

# A.1 Air Quality and Greenhouse Gas Emissions Appendix

## City of Seattle Comprehensive Plan 2004–2024

The existing City of Seattle Comprehensive Plan contains the following climate change-related goals and policies within its Environmental Element:

- Goal EG7** Reduce emissions of carbon dioxide and other climate-changing greenhouse gases in Seattle by 30 percent from 1990 levels by 2020, and become carbon neutral by 2050.
- Goal EG7.3** Seattle will act as a regional and national leader by becoming carbon neutral.
- Goal EG7.5** Prepare for and adapt to the likely effects of climate change through the development, ongoing assessment, and implementation of the Climate Action Plan.
- Goal EG9** Reduce fossil-fuel consumption in constructing new and renovating existing City-owned buildings to one-half the U.S. average for each building type.
- Goal EG10** Reduce consumption of fossil fuels in all new City government buildings in the following increments (percent reduction from 2007 U.S. average for each building type):
- 60% in 2010;
  - 70% in 2015;
  - 80% in 2020;
  - 90% in 2025; and
  - Carbon Neutral by 2030 (meaning new buildings will use no fossil fuel or greenhouse gas-emitting energy to operate).
- Policy E15** Work with private and public sector partners to achieve the goal of reducing climate-changing greenhouse gas emissions.
- Policy E15.1** Build infrastructure and provide services for pedestrians, bicycles, electric vehicles and transit to facilitate movement around the city by means other than fossil-fueled automobiles.
- Policy E15.2** Consider innovative measures that would encourage and facilitate use of alternatives to single-occupant vehicles, such as parking maximums for new development, parking taxes or fees.

**A.1 Air Quality & GHG**

**Policy E15.3** Continue to recognize the value of planning for transportation facilities at the same time as for the location, type and density of future housing and jobs as a way to reduce the need for future residents and workers to travel by automobile.

**Policy E15.4** Work to reduce greenhouse gas emissions through energy efficiency and low-carbon energy sources in buildings.

**Policy E15.5** For itself and the general public, the City should anticipate the effects of climate change and make plans for adapting to those effects.

**Policy E15.6** Establish energy efficiency standards for new buildings, consistent with applicable law, and encourage existing buildings to also achieve those standards.

**Policy E15.7** Reduce emissions associated with solid waste by reducing the amount of waste generated and by operating efficient collection and disposal systems.

**Policy E15.8** Encourage local food production as a way to decrease the environmental and climate impacts of the food production and distribution systems.

## **Transportation Related Greenhouse Gas Emissions: Affected Environment**

In April 2014, the City of Seattle published its 2012 Seattle Community Greenhouse Gas Emissions Inventory. The inventory includes road transport related emissions. The City of Seattle uses an origin-destination approach to estimate citywide GHG emissions. The methodology calculates vehicle miles travelled (VMT) based on the forecasted number of trips as follows:

- All trips that begin and end within the City
- Half of trips that either begin or end within the City
- None of the trips that begin and end outside the City

The analysis completed for this EIS builds off of the findings in the 2014 report. This analysis calculates transportation GHG emissions at the citywide level.<sup>1</sup>

<sup>1</sup> The Transportation Chapter (3.7) of this EIS generally summarizes transportation conditions at a sector or neighborhood level. However, given the amount of travel between sectors, accounting for sector-specific GHG emissions is not relevant. Therefore, only citywide GHG emissions are calculated. This approach is also consistent with the 2014 report.

**A.1 Air Quality & GHG**

The Seattle inventory estimates 2,389,000 metric tons of CO<sub>2</sub>e (MTCO<sub>2</sub>e) in 2012. Recent traffic growth trends were reviewed to determine if volumes should be factored up to approximate 2015 conditions, the base year of this study. That evaluation found that traffic volumes along major roads have remained relatively flat for the past five years. This pattern of stable traffic volumes despite growth has been observed in other cities in the region as well and is part of a larger national trend of reduced vehicle miles of travel.

Emissions factors were also reviewed to determine if they should be adjusted between the year 2012 and year 2015 analyses. The National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA) set a National Program to improve fuel economy and reduce GHG emissions for model years 2012 through 2016 passenger cars and light trucks. According to those standards, fuel economy for passenger cars and light trucks would improve from 30.1 miles per gallon (mpg) in 2012 to 33.8 mpg by 2015. This equates to a GHG emissions decrease of roughly 11 percent for new passenger cars and light trucks entering the vehicle fleet.<sup>2</sup> Given that those new vehicles would represent a relatively small proportion of the 2015 vehicle fleet, no reduction to emissions factors was assumed for the 2015 baseline.

Based on the traffic volume and fuel economy findings, the 2012 GHG emissions estimate is assumed to adequately represent 2015 conditions, and may be conservatively high given that traffic volumes have remained steady over the past five years, VMT per capita has been decreasing within the City<sup>3</sup>, and EPA/NHTSA regulations will result in modestly improved fuel economy between 2012 and 2015. Figure 3.2-5 summarizes the 2015 road transportation greenhouse gas emissions.

<sup>2</sup> USEPA, EPA-420-F-10-014, p. 4.

<sup>3</sup> Stockholm Environment Institute, 2012 Seattle Community Greenhouse Gas Emissions Inventory, p. 10.

**A.1 Air Quality & GHG**

**Table A.1-1 Road transportation pollutant emissions**

<b>Emissions in Tons per Year</b>					
<b>Pollutant</b>	<b>2012</b>	<b>2035 Alt. 1</b>	<b>2035 Alt. 2</b>	<b>2035 Alt. 3</b>	<b>2035 Alt. 4</b>
VOC	466.7	196.4	195.8	196.1	196.3
NO <sub>x</sub>	4,945.6	1,663.9	1,661.0	1,662.7	1,663.6
CO	10,992.5	4,261.7	4,229.6	4,248.8	4,258.5
PM <sub>2.5</sub>	58.5	42.23	42.44	42.51	42.54

Source: ESA, 2014.

**Table A.1-2 GHG emissions summary**

<b>GHG Emissions</b>	<b>2015*</b>	<b>2035 Alt. 1</b>	<b>2035 Alt. 2</b>	<b>2035 Alt. 3</b>	<b>2035 Alt. 4</b>
<b>Cars &amp; Light Duty Trucks</b>					
2015 to 2035 VMT Annual Growth Rate		0.47%	0.44%	0.46%	0.47%
Interim GHG Emissions (no improved fuel economy)		1,761,000	1,749,000	1,756,000	1,761,000
2015 to 2035 Emissions Reduction Factor		30%	30%	30%	30%
<b>Final GHG Emissions Estimate</b>	<b>1,603,000</b>	<b>1,233,000</b>	<b>1,224,000</b>	<b>1,229,000</b>	<b>1,233,000</b>
<b>Truck</b>					
2015 to 2035 VMT Annual Growth Rate		1.28%	1.28%	1.28%	1.28%
Interim GHG Emissions (no improved fuel economy)		929,000	929,000	929,000	929,000
2015 to 2035 Emissions Reduction Factor		4%	4%	4%	4%
<b>Final GHG Emissions Estimate</b>	<b>720,000</b>	<b>892,000</b>	<b>892,000</b>	<b>892,000</b>	<b>891,000</b>
<b>Bus</b>					
2015 to 2035 VMT Annual Growth Rate		0.39%	0.39%	0.39%	0.39%
Interim GHG Emissions (no improved fuel economy)		69,000	69,000	69,000	69,000
2015 to 2035 Emissions Reduction Factor		35%	35%	35%	35%
<b>Final GHG Emissions Estimate</b>	<b>64,000</b>	<b>42,000</b>	<b>42,000</b>	<b>42,000</b>	<b>42,000</b>
<b>Vanpool</b>					
2015 to 2035 VMT Annual Growth Rate		0.47%	0.44%	0.46%	0.47%
Interim GHG Emissions (no improved fuel economy)		2,000	2,000	2,000	2,000
2015 to 2035 Emissions Reduction Factor		30%	30%	30%	30%
<b>Final GHG Emissions Estimate</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>
<b>Interim Total (no improved fuel economy)</b>		<b>2,761,000</b>	<b>2,749,000</b>	<b>2,756,000</b>	<b>2,761,000</b>
<b>Final Total</b>	<b>2,389,000</b>	<b>2,169,000</b>	<b>2,160,000</b>	<b>2,165,000</b>	<b>2,168,000</b>

\* 2015 data assumed to be equal to 2012 inventory from Seattle Community Greenhouse Gas Emissions Inventory.

**A.1 Air Quality & GHG****Table A.1-3** Emissions factor data

<b>Projected Fleet-wide Emissions Compliance Levels under the Footprint-Based CO2 Standards (g/mi) and Corresponding Fuel Economy (mpg)</b>			
	<b>Year</b>	<b>Combined Cars and Trucks (g/mi)</b>	<b>Combined Cars and Trucks (mpg)</b>
	<b>2012</b>	295	30.1
	<b>2013</b>	286	31.1
	<b>2014</b>	276	32.2
	<b>2015</b>	263	33.8
	<b>2016</b>	250	35.5
	<b>2017</b>	243	36.6
	<b>2018</b>	232	38.3
	<b>2019</b>	222	40.0
	<b>2020</b>	213	41.7
	<b>2021</b>	199	44.7
	<b>2022</b>	190	46.8
	<b>2023</b>	180	49.4
	<b>2024</b>	171	52.0
	<b>2025</b>	163	54.5
	<b>2012 to 2015 GHG Emissions Factor</b>	-11%	
	<b>2015 to 2025 GHG Emissions Factor</b>	-38%	

**Sources:**

United States Environmental Protection Agency, Office of Transportation and Air Quality, EPA-420-F-10-014, April 2010. EPA and NHTSA Finalize Historic National Program to Reduce Greenhouse Gases and Improve Fuel Economy for Cars and Trucks. Accessed September 9, 2014:

<http://www.epa.gov/otaq/climate/regulations/420f10014.pdf>

United States Environmental Protection Agency, Office of Transportation and Air Quality, EPA-420-F-12-051, August 2012. EPA and NHTSA Set Standards to Reduce Greenhouse Gases and Improve Fuel Economy for Model Years 2017-2025 Cars and Light Trucks. Accessed September 9, 2014:

<http://www.epa.gov/otaq/climate/documents/420f12051.pdf>

**EMFAC 2011**

	<b>Year</b>	<b>Cars/Light Trucks</b>	<b>Heavy Trucks</b>
	2012	396.73	1163.37
	2035	264.02	1114.19
	2015	379.42	1156.96
	<b>2015 to 2035 GHG Emissions Factor</b>	<b>-30%</b>	<b>-4%</b>

**Source:**

California Air Resources Board, EMFAC tool, 2011. Used Alameda County, 25-30mph, CO2 (Pavley I+LCFS).

**King County Metro GHG Emissions Goals (compared to 2009 baseline)**

	<b>Year</b>	<b>Goal</b>
	2015	15%
	2030	50%
	<b>2015 to 2030 Reduction</b>	<b>-41%</b>

**Source:**

King County Metro Transit, Sustainability Plan, April 2014. Accessed September 10, 2014: <http://metro.kingcounty.gov/am/reports/2014/metro-sustainability-plan-2014.pdf>

**Sound Transit GHG Emission Goal (compared to 2010 baseline)**

	<b>Year</b>	<b>Goal</b>
	2030	40%
	<b>2015 to 2030 Reduction</b>	<b>-30%</b>

**Source:**

Sound Transit, Sustainability Plan, April 2014. Accessed September 10, 2014:

<http://www.soundtransit.org/Documents/pdf/about/environment/SustainabilityPlan.pdf>

**A.1 Air Quality & GHG**

**Table A.1-4** Auto VMT

Trip Type	2015	2035 Alt. 1	2035 Alt. 2	2035 Alt. 3	2035 Alt. 4
II	932,108	1,032,308	1,009,709	1,027,709	1,024,805
IX/XI	3,481,841	3,809,819	3,812,472	3,801,808	3,822,751
XX	15,441,729	18,070,080	18,050,993	18,079,784	18,052,289
Total	19,855,678	22,912,208	22,873,174	22,909,301,	22,899,845
Seattle VMT	2,673,029	2,937,218	2,915,945	2,928,613	2,936,181
External VMT	17,182,649	19,974,990	19,957,229	19,980,688	19,963,665
Seattle Annual Growth Rate		0.47%	0.44%	0.46%	0.47%

**Table A.1-5** Medium and heavy truck VMT

Trip Type	2015	2035 Alt. 1	2035 Alt. 2	2035 Alt. 3	2035 Alt. 4
II	14,974	20,025	19,926	20,081	19,990
IX/XI	244,149	313,678	313,872	313,376	313,495
XX	624,124	844,338	878,742	877,203	877,959
Total	883,247	1,211,041	1,212,541	1,210,660	1,211,444
Seattle VMT	137,049	176,864	176,863	176,769	176,737
External VMT	746,199	1,034,177	1,035,678	1,033,891	1,034,707
Seattle Annual Growth Rate		1.28%	1.28%	1.28%	1.28%

**Table A.1-6** Regional comparison

City of Seattle	2015	2035 Alt. 1	2035 Alt. 2	2035 Alt. 3	2035 Alt. 4
Households	302,220	368,464	368,473	368,480	368,475
Jobs	534,392	649,394	649,386	649,404	649,394
VMT	2,673,029	2,937,218	2,915,945	2,928,613	2,936,181
VMT per Pop+Job	2.3	2.1	2.1	2.1	2.1

*Notes* Includes 100% of trips with at least one end in Seattle  
 Assumes 2.06 average household size

Outside Seattle	2015	2035 Alt. 1	2035 Alt. 2	2035 Alt. 3	2035 Alt. 4
Households	1,232,266	1,640,356	1,640,356	1,640,356	1,640,356
Jobs	1,410,406	2,034,792	2,034,792	2,034,792	2,034,792
VMT	17,182,649	19,974,990	19,957,229	19,980,688	19,963,665
VMT per Pop+Job	3.7	3.2	3.2	3.2	3.2

*Notes* Includes 100% of trips with at least one end outside Seattle  
 Assumes 2.57 average household size

**A.1 Air Quality & GHG****Table A.1-7** Operational GHG emissions of Alternative 1

Source	Metric Tons CO <sub>2</sub> e per Year
Transportation	-220,000 (citywide)
Building Energy— Residential	45,793
Building Energy—Commercial	17,767
Solid Waste	36,958
<b>Total</b>	<b>-119,482</b>

Source: ESA, 2014; Fehr &amp; Peers, 2014.

**Table A.1-8** Operational GHG emissions of Alternative 2

Source	Metric Tons CO <sub>2</sub> e per Year
Transportation	-229,000 (citywide)
Building Energy— Residential	41,949
Building Energy—Commercial	18,396
Solid Waste	36,958
<b>Total</b>	<b>-131,697</b>

Source: ESA, 2014; Fehr &amp; Peers, 2014.

**Table A.1-9** Operational GHG emissions of Alternative 3

Source	Metric Tons CO <sub>2</sub> e per Year
Transportation	-224,000 (citywide)
Building Energy— Residential	41,670
Building Energy—Commercial	18,640
Solid Waste	36,958
<b>Total</b>	<b>-126,732</b>

Source: ESA, 2014; Fehr &amp; Peers, 2014.

**Table A.1-10** Operational GHG emissions of Alternative 4

Source	Metric Tons CO <sub>2</sub> e per Year
Transportation	-221,000 (citywide)
Building Energy— Residential	39,023
Building Energy—Commercial	18,238
Solid Waste	36,958
<b>Total</b>	<b>-126,781</b>

Source: ESA, 2014; Fehr &amp; Peers, 2014.

**A.1 Air Quality & GHG**

< intentionally blank >