Oregon Department of Transportation

US 97
Bend North Corridor
Solutions

"Improving Safety, Mobility, Traffic Flow"

Final Energy

Impact Assessment Methodology Memorandum

October 2009

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Region 4

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1. Introduction

This technical memorandum fulfills a requirement of the Federal Highway Administration (FHWA) 2005 legislation titled Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (23 U.S. Code §139). Section 6002 of the legislation, titled Efficient Environmental Reviews for Project Decisionmaking, requires regulatory agencies to collaborate in establishing the research methodologies used to evaluate transportation project alternatives.

The purpose of this Energy Impact Assessment Methodology memorandum is to describe the methods that will be used to collect data and evaluate the project's impacts to energy. This memorandum, for the US 97 Bend North Corridor Project, will also document consultation with the Oregon Department of Transportation (ODOT) and the participating agencies on the approach taken to research each environmental discipline before conducting the research.

1.1 Project Description

US 97 is a strategic north-south state facility that runs through the central portion of the state and is a complement to the I-5 corridor. It is classified as a statewide facility and freight route along its entire length, and as an expressway through the study area. US 97 is a critical link in moving goods and people through Central Oregon. US 20 is similarly designated as a statewide freight route and expressway through the study area.

Through the study area, US 97 also serves as a way for people to get to and from home and work, and it is a connection to area shopping and dining. In addition, the tremendous population growth in Bend and Central Oregon has placed many demands on US 97: an increase in congestion, disruptions in traffic flow, an increase in traffic delays and an increase in the number of crashes. The purpose of the US 97 Bend North Corridor Project (the project) is to reduce traffic congestion, improve traffic flow and improve public safety on the segment of US 97 between the Deschutes Market Road / Tumalo Junction interchange and the Bend Parkway / Empire Avenue interchange.

By Summer 2009, four Build Alternatives were identified for detailed environmental study: three distinct east corridor alternatives (East 1, East 2, and East 3) and one west corridor alternative (West 1). These alternatives are described below. As of Fall 2009, the project team is investigating down-scaled versions of these alternatives to determine if lower cost solutions address the project purpose and need. If any down-scaled versions are forwarded for detailed environmental study, subsequent project documentation will be provided. All methodology included in this memorandum is expected to apply to any transportation alternative developed for the US 97 Bend North Corridor project.

1.1.1 *East Corridor Alternatives*

With the east corridor alternatives US 97 would be realigned east of the existing highway adjacent to the Burlington Northern Santa Fe Railroad. The following is a summary of the key features of all of the east corridor alternatives:

- Slip ramp provided to access Robal Road from northbound US 97.

- Existing US 97 becomes a local route, 3rd Street.
- US 97 and US 20 are connected just north of Empire Avenue. Direct connections from northbound US 97 to westbound US 20 and eastbound US 20 to southbound US 97.
- US 97 / Empire Avenue interchange uses a single point interchange to handle traffic more efficiently.

The east corridor alternatives differ in the location of the project's northern interchange and the type of interchange.

- **East 1:** Partial northern US 97 interchange located just north of Fort Thompson Lane. Exit for southbound US 97 traffic to 3rd Street and an entrance for traffic on northbound 3rd Street on US 97.
- **East 2:** Partial northern US 97 interchange located near Bowery Lane. Exit for southbound US 97 traffic to 3rd Street and an entrance for traffic on northbound 3rd Street on US 97.
- **East 3:** Partial northern US 97 interchange located in the Clausen/Grandview area. Exit for southbound US 97 traffic to 3rd Street and an entrance for traffic on northbound 3rd Street on US 97.

1.1.2 *West Corridor Alternative*

With the west corridor alternative US 97 would be realigned to the west of the existing highway. The following is a summary of the key features of West 1:

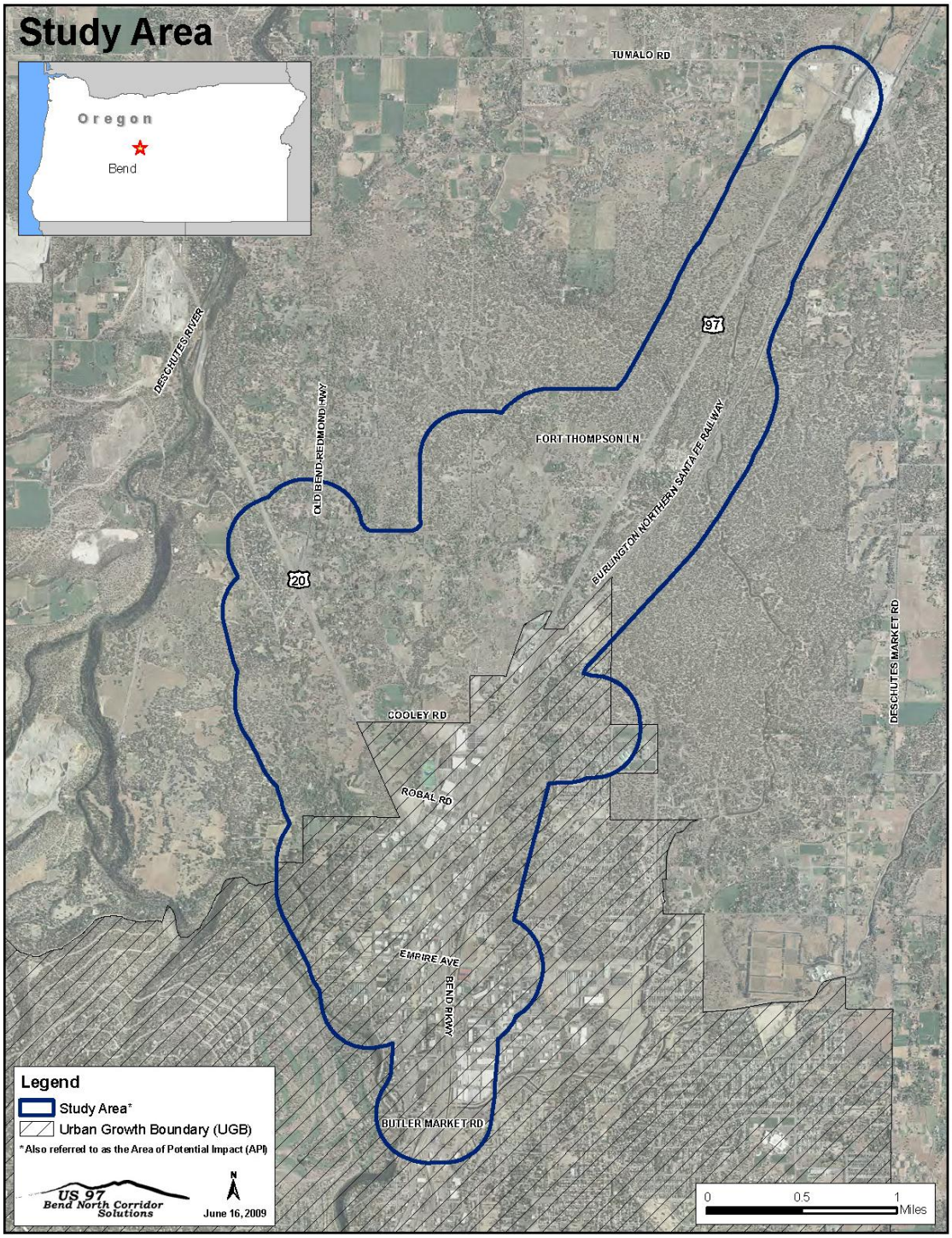
- US 97 and US 20 traffic are combined into a common roadway corridor between Empire Avenue and Cooley Road.
- US 97 and US 20 interchange is located near Cooley Road.
- Collector / distributor roads provide access at Robal Road, 3rd Street and Empire Avenue from the highways.
- Partial northern US 97 interchange is located near Bowery Lane. Exit for southbound US 97 traffic to 3rd Street and entrance for traffic on northbound 3rd Street on US 97.
- Existing US 97 becomes a local route, 3rd Street.
- Empire Avenue interchange is reconfigured in a split diamond interchange design, which will function as collector / distributor roads from 3rd Street / US 20 and which will include signals on the ramps at Empire Avenue and 3rd Street.

1.2 Area of Potential Impact

The project's study area is the area within which potential environmental, social and economic impacts from the project may directly occur. It is also called the Area of Potential Impact (API). The study area is in the north end of Bend. It extends along US 97 from the Deschutes Market Road / Tumalo Junction interchange to approximately Butler Market Road, and along US 20 from approximately Old Bend-Redmond Highway to Butler Market Road. It also encompasses the area between US 97 and US 20 south of Fort Thompson Road. The study area extends about

one-quarter mile on either side of the combined preliminary project footprint for the project alternatives. The preliminary project footprint is the estimated maximum extent of potential ground disturbing activities. The API is shown in Exhibit 1, which also shows the location of the City of Bend's Urban Growth Boundary (UGB).

Exhibit 1. US 97 Bend North Corridor Project Area of Potential Impact



2. Relevant Laws and Regulations

All environmental analysis and reporting for the project will comply with the National Environmental Policy Act (NEPA) and the FHWA's Technical Advisory T6640.8A (October 30, 1987). Relevant laws and regulations include federal requirements, state plans and laws, and local adopted plans and policies. Exhibit 2 identifies the federal, state and local plans and regulations relevant to energy. All environmental analysis and reporting for the project will comply with the National Environmental Policy Act (NEPA) and the FHWA's Technical Advisory T6640.8A (October 30, 1987).

Exhibit 2. Relevant Laws and Regulations for Energy

Regulatory Source	Title	Source	Statement of Requirement
Federal	National Environmental Policy Act (NEPA). 42 United States Code (USC) 4332	U.S. Code	NEPA requires that federal agencies consider environmental impacts before taking actions that could affect the human environment. Energy use is one of the environmental elements typically assessed in a NEPA document.
Federal	Title 42. 42 USC 6201, 13401, 13431	U.S. Code	Title 42 of the USC focuses on energy conservation, reduced reliance on foreign energy sources (mainly petroleum), use of alternative fuels, and increased efficiency in energy use.
Federal	Energy Policy Act of 2005	Public Law (PL) 109-58	The Energy Policy Act of 2005 amended and now supersedes several previous energy policy acts, including the National Energy Act of 1978 (PL 95-619), the Energy Policy and Conservation Act Amendments of 1985 (PL 99-58), and the Energy Policy Act of 1992 (PL 102-486).
Federal	FHWA Technical Advisory T 6640.8A		This document provides guidance on the preparation of environmental documents, including the analysis of energy impacts. It states that an environmental impact statement (EIS), "…should discuss in general terms the construction and operational energy requirements and conservation potential of the various alternatives under consideration."
Oregon	Statewide Planning Goals: Goal 13 (Oregon Administrative Rules (OAR) 660-015-0000(13))		Goal 13: Energy conservation Land and uses developed on the land shall be managed and controlled so as to maximize the conservation of all forms of energy, based upon sound economic principles.
Oregon	Oregon State Transportation Plan (OTP)		The OTP establishes goals, policies, strategies and initiatives that address the core challenges and opportunities facing Oregon. Several plan policies relate to energy conservation and efficient use.
Oregon	e-Guide: ODOT's Environmental Guidance Website		Website provides guidance for completing energy analyses for transportation projects.

3. Coordination with ODOT and Other Agencies

ODOT's Traffic Planning and Analysis Unit (TPAU) will be providing traffic data for the build alternatives.

4. Data Sources

The following data sources will be used:

- ODOT's TPAU traffic data typical for EIS documents
- Average Daily Traffic (ADT) volumes for automobiles and trucks
- Fuel consumption rates for trucks and autos

Where appropriate, data collection and use will be coordinated with other relevant disciplines.

5. Data Collection Methods

5.1 General Methods

Information will be collected from the sources listed in Section 4, Data Sources, to describe the existing energy conditions in the API.

ADT volumes for automobile and trucks (separately) are calculated for each link, the link length and its respective speed. This information is used to calculate operational energy requirements for autos and trucks separately. The auto and truck fuel usage is then grand totaled after these calculations.

5.2 Modeling Tools

TPAU will perform the traffic modeling and provide the modeling data, which will be used in the energy analysis.

6. Analysis Methods

The following is a summary of the methods that will be used to assess the project's adverse and beneficial direct, indirect and cumulative energy impacts. The general approach for mitigation is also documented.

6.1 Direct Impact Analysis Approach

6.1.1 *Temporary Construction Impacts*

The construction-related energy consumption required to complete a project is proportional to the project size and the nature of the work involved. For projects of a specific type, the energy required for construction is proportional to the project cost, as the project cost is directly related to the project size. As a result, energy consumption for a specific project can be expressed as a function of cost and type. Exhibit 3 provides the correlation between project type and the rate to evaluate construction – related impacts. These data are taken from Caltrans' study *Energy Transportation Systems* (1983) and converted to 2008 dollars.

Exhibit 3. Correlation between Facility Type and Construction Energy Rate

Facility Type	Factor (MBTU / thousand dollars)
Rural Freeway	30.5
Rural Conventional Highway	29.0
Rural Freeway Widen	19.0
Rural Conventional Highway Widen	20.5
Urban Freeway	12.1
Urban Conventional Highway	11.1
Urban Freeway Widen	10.8
Urban Conventional Highway Widen	10.2
Interchange	30.8

6.1.2 *Long-Term Impacts*

Following the method described above, long-term energy impacts will be quantified in terms of gallons of fuel consumed and, energy consumption requirements (in MBTU) for the No Build Alternative and each of the Build Alternatives.

6.2 Indirect Impact Analysis Approach

In addition to the energy directly consumed by vehicles and used for facility operation and maintenance, transportation systems indirectly consume energy. For example, the manufacturing and routine maintenance of vehicles requires energy. Indirect energy consumption is typically negligible in energy analysis. The report will provide a qualitative summary of indirect impacts. The indirect impacts analysis will use a boundary no larger than the geographic boundary for cumulative impacts (below).

6.3 Cumulative Impact Analysis Approach

Coordination with ODOT will occur to determine if the project would have a cumulative energy impact when combined with past, present and reasonably foreseeable future actions. If it is determined that cumulative impacts would occur the following approach would be followed.

First, a cumulative impacts geographic boundary will be identified for each resource. The determination of geographic boundary will consider the geographic extent of direct and indirect project impacts as well as corresponding natural boundaries of the resource. Justification for the geographic boundary will be provided for each resource.

Next, a temporal boundary will be identified for the resource. This temporal boundary defines the historic timeframe for the resource, and will be the beginning point for the historic context discussion. The historic context discussion will be a qualitative discussion of how the resource came to be in its current condition. A general discussion of past and present actions that have influenced the current condition of the resource will be included. Specific past and present projects will not be identified, but general actions (e.g. expansion of urban areas, development of national highway system, conversion of agricultural lands, etc) will be discussed.

Third, a list of reasonably foreseeable future projects (both public and private) will be developed for the cumulative impacts geographic boundary for all resources combined. This list will include projects currently identified in city, county and regional adopted plans, and therefore "reasonably foreseeable", that could potentially combine with direct or indirect impacts of the US 97 Bend North Corridor project to produce cumulative impacts. An end date for the list of projects will be identified (e.g. extent of timeframe for adopted plans), and will not extend past the design horizon for the project. Private development projects will be identified through coordination with planners at the city and county (e.g. review of pre-application materials). Additionally, the Juniper Ridge development will be included in the list of projects. Rationale for projects included in the list will be provided.

Lastly, a methodology for identifying and analyzing cumulative impacts for each resource will be presented. The cumulative impacts analysis will be done qualitatively, but, when possible, quantitative information will supplement the discussion. Technical report authors will coordinate with ODOT on the proposed methodology.

6.4 Mitigation Approach

This section discusses potential mitigation measures that could be used to avoid or minimize energy impacts. Potential mitigation measures will only be discussed for the temporary impacts of the build alternative. The document will describe possible mitigation measures for temporary effects such as:

- Limit idling of construction equipment
- Locate staging areas as close to work sites as possible
- Implement traffic management plans that minimize delay and vehicle idling.

7. References

California Department of Transportation (CalTrans) Energy and Transportation Systems. 1983.

Oregon Department of Land Conservation and Development. 1975. Statewide Planning Goals.

Oregon Department of Transportation. 2006. Oregon State Transportation Plan.

Appendix A Correspondence with ODOT Discipline Reviewer

Jason Bright (Parsons Brinckerhoff) contacted Marina Orlando, ODOT Air Quality Program coordinator, on July 13, 2009 to discuss the methods for the energy analysis. She provided fuel consumption rates to be used in the analysis. Ms. Orlando also provided review comments on the methodology presented, which have been incorporated.

Appendix B Coordination with Participating Agencies

ODOT distributed the Draft Final Impact Assessment Methodology Memoranda to participating agencies for review on August 25, 2009. The 30-day review period ended on September 23, 2009. ODOT received no substantive comments that required changes to this memorandum from the participating agencies.