TECHNICAL MEMORANDUM:
METHODOLOGY SUMMARY & REVIEW (Task 2A)

This memorandum has been prepared to address Task 2A of TGM project 4A-09 Central Oregon Public Transportation and Infrastructure Investment Strategic Plan:

> *The COIC Project Planner, with the assistance and guidance of the TC, shall prepare a summary methodology overview for the development of the following Technical Reports. The methodology overview must outline all* ***data collection, assumptions and analysis methods****, and indicate how the data will be used, how estimates will be determined, the reliability of the data, and the types of conclusions that can be drawn from the methodology. Due to the long-term and broad nature of this project, data and outcomes will be coarse in scale, and use to present a "30,000 foot view" of the issues. The methodology will be reviewed by ODOT Transportation Planning Analysis Unit.*

The methodology outlined below was reviewed and approved by the project Technical Committee at the first TC meeting, held August 12, 2010.

1. DATA COLLECTION

A. Data Sources:

- ODOT Transportation Planning Analysis Unit
- Bend MPO
- Local Comprehensive Plans/TSPs
- Other Regional and MPO Data for Oregon
- Applicable national studies on transit, greenhouse gas reduction, etc.

B: Specific Data Proposed for Use for the Analysis:

- highway lane miles and Average Annual Daily Trips: ODOT
- Public Transit Supply Levels: Ridership and route information from Bend Area Transit, Cascades East Transit, Bend Dial-a-Ride, Breeze for inter-city travel
- Vehicle Miles Traveled (VMT)/Average Daily Trips (ADT) on intercity arterials: ODOT, Bend MPO
- Carbon Emissions Baseline Data: Bend Community Carbon Inventory (Phase I): Analysis and Recommendations (Balter et al, 2008); EPA's Guidelines to Calculating CO2 Emissions @ http://www.epa.gov/otaq/climate/420f05001.htm#calculating; Greenhouse Gas reductions from Transportation Strategies: Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions. Cambridge Systematics for Urban Land Institute. 2009.
- Employment data (i.e. number of employees that commute from another city): Commute Options
- Planned capitol roadway improvements (i.e. interchanges, new arterials): TSPs, Comprehensive Plans, and interviews with ODOT/County staff
- Infrastructure costs: Road departments and ODOT will provide typical costs
- Travel forecasts and infrastructure needs: TSPs, Comprehensive Plans, and interviews with ODOT/County staff
- Greenhouse gas emissions of Transit: APTA Climate Change Standards Working Group Recommended Practice for Quantifying Greenhouse Gas Emissions from Transit August, 2008

- Potential Scenarios for Transportation Strategies: City, County and State TSPs (including the State Rail Plan), Comprehensive Plans, interviews with Staff, as well as literature review

2. ASSUMPTIONS

- Analysis will be based on highway travel between cities within the project area. Cities include: Madras, Sisters, Redmond, Prineville, Bend, and LaPine. The highways included for analysis (as data is available) include:
    - 126, Sisters-Redmond (ODOT Hwy No. 15)
    - 126, Redmond to Prineville (ODOT Hwy No. 41)
    - 97, Madras-Redmond (ODOT Hwy No. 4)
    - 97, Redmond-Bend (ODOT Hwy No. 4)
    - 97, Bend-LaPine (ODOT Hwy No. 4)
    - 26, Madras-Prineville (ODOT Hwy No. 360)
    - 20, Bend-Sisters (ODOT Hwy No. 17)
    - 361, Culver & Metolius (ODOT Hwy No. 361)
    - Powell Butte Hwy, Bend-Prineville (if comparable data is available)
- The State of Oregon GreenSTEP methodology currently being developed by TPAU will not be used for this project, as it is not completely tested and is more complex than is required for the "30,000 foot level" analysis required by this project.
- VMT will be calculated by multiplying the AADT with the highway segment length per available ODOT data.
- Intercity commute trips will be approximated by locating the closest ODOT mile post to the city boundary of each city within the study area and averaging the AADTS over the segment between cities.
- ODOT sources will be used for vehicle classification.
- The calculated VMT will be used to for calculating baseline GHG emissions in 1990 and 2010 (or as close to those years for which data is available).
- No adjustments for trips passing through a city (ie, LaPine to Madras) will be made.
- The most accurate data available will be obtained and be the basis for the analysis – on the premise that some data will consist of averages or other estimates, the analysis techniques will strive for overall consistency for true comparative purposes, rather than a high degree of precision (in keeping with the "30,000 foot view")
- The primary goal of the analysis is application of a consistent methodology to demonstrate a percentage of change for the scenario analysis.

3. ANALYSIS METHODS

A. Baseline Greenhouse Gas

The starting point for the analysis of GHG reductions is referred to as the study "baseline." Estimates of the GHG reductions from the scenarios developed in Task 2(B) will be reflected as changes from the study baseline. It is recognized that the baseline does not include shorter-term fluctuations that occur due to fuel price changes and economic cycles.

The methodology for determining baseline greenhouse gases is derived from Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel EPA420-F-05-001 February 2005:

- For 1990: VMT*0.19(lb CO2e per mile)/18.2 (average mpg in 1990[1])/2204.62 = metric tons of CO2e per highway segment
- For 2000: VMT*0.19(lb CO2e per mile)/19.7 (average mpg in 2000)/2204.62 = metric tons of CO2e per highway segment
- For 2010: VMT*0.19(lb CO2e per mile)/20.3 (average mpg in 2009)/2204.62 = metric tons of CO2e per highway segment
- For 2030: [VMT*0.19 (lb CO2e per mile)/30.14 (predicted average mpg in 2030[2])/2204.62 = metric tons of CO2e per highway segment

B. 2030 Regional Community Trip Forecast & Infrastructure Estimate

This task measures expected trip generation and infrastructure costs based on **no change** to existing policies affecting transit use.

Data from County TSPs and ODOT will be used to predict regional intercommunity trip generation, based on the conditions assumed in existing planning documents (i.e., land use patterns, growth factors).

Where previously determined numbers are not available, future trips will be calculated using a growth factor multiplier consistent with AASHTO's recent Bottom Line analyses, which predicts a base case forecast growth rate of 1.4 percent per year in highway vehicle miles of travel[3].

The costs of accommodating anticipated 2030 regional intercity will be determined using Infrastructure costs from existing TSPs, ODOT information, and cost information obtained from existing intercity transit providers. In addition, the study Rural Transit in Oregon: Current and Future Needs (PSU for ODOT, 2010) will be used to determine the basic costs of providing intercity transit services. Where costs are not available, the TC and ODOT will provide guidance on the extent and cost of typical infrastructure improvements needed to accommodate the projected increases in traffic.

C. Alternative Scenario & Cost Analysis

The Alternative Scenarios are not yet developed (Task 2.B), so the methodology for measuring their effect is still unknown. It is likely that the scenarios will include such alternatives such as: reducing fares, increasing levels of service (improved travel time), and expanding intra-city transit so that end-trips are more effective.

Once the scenarios are developed, the effects of each scenario will be measured in terms of potential VMT and green house gas reduction. Where possible, we will rely on existing analytical tools to estimate the extent of GHG reductions. These will be derived, to the extent feasible, from previous publications such as Moving Cooler: an Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions, and the Technical Appendices for that study.

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[1] "Average Fuel Efficiency of U.S. Passenger Cars and Lights Trucks," Research and Innovative Technology Administration, Bureau of Transportation Statistics, U.S. Department of Transportation

[2] From *Moving Cooler:* assumes an annual 1.91% increase in fuel economy for cars and light trucks

[3] Bottom Line Technical Report: Highway and Public Transportation Investment Needs. American Association of State Highway and Transportation Officials (AASHTO), March 2009.

We will also determine the potential for the selected scenarios to reduce the need to construct new transportation infrastructure over the planning period.

To determine the potential for intercity trips to convert to transit, we will also use the recent report Rural Transit in Oregon: Current and Future Needs[4], which makes some predictions about the effect that certain transit improvement strategies could potentially have on ridership.

[4] Rural Transit in Oregon: Current and Future Needs. By Portland State University, Center for Transportation Studies for the Association of Oregon Counties and ODOT. January 2010.