

**Supplementary Information for HB 2186 MPO Greenhouse Gas Emissions Task Meeting #2 Related to Briefing on Greenhouse Gas Emissions in the Oregon Transportation Sector**

ODOT Transportation Planning Analysis Unit

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**Worker Travel Tables**

**Percentages of Workers Traveling to Metropolitan Area Workplaces**

| <b>Workplace MPO</b> | <b>% Residing Inside MPO</b> | <b>% Residing Outside MPO</b> | <b>Workers</b> |
|----------------------|------------------------------|-------------------------------|----------------|
| Bend                 | 74                           | 26                            | 38051          |
| Eugene-Springfield   | 80                           | 20                            | 124735         |
| Corvallis            | 64                           | 36                            | 38429          |
| Metro                | 83                           | 17                            | 751609         |
| Rogue Valley         | 86                           | 14                            | 75943          |
| Salem-Keizer         | 73                           | 27                            | 100758         |
| All MPO              | 81                           | 19                            | 1129525        |

**Average Round Trip Travel Distance of Workers Traveling to Metropolitan Area Workplaces**

| <b>Workplace MPO</b> | <b>Ave. Miles of Workers Residing Inside MPO</b> | <b>Ave. Miles of Workers Residing Outside MPO</b> | <b>Ave. Miles All Workers</b> |
|----------------------|--|---|-------------------------------|
| Bend                 | 10   | 42  | 18                            |
| Eugene-Springfield   | 8  | 48  | 16                            |
| Corvallis            | 7  | 40  | 19                            |
| Metro                | 13   | 45  | 18                            |
| Rogue Valley         | 13   | 58  | 19                            |
| Salem-Keizer         | 8  | 42  | 17                            |
| All MPO              | 12   | 45  | 18                            |

**Percentages of Vehicle Miles Traveled of Workers Traveling to Metropolitan Area Workplaces**

| <b>Workplace MPO</b> | <b>% Residing Inside MPO</b> | <b>% Residing Outside MPO</b> | <b>VMT</b> |
|----------------------|------------------------------|-------------------------------|------------|
| Bend                 | 40                           | 60                            | 689868     |
| Eugene-Springfield   | 40                           | 60                            | 2004778    |
| Corvallis            | 24                           | 76                            | 719794     |
| Metro                | 59                           | 41                            | 13689134   |
| Rogue Valley         | 58                           | 42                            | 1453752    |

|              |    |    |          |
|--------------|----|----|----------|
| Salem-Keizer | 33 | 67 | 1693209  |
| All MPO      | 53 | 47 | 20250535 |

**Percentages of Greenhouse Gas Emissions of Workers Traveling to Metropolitan Area Workplaces**

| <b>Workplace MPO</b> | <b>% Residing Inside MPO</b> | <b>% Residing Outside MPO</b> | <b>Tons CO2e</b> |
|----------------------|------------------------------|-------------------------------|------------------|
| Bend                 | 40                           | 60                            | 282              |
| Eugene-Springfield   | 40                           | 60                            | 820              |
| Corvallis            | 24                           | 76                            | 294              |
| Metro                | 59                           | 41                            | 5599             |
| Rogue Valley         | 58                           | 42                            | 595              |
| Salem-Keizer         | 33                           | 67                            | 695              |
| All MPO              | 53                           | 47                            | 8285             |

**Methodology for Estimating Worker Travel Tables**

The worker travel tables were estimated using data from the year 2000 Census contained in the Census Transportation Planning Package (CTPP). The CTPP contains a number of special tabulations by the Census Bureau for transportation research and planning purposes. Workers and their travel are tabulated by residence location, by work location, and jointly by residence and workplace. The Oregon and Washington CTPP tables for worker travel from residence census tract to workplace census tract by travel mode were used to make the estimates in the report. The steps followed for converting these data into estimates of worker travel and greenhouse gas emissions were as follows:

1) Census tract boundaries do not line up with metropolitan area urban growth boundaries (UGB). Census tracts at the metropolitan area fringe frequently include some areas inside and outside of the UGB. Deciding whether or not to include workers in census tracts that straddle a UGB in the tabulation of metropolitan workers required the exercise of judgment regarding how to balance out errors. Excluding tracts that have any portion located outside of the UGB would underestimate the metropolitan area worker count. Including tracts that extend across the UGB into rural areas would overestimate the metropolitan area worker count. The decision was made to err on the side of including more census tracts in the tabulations of workers residing in metropolitan areas because:

- Population densities within UGBs tend to be several times higher than population densities outside of UGBs, so for any given area size, the size of the error of including a rural area in the metropolitan tabulation is lower than the size of the error of excluding an urban area;
- The populations of UGB straddling census tracts are small compared to the metropolitan area totals;
- Rural residents at the fringe of a UGB are likely to have travel characteristics that are similar to those of nearby suburban residents at the UGB fringe.

Based on these considerations, a decision was made to err on the side of including, rather than excluding UGB straddling census tracts. A number of area thresholds were mapped and compared to urban growth boundaries before deciding on using a threshold of 5% of the area of the census tract being located within a metropolitan area UGB.<sup>1</sup>

2) Travel distances between census tracts were estimated as the shortest path distance on roadways between census tract centroids. Shortest path distances were computed using the statewide model.

3) For the purposes of confidentiality, the Census bureau does not identify the mode of travel (e.g. single-occupant vehicle, rideshare, van-pool, bus) between census tracts where less than 4 people traveled by that mode. To estimate likely mode share for underreported census tract to census tract travel movements, it was assumed that the mode share would be similar to well reported movements that had residence and workplace locations that are nearby. For underreported travel movements that did not have nearby values to use, the county to county mode share averages corresponding to the residence and work counties for the travel were used. In a few specific instances where county to county mode shares were also underreported, statewide average mode shares by distance traveled were used.

4) In some counties, there was an underreporting of work locations. This was significant for metropolitan commuting only in a few instances. Linn County was the only county in the Willamette Valley where work locations were not reported (38%). Deschutes County was the only metropolitan area county where work locations were not reported (46%). To adjust for this underreporting, it was assumed that workers with unaccounted work destinations would have work destinations that have the similar travel distances and mode splits as workers living in the same census tract that had their work destinations accounted for.

5) Once the data issues discussed above were resolved, worker trips and VMT could be tabulated directly from the data. The distance between census tracts was multiplied by 2 to calculate round-trip distances.

6) Carbon dioxide emission equivalents were calculated by applying per mile emission rates by travel mode.<sup>2</sup>

### **GreenSTEP Model Structure and Assumptions and Use**

GreenSTEP is a model for forecasting greenhouse gas emissions from passenger and freight travel. The model was developed for the purpose of assisting the development of a

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<sup>1</sup> One way of considering the reasonableness of this threshold is to compare typical urban and rural densities. Suburban residential development with 5000 square foot lots is about 17 times the density of rural residential development with 2 acre lots.

<sup>2</sup> M.J. Bradley & Associates, Comparison of Energy Use and CO2 Emissions from Different Transportation Modes, American Bus Association, Washington D.C, May 2007.

statewide strategy for reducing greenhouse gas emissions from the transportation sector. A number of factors can be adjusted to estimate effects on greenhouse gas emissions these include:

- Relative amounts of development occurring in urban and rural areas;
- Metropolitan and other urban area densities;
- Urban form;
- Amounts of metropolitan area transit service;
- Highway capacity;
- Vehicle fuel efficiency;
- Vehicle ages;
- Use of electric vehicles;
- Fuel prices;
- VMT pricing;
- Demand management;
- Effects of congestion on fuel economy;
- Vehicle operation and maintenance;
- Carbon content of fuels, including the well to wheels emissions; and,
- Carbon production from electrical power generation for electric vehicles.

GreenSTEP is also sensitive to forecasted changes in age demographics and statewide income.

It is anticipated that GreenSTEP will be helpful for developing preliminary estimates of metropolitan area emissions and that portions of the GreenSTEP model may be combined with urban travel models to develop better metropolitan area estimates.

Several presentations on GreenSTEP have been posted on the website. These provide information about GreenSTEP and about the assumptions that were used for the model runs that were presented at the task force meeting.

- OGWC\_TLU\_Review\_20090209.ppt is a presentation given to the Transportation and Land Use committee of the Oregon Global Warming Commission that provides an overview of GreenSTEP and preliminary results. This presentation described the scenario assumptions tested.
- GreenSTEP\_Peer\_Review\_20090203.ppt is a presentation given to the expert peer review panel on GreenSTEP structure, model estimation and model validation. This describes the guts of the model (not for the faint hearted).