle assessments of the environmental impacts of roads form the basis for the per unit embodied emissions of pavement. Each study is constructed in slightly different ways; however, the aggregate results of the reports represent a reasonable estimate of the GHG emissions that are created from the manufacture of paving materials, construction related emissions, and maintenance of the pavement over its expected life cycle. For specifics, see the worksheet.

**Special Section: Estimating the Embodied Emissions for Pavement**

Four recent life cycle assessments of the environmental impacts of roads form the basis for the per unit embodied emissions of pavement. Each study is constructed in slightly different ways; however, the aggregate results of the reports represent a reasonable estimate of the GHG emissions that are created from the manufacture of paving materials, construction related emissions, and maintenance of the pavement over its expected life cycle.

The results of the studies are presented in different units and measures; considerable effort was undertaken to be able to compare the results of the studies in a reasonable way. For more details about the below methodology, contact matt.kuharic@kingcounty.gov.

The four studies, Meil (2001), Park (2003), Stripple (2001) and Treolar (2001) produced total GHG emissions of 4-34 MTCO2e per thousand square feet of finished paving (for similar asphalt and concrete based pavements). This estimate does not including downstream maintenance and repair of the highway. The average (for all concrete and asphalt pavements in the studies, assuming each study gets one data point) is ~17 MTCO2e/thousand square feet.

Three of the studies attempted to thoroughly account for the emissions associated with long term maintenance (40 years) of the roads. Stripple (2001), Park et al. (2003) and Treolar (2001) report 17, 81, and 68 MTCO2e/thousand square feet, respectively, after accounting for maintenance of the roads.

Based on the above discussion, King County makes the conservative estimate that 50 MTCO2e/thousand square feet of pavement (over the development's life cycle) will be used as the embodied emission factor for pavement until better estimates can be obtained. This is roughly equivalent to 3,500 MTCO2e per lane mile of road (assuming the lane is 13 feet wide).

It is important to note that these studies estimate the embodied emissions for roads. Paving that does not need to stand up to the rigors of heavy use (such as parking lots or driveways) would likely use less materials and hence have lower embodied emissions.

Sources:

Meil, J. A Life Cycle Perspective on Concrete and Asphalt Roadways: Embodied Primary Energy and Global Warming Potential. 2006. Available: http://www.cement.ca/cement.nsf/eee9ec7bbd630126852566c40052107b/6ec79dc8ae03a782852572b90061b914/$FILE/ATTK0WE3/athena%20report%20Feb.%202%202007.pdf

Park, K, Hwang, Y., Seo, S., M.ASCE, and Seo, H. , "Quantitative Assessment of Environmental Impacts on Life Cycle of Highways," Journal of Construction Engineering and Management , Vol 129, January/February 2003, pp 25-31, (DOI: 10.1061/(ASCE)0733-9364(2003)129:1(25)).

Stripple, H. Life Cycle Assessment of Road. A Pilot Study for Inventory Analysis. Second Revised Edition. IVL Swedish Environmental Research Institute Ltd. 2001. Available: http://www.ivl.se/rapporter/pdf/B1210E.pdf

Treloar, G., Love, P.E.D., and Crawford, R.H. Hybrid Life-Cycle Inventory for Road Construction and Use. Journal of Construction Engineering and Management. P. 43-49. January/February 2004.