OTIG
Oregon Transportation Improvement Group

OREGON ROADS PROJECT

ALTERNATIVES ASSESSMENT: SUMMARY FEASIBILITY REVIEW

NEWBERG DUNDEE TRANSPORTATION IMPROVEMENT PROJECT

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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

Purpose of the Summary Feasibility Review

The Oregon Transportation Improvement Group (OTIG), working in consultation with the Oregon Department of Transportation (ODOT) and local communities, is investigating whether the Newberg-Dundee Transportation Improvement Project, a proposed 11-mile stretch of highway to be located on the south side of Newberg and Dundee, is a technically and financially viable transportation solution for the state of Oregon.

OTIG has prepared a Summary Feasibility Review (the Review), which identified issues surrounding the proposed Newberg-Dundee bypass, including funding, tolling and extension options, design and construction costs, and recommended next steps in the analysis process.

It is important to note that this study represents a preliminary review of the likely feasibility issues associated with each of the alternatives that are discussed and that it is based on incomplete information. The purpose of this study is to identify the issues, which require further focus and analysis, not to reach conclusions at this stage.

Revenue from direct tolls is the largest and most immediate source of potential revenue for the project. Both the bypass project itself and the use of tolls as a funding mechanism for the project, enjoy strong local support. This approach is likely to have greater public acceptance than increases in property or gas taxes, and offer more certainty than federal or state funding sources.

One of the objectives of Stage One of the work being undertaken by OTIG due for completion by the Fall of 2006 is to identify the potential for the project to be self-supporting using direct tolls and to calculate any “funding gap” which would remain to be filled through other sources. It is premature to calculate the funding gap in this Review as the majority of the data collection and analysis work still needs to be completed. It is possible to identify some broad themes in respect of the likely funding gap to focus and inform the work yet to be done.

The existence of a funding gap will depend upon a number of factors including both the cost and the revenue sides of the project.

Design and Construction Costs

The design and construction costs for the Newberg-Dundee Bypass are still under development and therefore carry a wide range of estimate between $325 million at the low end to $425 million at the high end. There are several critical areas that have yet to be finalized as part of the NEPA environmental process. The Interchange Area Management Plan (IAMP) process should not significantly impact the project costs, however efforts need to be made to ensure that it does not impact the schedule. The vertical alignment needs to be evaluated, pavement design and soil stabilization need to be reviewed along with the number of bridges and their spans. Some interchanges and overpasses may also need to be re-evaluated.

Schedule

The current schedule for the base project shows the FEIS for the Tier 2 in December 2007 with a Record of Decision (ROD) for January or February 2008. Delays could be caused

by the NEPA process or the IAMPS process. The parties will work collaboratively to ensure that the environmental process proceeds on schedule.

Cost and Schedule Reduction Options

To date, cost has not been used as part of the criteria to evaluate proposed design alternatives, some of which have proven to be quite costly. Reductions in the schedule will depend on interagency reviews, the public involvement and review process, and other factors, all of which will need to be carefully managed.

Extension Options

Several options for extending the base Project have been suggested by ODOT, OTIG or local officials. These options will only progress if they materially enhance the technical or financial feasibility of the base project. A preliminary analysis has been conducted for each option:

- **McMinnville Extension.** OTIG has proposed to extend the Project along OR18 from McDougall Corner to McMinnville to create a 20 mile limited access corridor. The largest costs for this extension are the interchanges and additional right of way. If this option is to go forward, additional design and research will need to be done along with a separate environmental assessment. Additional design should be done at the interchanges to verify type, layout and cost, and research on existing bridges should be conducted to verify if replacement or widening is required. The existing network of collector-access roads should be reviewed and discussed with the local communities and Yamhill County to verify timing and need, and an Environmental Classification Assessment should also be conducted.
- **Tualatin–Sherwood (I-5 / 99W Connector).** ODOT is conducting early stage analysis of this project to provide a direct link between the I-5 and OR 99W bypassing the towns of Tualatin and Sherwood. OTIG is considering this option in its analysis of the base project. Additional design in relation to the I-5 interchange is required to verify the cost of this project. The alignment along 99W also needs to be evaluated with respect to both traffic and environmental concerns. In addition, the amount of right of way required will need to be verified before this project can move forward.
- **OR18 beyond McMinnville.** The McMinnville Extension would provide the opportunity to add further lanes to the Yamhill County line and ultimately to the Oregon coast. At this point, no cost estimates have been prepared by ODOT for this project and it would be premature to provide recommendations on this extension option at this time.

If either the McMinnville or OR18 extension proves feasible, separate environmental documents will be prepared. These extension options will not delay implementation of the base project. At this point, it is highly unlikely that the Tualatin-Sherwood Connector will satisfy the requirements of the RFP as an extension to the Newberg-Dundee project and therefore will likely not proceed on that basis.

Tolling Issues

There are three basic tolling methods possible: Distance related tolls, a toll per Trip (either captured at the exit or a point such as a bridge), and a time of day based Period Toll. In addition, OTIG has defined two general tolling options:

- Tolling the Bypass - A toll plaza could be located at the proposed East Newberg Interchange at the entry of the new Bypass to toll only the Bypass. Traffic which did not wish to pay the toll could use the existing OR 99W.
- Access Tolling - A toll plaza could be located near the proposed East Newberg Interchange. The Access Tolling concept would capture all through traffic using the corridor, whether the choice was made to use the faster Bypass or the existing OR 99W to visit the towns of Newberg and Dundee. Access tolling would ensure full utilization of the capacity of the Newberg-Dundee Project and reduce the impact of traffic through the city centers of Newberg and Dundee. This would ensure that the project meets the NEPA Purpose and Need statement in diverting traffic out of the city centers. It is expected that any Access Tolling concept would be combined with a local discount scheme to avoid capturing local trips.

Two methods of payment are under consideration: Barrier and Open Road Tolling, both of which could employ non-stop electronic toll collection systems that are being progressively implemented worldwide. Several toll levels and vehicle classification approaches are reviewed and outlined. The issue of "interoperability" is particularly important in Oregon where there are no tolled facilities at present. Ideally the system would be designed to allow electronic toll collection customers to use any future toll road in Oregon as well as surrounding states with a single e-sticker or transponder toll collection device.

The traffic and revenue data proposed to be collected will support decision making based on any of these tolling options and no option is being precluded at this stage.

Preliminary Traffic and Revenue Forecasts

Preliminary traffic and revenue forecasts, based on existing data sources, have been prepared for OTIG in relation to the Newberg-Dundee Bypass and I-5 - 99W Connector. These have provided initial estimates of annual revenue under a variety of scenarios based on experience of similar situations, including different toll levels, concession periods, traffic composition, local traffic discounts and anticipated traffic growth.

The traffic forecasts indicate existing traffic volumes of approximately 35,000 average daily traffic (ADT) between Newberg and Dundee in the busiest part of the corridor falling to 25,000 ADT to the south of Dundee. The key information missing from current data is the proportion of short trips between Newberg and Dundee made by local residents and the proportion of trips passing through Newberg and Dundee to points elsewhere. One of the keys to the size of the funding gap is the total proportion of trips that are eligible to pay a toll.

The preliminary results indicate that the Project is likely to be financially self-supporting by toll revenues alone only under an access tolling approach, in which the entire corridor traffic can be captured rather than having the Bypass compete with the existing free alternative. This results in the strongest revenue and is likely to be the best option to minimize any funding gap in respect of the Project.

Investment Grade Traffic and Revenue Forecasts

A methodology for developing investment grade demand and revenue forecasts is described. Forecasts will be developed using an approach that quantifies the proportion of traffic likely to be to use the facility, which depends on:

- Traffic data

- Economic, demographic and market trend data
- The advantages (or benefits) of the toll road over the existing road
- The willingness of drivers to pay for those advantages.

A detailed survey program, which is planned to begin May 2006, will form the basis for the development of the forecast.

Financial Model Overview

The preliminary assumptions that are currently being used in the financial model are outlined. The financial model takes the revenues identified from the potential funding sources and uses them to support potential financing for the project. The model can analyze:

- Upfront grant funding of design and construction costs
- Public sector tax exempt or taxable bond issues
- Private Activity Bonds (tax exempt)
- Private taxable debt and equity financing

As a primary assumption, the amount of senior and subordinated debt as a percentage of total capital employed (debt plus equity) is assumed to be 70% at the completion of construction, implying that 70% of all construction costs are funded by debt. By extension, the remaining 30% of construction costs are assumed to be funded by equity.

Funding Options

There are several potential revenue streams available to support the development, construction and operation of the Project including federal earmarks and Oregon STIP funding, gas tax revenues, regional tax increment financing, and land value capture. These funding sources are unlikely to provide significant amounts of funding for the foreseeable future and may require new legislation to be enacted.

Funding Gap

This preliminary assessment indicates that direct tolling of the Project on an access basis may come close to making the Project fully self-supporting. However, a funding gap may exist depending upon the tolling option that is chosen and the capital costs of the Project. The funding gap varies considerably according to the type of tolling option that is employed. Tolling options other than an access tolling concept are considered unlikely to attract sufficient traffic onto the Bypass to make the Project self-supporting. A key variable is the proposed discounts for local traffic. The existing data obtained by OTIG does not indicate the level of local traffic as opposed to through traffic.

Any funding gap could be overcome through a combination of measures including a rigorous examination and reduction of costs to construct the Project, effective scheduling, further detailed study of the McMinnville, Tualatin-Sherwood, and OR18 extension options, a longer concession, and/or adjustments in toll rates.

In the event that the level of tolls required to make the Project feasible is publicly unacceptable, design options should be reconsidered and scaled back (while retaining overall public acceptance). Other sources of funding, such as federal, state or local funding, should be considered a secondary source.

Recommended Options for Stage 2 Assessment

The data collection and analysis proposed for Stage 2 of the assessment is sufficiently broad that no material options have been excluded. The key are of focus will be the Traffic and Revenue forecasts that are essential to understand the proportion of local traffic as opposed to through traffic, both now and in the future.

To reduce the overall construction cost of the project and the extensions, OTIG recommends completing further engineering studies, with the goal of reducing costs while maintaining an acceptable design. OTIG also recommends further collaboration with ODOT to identify areas of the project that can be scaled back.

2. OVERVIEW

The Review has been prepared by the Oregon Transportation Improvement Group ("OTIG") in consultation with ODOT for the Newberg-Dundee Transportation Improvement Project ("the Project"). ODOT has entered into a Pre-Development Agreement ("PDA") with OTIG to advance the Newberg-Dundee Project towards implementation. The work is structured around specific milestones and includes "off-ramps" permitting ODOT to terminate the agreement if the resulting analysis does not support project feasibility.

The Review provides a review of existing data sources and reports as well as analysis work to develop an initial assessment of the feasibility of identified alternatives for the Project. The alternatives are assessed based on their potential to generate use by toll paying motorists and to meet typical project financing parameters.

For each alternative option a funding analysis is presented including an estimation of any funding gap. The Review includes an assessment of potential options for bridging this funding gap through non-ODOT sources including contributions from regional businesses benefiting from the Project, land development rights, land or regional tax increment financing.

The Review will also consider at a high level the network implications of the roadway alternatives including the potential for extensions to McMinnville, the I-5/99W Connector (also referred to as the Tualatin-Sherwood connector) and OR18.

It is important to note that this work is only a preliminary review of the likely feasibility issues associated with each of the alternatives based on incomplete information. The purpose is to identify fatal flaws and the issues which require further focus and analysis, not to reach conclusions at this stage.

3. FUNDING OPTIONS

The term Funding Options is used to describe the revenue streams available to support the Project. They are independent of the Financing Options, described later in this review, which are the methods by which the sources of funding are converted into upfront capital to support the development costs of the Project.

The following major Funding Options have been identified for the Newberg–Dundee Project:

- Federal Earmarks
- Oregon STIP Funding
- Oregon Gas Tax increases
- Regional Tax Increment Financing
- Land Value Capture
- Direct Tolling

Each of these options are considered in turn.

3.1 Federal Earmarks and Oregon STIP Funding

ODOT's current funding for the Project includes:

- $10.5m from Federal State and Local funds
- $4m from OTIA III bonds
- $23.5m from The Transportation Equity Act (SAFETEA-LU HR.3)

These sources of funds are available to support ODOT's development of the project, but no funds have been allocated towards construction activities or acquisition of Right of Way along the proposed routes.

There is extremely limited potential to expand these sources of Federal and Oregon State funding in the short to medium term. There are almost no federal discretionary transportation funds left for the Federal Highway Administration to distribute as grants, and any federal funding will need to be secured as an earmark through the annual congressional appropriations process. Although funding through the 2007 appropriations bill has been requested, the total amount of funding provided is likely to be a maximum of three million dollars. Other means of securing federal funding is through the surface transportation act reauthorization (SAFETEA-LU) which is scheduled for 2009 and thus does not provide a readily available nor certain source of funding.

3.2 Oregon Gas Tax Increases

Gas tax revenues have traditionally played a large part in funding infrastructure expenditures, particularly roadways. A statewide gas tax increase could theoretically spread the costs of the Project evenly over the State. However, it is unlikely a statewide increase would be granted to fund a project in a specific location. The Oregon State Gas Tax was last raised in 1991 and subsequent attempts to seek an increase have been unsuccessful.

An increase in gas taxes is unlikely to raise sufficient revenues in a timely manner to significantly fund the Project. Statewide, a one-cent per gallon increase in fuel tax raises just $26 million per year, a portion of which must be allocated to local governments. In order to provide sufficient funding for the Project, an increase in the gas tax of a minimum of $0.065 per gallon would have to be levied on consumers. Furthermore, an additional gas tax levy would require legislation which introduces uncertainty regarding political will and timeliness.

3.3 Regional Tax Increment Financing

Another potential funding source would be to increase property taxes in Yamhill County. This would mean that local residents would be paying for the benefits of the bypass, while some of these benefits would accrue to highway users from other counties.

Property tax revenues are unlikely to be a sufficient source of funds given the magnitude of the project. Property tax eligible to be collected in Yamhill County for fiscal year 2005 was just $71.8 million, of which nearly 50% was allocated to education. Funding the Project through property taxes would require a re-allocation of property tax receipts and/or a massive increase in property tax rates.

3.4 Land Value Capture

Land Value Capture refers to methods of capturing the likely increases in property values that may be driven by the construction of the bypass and using this as a funding source for the Project. As increases in property value may only occur after the Project has been completed (and several years after completion in many instances), it can be challenging to use this as a revenue stream which can be used to fund construction of the Project.

Typically Land Value Capture is achieved through targeted rezoning or development levies applied directly to areas which increase in value as a result of the Project, for example, to property within a one half square mile radius of the intersections.

Other methods could include the grant of existing State or County land to the Project for development.

Neither of these opportunities for Land Value Capture appear to be very relevant or appropriate for the Newberg–Dundee Project for the following reasons:

1. Firstly, much of the Project, including its major intersections, occurs outside the existing Urban Growth Boundary (UGB), limiting the ability to assume development and limiting community acceptance of it.
2. Secondly, an important part of ODOT planning for new projects is the Interchange Area Management Plan (IAMP) framework which is intended to ensure that new interchanges do not become overwhelmed by traffic growth beyond the design specifications as a result of new development.
3. Thirdly, there does not appear to be any significant public sector land associated with the Project which would be appropriate for development, with or without the constraints mentioned above.

In these circumstances, the major land value benefits of the Project are likely to be:

1. Increases in the value of “city center” properties and businesses in Newberg–Dundee as a result of reductions in congestion and an improvement in the

environment. While these are expected outcomes they are difficult to model with precision in advance and are difficult to capture in practice. Furthermore, any value that could be captured in this area would also probably be best allocated towards improvement of the municipal street network rather than to the bypass itself.

2. Benefits to businesses in the general corridor which accrue as a result of the reductions in congestion. This is likely to include regional wineries and casinos which are able to attract increased business. There are challenges in capturing these benefits by way of taxation as they may fall under different jurisdictions and cannot effectively be targeted by taxation levies. Accordingly the most likely method of capturing this value may be on a voluntary basis, offering these businesses an opportunity to support the Project by, for example, the purchase of bulk toll tokens at a reduced price to distribute to customers or potential customers. This may be important at the margin but is unlikely to be a fundamental revenue source for the Project. This source of revenue will be explored in more depth during the next stage of the analysis.

3.5 Tolling

There are many advantages to using tolls as a source of funding for this Project.

- With increasing awareness of the highway funding shortage, the construction of new toll facilities is gaining support among politicians and their constituents.
- Tolls are the most direct user fee for highway transportation
- Electronic toll collection systems allow for non-stop toll collection, eliminating the need for toll barriers that impede the flow of traffic.

Some of the potential challenges that come with tolling are:

- The revenues derived from tolling may not be adequate to cover operating and capital costs
- Concerns about diversion of traffic and failure to meet the purpose of the Project
- Acceptance of optimal toll levels
- When federal funds are involved, certain approvals are necessary from the Federal Highway Administration

Given the funding options above, preliminary analysis indicates that the Project is most likely to be financeable on a standalone basis supported by toll revenues. Toll revenue could be adequate to fund the Project, but only if the entire corridor can be captured rather than having the bypass competing with an existing free alternative. It is also necessary to ensure that tolled bypass meets the requirements of the NEPA environmental documents and agreements under the land use exceptions. The use of a tolling option for the Project would further benefit from the system-wide tolling policy which OTIG understands is currently being developed by ODOT.

Several different tolling schemes are available including distance, trip, and period tolling. These are discussed later in the Review.

4. BASE PROJECT

Traffic congestion on the Oregon 99W is especially acute along the section that includes Newberg, Dundee and the area west of Dundee to the McMinnville Bypass. ODOT initiated the Newberg-Dundee Transportation Improvement Project to address these problems while preserving Oregon's natural and historic resources and improving the local economy and residents' quality of life.

The baseline Newberg-Dundee Bypass ("Bypass") project encompasses a section of Oregon 99W extending northeast across Yamhill County. The Bypass corridor is approximately 11 miles long and lies along the south side of Newberg and Dundee. The eastern terminus is envisioned to be located east of Newberg in the Rex Hill area and the western terminus at the intersection of Oregon 99W and Oregon 18 (McDougal Corner) near Dayton.

As currently contemplated, the Bypass includes four proposed interchanges:

- The Dayton Interchange is located at the junction of Oregon 99W and Oregon 18 and represents the western terminus of the Bypass.
- The East Dundee Interchange is located between Dundee and Newberg. A new connector road would link the interchange at Oregon 99W to the Bypass. The connector road intersection with Oregon 99W includes a grade separation across both Oregon 99W and the parallel railroad tracks.
- The Oregon 219 Interchange is located in south Newberg along Oregon 219. This interchange is located inside Newberg's UGB and would provide full turning movements.
- The East Newberg Interchange is located southwest of Rex Hill and represents the eastern terminus of the Bypass providing free flow connections from the Bypass onto Oregon 99W eastbound and from Oregon 99W westbound onto the Bypass.

In addition, the proposed Bypass includes the following features:

- The Bypass will be a four-lane "Expressway" to provide for high-speed, high-volume travel with minimal interruptions. The Bypass will have a typical operating speed of 55 miles per hour. This facility would also serve as a statewide freight highway.
- A landscaped median or median barrier will be located between the travel lanes as well as shoulders on both sides of the travel lanes.
- Bicycles are permitted to travel on the shoulders of highway facilities in Oregon. In addition, enhanced bicycle facilities may be provided either as part of the roadway cross-section or as a separate, parallel facility.
- Access to the Bypass is restricted to interchanges; no direct access will be permitted from private properties. The Bypass will be grade-separated. Major county and city roads will be rerouted under or over the Bypass. Other local streets will be rerouted away from or terminated at the Bypass.
- Bridges will be used to cross larger fish-bearing streams. Smaller drainages might be crossed using fish-passable culverts.

5. EXTENSION OPTIONS

5.1 Background to Extension Options

The OIPP RFP allowed proposers to submit project modifications or extensions if they make the baseline projects more feasible or otherwise improve the transportation system. OTIG has proposed three potential extension options described below.

It is important to note that the process for evaluating and progressing these extension projects is different from the process in respect of the Base Project in a number of ways and substantial further review will be required.

5.2 McMinnville

A McMinnville Extension to the Newberg-Dundee Transportation Improvement Project would begin at the junction of Highway 18 (Dayton Bypass Road or Salmon River Highway) and Highway 99W just south of McMinnville and extends eight miles south to McDougal Corner. This extension would convert the existing alignment into a limited access road and upgrade it to four lanes with a median for the entire length.

In October 1996 ODOT prepared a report titled “Oregon Highway 18 Corridor Refinement Plan”. A portion of the report covers a 3.8 mile segment from the South Yamhill River west of the Highway 39 Spur to McMinnville to the Lafayette Highway (OR 233). This corridor is known as the “Three Mile Lane Section”.

The study proposed a system of collector-access roads to provide property access and was based on future growth in the area. The study also included three full service interchanges: (1) Highway 18 and Lafayette Highway, (2) an intersection midway between Airport Road and the Hospital to allow access from the collector access system and (3) an interchange at the Highway 18 Spur (Three Mile Lane). The plans also show a pedestrian overcross at the Hospital.

The estimate for the project was $20.5 million in 1996 plus approximately 94 acres of right of way costing $4.1 million. The majority of the right of way is for the collector distributor system. The system shown in the report will need to be refined based on existing and projected growth, and should identify which portions of the collector system can be phased.

The current plans for the Newberg-Dundee Project show a “folded diamond” interchange at the junction of 99W and Highway 18 (McDougal Corner). There is a proposed frontage road from the interchange along Kreder Road across the Yamhill River that connects to Ferry Street in Dayton. The frontage road may allow the existing Highway 18/3rd Street Interchange in Dayton to be eliminated subject to analysis of route continuity and travel patterns.

5.2.1 Interaction with Base Project

The McMinnville extension would allow traffic to continue on a limited access highway that was originally constructed as a bypass. As currently proposed, there are no construction conflicts between the base project and the McMinneville Extension. If the MacDougal Corner interchange is modified and the Kreder Road/Fletcher Road is eliminated then an additional interchange could possibly be required at 3rd Street in Dayton.

5.2.2 Environmental Overview

Because of the existing right of way along the corridor, it is assumed at this time that a Categorical Exclusion or an Environmental Assessment would most likely be required for the extension. The environmental process should be started as soon as feasible but should not delay the base project because the extension will be approved under a separate set of environmental documents.

5.2.3 Cost Estimate

The cost estimate presented in the OTIG proposal has been updated to include ODOT bid tabulation prices and information from the ODOT report discussed above. Additional design at the interchanges would refine the estimate and provide more certainty. Right of way impacts could also be refined. A summary of the cost breakdown in 2005 dollars is as follows:

SUMMARY			
Construction Estimate		$ 58,723,335	
Construction Engineering (CE)		$ 5,578,717	
Utilities Relocations		$ 5,872,333	
Total Mainline Construction Cost		$ 70,174,385	
Interchanges			
$6,500,000	4.5	$ 29,250,000	
Contingency	25%	$ 24,856,096	
Subtotal Construction			$ 124,280,481
Design	12%	$ 14,913,658	
QA (Design and Construction)	4%	$ 5,567,766	
Subtotal Design and Construction			$ 144,761,904
Right of Way	Acres		
$150,000	94	$ 14,100,000	
Total			**$ 158,861,904**

Note that cost estimates do not incorporate any interim inflation between the date of this report and the date of construction.

5.2.4 Preliminary Recommendation

The largest cost drivers for the extension are the interchanges and right of way. Additional design should be done at the interchanges to verify type, layout and cost. Research on existing bridges over the Yamhill should be conducted to verify if they need to be replaced or if they can be widened (estimate above assumes replacement). The existing network of collector-access roads should be reviewed and discussed with the local communities and Yamhill County to verify timing and need. An Environmental Classification Assessment should also be conducted to check for any fatal flaws and determine the probable environmental document that will be required.

5.3 I-5/99W Connector (Tualatin–Sherwood)

The Connector Project has been the subject of consideration and study since 1994. In total, approximately $35 million in ODOT, County and Federal funding has been allocated to the Project.

A corridor has not yet been selected for the Project and the NEPA process is yet to begin. Preliminary analysis indicates that there are three major route options for the Connector.

1. Northern Route connecting I-5 to the built up area of Sherwood was identified in the 1997 Regional Plan but the proposed corridor has since been incorporated into the Urban Growth Boundary.
2. The Central Route skirting the southern edge of the existing Urban Growth Boundary and connecting to Highway 99W to the north of Parrot Mountain. This route would not be contiguous to the Newberg-Dundee Bypass, but because of the high quality of 99W in that area, it would provide substantially expressway quality service all the way from I-5 to south of Dundee if both projects were completed.
3. The Southern Route would start further south of I-5 and accordingly would not be as convenient for I-205 traffic. This route could connect directly to the proposed Newberg-Dundee Bypass, however it would be unlikely to satisfy traffic demand as effectively as the northern routes.

In 1999 ODOT performed a preliminary design for the I-5 Interchange that would be required for the Connector. While the layout does account for all movements on I-5 and I-205 the number of lanes for the ramps needs to be verified. Also, because of development in the area the interchange needs to be relocated to the south which may create some issues with ramp lengths and weaves. Current ODOT estimates show the interchange to cost $120 million.

5.3.1 Interaction with Base Project and South I-205

Because the Connector project is a separate environmental process, it should not affect the base project or I-205. Traffic counts from I-205 should be taken into account during the design of the I-5 interchange to insure the ramps have sufficient capacity. An environmental assessment should be done for 99W to determine the type of document required. This will depend if 99W is widened or if a separate alignment is required.

5.3.2 Environmental Overview

David Evans and Associates, Inc. has begun preparing an Environmental Impact Statement that is studying several options for the project from I-5 to 99W. There are numerous wildlife corridors in the area and a viaduct may be required to span the corridor.

The alignment will also be impacted by the UGB, a prison, a regional fire training school, and numerous gravel excavation operations. The current schedule shows a ROD in 4 years.

5.3.3 Cost Estimate

No engineering has been completed to date so the cost estimate is based on the following assumptions.

- I-5 to 99W – Mainline cost per mile of Newberg-Dundee
- Viaduct to span Wildlife Corridor – 1000 feet long
- Interchanges at Murdock Road, 99W and midway on 99W
- I-5 Interchange – ODOT estimate of $120 million
- 99W to Rex Hill – Mainline cost per mile of Newberg–Dundee
- Right of way - $65 million thru Sherwood (ODOT), $15 million on 99W

SUMMARY			
I-5 to 99W	4.9 miles	$ 21,000,000	$ 102,900,000
Viaduct (1000 feet)			$ 8,800,000
Interchanges	3 miles	$ 6,500,000	$ 19,500,000
I-5 Interchange			$ 120,000,000
99W to Rex Hill	2.4 miles	$ 21,000,000	$ 50,400,000
			$ 301,600,000
Contingency	25%	$ 75,400,000	
Subtotal Construction			$ 377,000,000
Design	12%	$ 45,240,000	
QA (Design and Construction)	4%	$ 16,889,600	
Subtotal Design and Construction			$ 439,129,600
Right of Way		$ 80,000,000	
Total			**$ 519,129,600**

5.3.4 Recommendation

Additional design is required to verify the cost of the I-5 Interchange. The length of the viaduct needs to be verified via discussions with appropriate agencies. Preliminary design of the proposed interchanges should be completed based on available or easily obtained traffic data. The alignment along 99W needs to be evaluated with both traffic and environmental concerns to be taken into account. The amount of right of way required could then be reliably estimated.

At this point it is highly unlikely that the Tualatin-Sherwood Connector will satisfy the requirements of the RFP as an extension to the Newberg-Dundee project and therefore will likely not proceed forward on that basis.

5.4 OR18 beyond McMinnville

Based on traffic and financial issues the Project may be extended to the Yamhill County line to account for traffic to and from the Casinos. This section of Highway 18 has a high accident rate so safety could also be improved.

5.4.1 Interaction with Base Project

Any extensions beyond McMinnville will not affect the base project from a technical, environmental or schedule standpoint.

5.4.2 Environmental Overview

No analysis has been completed in relation to this corridor but because of cumulative effects the required document would probably be an Environmental Assessment. Combining the McMinnville and Highway 18 extension into one environmental document should also be considered.

5.4.3 Cost Estimate

There have been no cost estimates prepared by ODOT for this area. Based on the McMinnville extension cost of $20 million/mile, the cost to continue the extension 14 miles to the Yamhill/Polk County line would be approximately $280 million in 2005 dollars.

6. DESIGN AND CONSTRUCTION COSTS – BASE PROJECT

The construction costs for the Newberg-Dundee Bypass have been updated to reflect the latest ODOT design. However, there are several critical areas that have yet to be finalized as part of the NEPA process. Costs are based on the latest ODOT bid tabulation data available (2004).

6.1 OTIG Preliminary Estimate

There have been significant increases to the cost estimate since OTIG submitted its proposal. Based on the latest geotechnical report from ODOT's consultant, there is a high water table throughout the project alignment. The consultant has suggested increased excavation, soil stabilization, and geotextiles. Dewatering during construction and the operations phase may also be required. Input during the NEPA process has resulted in a vertical alignment that is significantly below grade. This has resulted in a net increase in earthwork and pavement costs of almost $25 million.

Also, the size and number of bridges has been refined from earlier estimates. This has increased the cost another $80 million. ODOT is currently meeting with their environmental consultant and environmental agencies to determine whether some of the bridges can be culverts. This depends on fish passage and other environmental concerns and must receive concurrence from State and Federal agencies. A summary of the costs for the baseline project are provided below in 2005 dollars:

SUMMARY			
Construction Estimate		$ 205,108,501	
Construction Engineering (CE)		$ 19,485,308	
Utilities Relocations		$ 10,255,425	
Total Mainline Construction Cost		$ 234,849,233	
Contingency	25%	$ 58,712,308	
Subtotal Construction			$ 293,561,542
Design	12%	$ 35,227,385	
QA (Design and Construction)	4%	$ 13,151,557	
Subtotal Design and Construction			$ 341,940,484
Right of Way		$ 41,000,000	
Total			$ **382,940,484**

6.2 Potential Impact of NEPA Process on Costs

The current schedule shows the FEIS to be completed in December 2007 with a ROD to be issued in January or February 2008. There are several areas still being evaluated that can have a significant impact on the cost of the project.

The original interchange at MacDougal Corner has been modified to reduce impacts and cost. However, the proposed interchange modification has not been discussed with the community or other stakeholders. Through the public involvement process the stakeholders have requested that the alignment be below grade from Fulquartz Landing Road to the Dayton Connector Road. This may cause a significant cost increase because of the high water table in the area. Details of the dewatering plan and construction impacts have yet to be determined. The vertical alignment near the Smurfit paper plant is also yet to be finalized. There are a number of options for the railroad spur: bypass over the railroad, bypass under the railroad, or elimination of the spur. The need for an interchange at Highway 219, including the type of interchange, is still being determined. Also whether the bypass will go over or under Fernwood Drive is yet to be finalized. While the horizontal alignment between the golf course and the hospital is still being finalized, it should not significantly affect the cost.

6.3 Potential Impact of IAMPS Process on Costs

The IAMP process should not significantly impact project cost. Changes to proposed frontage and access roads may result from the development of the project. The main issue with the IAMP process will be to ensure that it does not impact the schedule.

7. ENVIRONMENTAL SCHEDULE

7.1 Current Schedule – Base Project

The current schedule for the base project shows the Tier 2 FEIS to be completed in December of 2007 with a ROD to be issued in January or February 2008. There have been several discussions in the Environmental Working Group regarding schedule and all team members are looking for ways to reduce the schedule. Parametrix, the ODOT NEPA consultant, has been tasked with preparing a more detailed schedule showing dependencies. This may highlight opportunities to reduce the schedule.

7.2 Extension Impacts

If any of the extensions appear financially feasible, they will be evaluated through separate environmental documents. The approach in relation to the extensions under consideration is to ensure that the base project is not affected.

7.3 Potential Impact of NEPA Process

Several of the design alternatives are outside of the approved Tier 1 corridor and will require modifications to the land use goal exceptions. This process could take six months or more and it is critical that these alternatives be finalized and the process started to modify the Tier 1 and apply for any necessary goal exceptions and land use changes as soon as possible.

7.4 Potential Impact of IAMPS Process

The IAMP process is relatively new to ODOT so the schedule is somewhat uncertain. The current schedule shows the process being completed prior to the ROD. Initial meetings are being held and the process has begun. A detailed schedule has been requested from Parametrix to further analyze the potential impacts.

8. COST AND SCHEDULE REDUCTION OPTIONS

8.1 Cost Reduction Options

To date, cost has not been used as part of the criteria to evaluate design alternatives. Some design options, including interchange design, routing and use of bridges in place of culverts, are costly and may need to be modified or eliminated in order for the Project to be financially feasible. OTIG estimates that design changes (e.g. replacing bridges with culverts) have the potential to reduce the cost of the Newberg-Dundee base project from almost $383 million to approximately $325 million. The next step in the NEPA process is to evaluate alternatives using cost and funding as part of the evaluation criteria. Design changes may require modifications to the Inter-Governmental Agreements and to the goal exceptions. This will need to be tightly managed so as not to delay implementation.

8.2 Schedule Reduction Options

The schedule is dependent on the public involvement and review process. The Environmental Working Group has discussed shortening the time between public meetings and minimizing any design changes or revisions. The parties have also discussed ways to work with FHWA to accelerate their review process.

9. DESIGN/ENVIRONMENTAL ISSUES

9.1 Newberg–Dundee Base Project

The vertical alignment needs to be evaluated based on the geotechnical data and revised to minimize cut sections. Pavement design and soil stabilization options need to be reviewed and refined. The number of bridges as well as their spans needs to be reviewed and for larger bridges more detailed cost estimates and value engineering need to be performed. If required, some interchanges and overpasses may need to be reevaluated and, if necessary, modified, delayed or eliminated.

9.2 McMinnville Extension

The largest cost drivers for this extension are the interchanges and right of way. Additional design should be done at the interchanges to verify type, layout and cost. Research on existing bridges over the Yamhill River should be conducted to verify if they need to be replaced or if they can be widened (estimate assumes replacement). The existing network of collector-access roads should be reviewed and discussed with the local communities and Yamhill County to verify timing and need. An Environmental Classification Assessment should also be conducted to check for any fatal flaws and determine the probable environmental document that will be required.

9.3 I-5/99W Connector

Additional design in relation to the I-5 Interchange is required to verify the cost. The length of the viaduct needs to be verified with appropriate agencies. Preliminary design of the proposed interchanges should be completed based on available or easily obtainable traffic data. The alignment along 99W needs to be evaluated with both traffic and environmental concerns taken into account. The amount of right of way required needs to be verified. All work should be undertaken at the appropriate time. At this point, any further work on the I-5/99W Connector will likely not proceed as an extension to the Newberg-Dundee project.

10. TOLLING ISSUES

10.1 Overview of Tolling Concepts

The purpose of the Project is to improve mobility and safety for inter-regional highway traffic through Newberg and Dundee and to relieve congestion by reducing vehicle traffic on Oregon Highway 99W in these communities in particular. The EIS process and the land use exceptions further stress that the removal of traffic from the existing road network to be of primary importance.

Tolls have been identified as a primary source of funding for the Project. There is a very high degree of support from both local residents and users of the corridor for direct tolls to support the development of the Project. An opinion survey conducted by Davis Hibbitts & Midghall in April 2004 showed that 75% of respondents in the corridor would be willing to pay an amount for the construction of the Bypass. Given the likelihood of tolls being utilized, it is important to maintain the focal point of removing traffic from 99W be maintained under the different tolled scenarios so as to meet the project's Purpose and Need in the NEPA document.

OTIG has defined two general tolling options:

- Tolling the Bypass - This would only charge users of the Bypass for the road although local residents will benefit from reduced traffic through Newberg and Dundee. Preliminary analysis suggests that tolling the Bypass alone may not divert a sufficient amount of traffic from travelling through Newberg and Dundee, particularly truck traffic. As such, tolling the bypass alone may not achieve local resident expectations, improve local quality of life nor meet the project Purpose and Need as identified in the NEPA process. Moreover, tolling the Bypass alone reduces the revenue available to pay for the Project in the first place and may prevent it from moving forward.
- Access Tolling - A toll plaza could be located near the proposed East Newberg Interchange. The access tolling concept would capture all through traffic using the corridor, whether the choice was made to use the faster Bypass or the existing OR 99W to visit the towns of Newberg and Dundee. Access tolling would ensure full utilization of the capacity of the Newberg-Dundee Project and reduce the impact of traffic through the city centers of Newberg and Dundee. This would ensure that the project meets the NEPA Purpose and Need statement in diverting traffic out of the city centers. It is expected that any Access Tolling concept could be combined with a local discount scheme to avoid capturing local trips.

To increase local resident acceptance of the Project while still achieving its purpose, studies are being undertaken to determine the traffic and revenue impact of allowing local residents to obtain a local pass to allow discounted tolls at the proposed toll plaza near the proposed East Newberg Interchange.

10.2 Tolling Options

10.2.1 Types of Tolls

Various toll schemes have been enacted in the United States and worldwide. In general, there are four basic types of tolling:

Type of Toll	Description
Distance	• Each vehicle is charged a toll according to the distance travelled on the toll road. There may be multiple toll plazas along the route.
Exit	• Each vehicle is charged a toll as the vehicle exits the route on an off-ramp. Typically a flat charge per exit.
Point	• A single toll plaza is located at a point along the route and all vehicles crossing the point are charged a flat toll. • Examples include the Golden Gate Bridge and proposed twinned Tacoma Narrows Bridge.
Period	• A pre-paid amount that allows the user unlimited travel on the toll road within a designated period e.g. a week, month or time of day. • This system is widely used in Central Europe

Access tolling is similar to point tolling except that a single toll plaza is located at the start of the toll road and all vehicles crossing the plaza are charged a flat toll.

10.3 Method of Payment

10.3.1 Barrier

Barrier methods of payment include a physical barrier that requires vehicles to stop and pay the toll, typically using a cash payment. Barrier systems provide a simple and effective enforcement method that guarantees immediate payment. There are also relatively few back-office costs. This is the traditional method of collecting toll payments.

Cash payment methods include staffed tollbooths, coin machines or toll buckets (where you 'throw in' the toll payment). Proximity cards and credit cards can also be used to pay tolls.

10.3.2 Open Road Tolling

In recent years, many toll road systems have enacted electronic toll collection ("ETC") systems that allow the vehicles to pass the toll plaza without a reduction in speed. Under an ETC system, toll road users are required to obtain a transponder and set up a method of payment. The vehicle's transponder is read via radio frequency by equipment situated at the roadside, overhead gantries, or other structures, which then proceed to charge the user the appropriate toll. Method of payment may include direct debit, credit card or prepaid account.

Enforcement of toll collection on those vehicles not utilizing a transponder may include cash collection lanes where traffic without transponders is diverted and required to pay. Under some ETC systems, vehicles without transponders that do not pay may have a picture taken of their license plate and subsequently mailed a bill.

ETC systems have become the preferred method of tolling as it allows for the free flow of traffic by eliminating queues for cash collection toll booths. Examples of ETC systems include the Westpark in Houston, the SR91 in California, the 407 ETR in Toronto, the Cross Israel Toll Road, the Melbourne City Link as well as several urban toll roads in Santiago, Chile.

Both barrier and ETC systems are compatible with each of the tolling schemes presented in Section 10.2.1. In addition, barrier and ETC systems can be used in conjunction with one another. In this scenario vehicles without a transponder would be diverted to off-ramp cash lane to make payment. This may be particularly effective where electronic tolling is a relatively new concept and transponder usage is not yet widespread. This is the case in a number of facilities throughout the US including the New Jersey Turnpike, North Texas Turnpike Authority and the Florida Turnpike. However, operating a multiplicity of systems simultaneously can significantly increase implementation and operating costs and thereby reduce the Project's viability. The table below outlines compatibility between toll options and method of payment:

Type of Toll	Barrier	Open Road	Barrier + Open Road
Distance	• Ticket issued upon entry and paid at exit • Requires multiple stops • Typically cash based	• ETC system • No stops • Use of prepaid accounts, credit cards, debit cards	• Possible to operate a barrier and open road system simultaneously
Exit	• Payment required at exit • Single stop • Typically cash based	• ETC system • No stops • Use of prepaid accounts, credit cards, debit cards	• Possible to operate a barrier and open road system simultaneously
Point	• Payment required in mid-trip • Single stop • Typically cash based	• ETC system • No stops • Use of prepaid accounts, credit cards, debit cards	• Possible to operate a barrier and open road system simultaneously
Period	• Possible multiple checkpoints to check pass • Cash or credit card based	• Electronic monitoring system • Cash or credit card based	• Possible to operate a barrier and open road system simultaneously
Access	• Payment required at entrance/exit • Single stop • Typically cash based	• ETC system • No stops • Use of prepaid accounts, credit cards, debit cards	• Possible to operate a barrier and open road system simultaneously

10.4 Toll levels and categories

10.4.1 Benchmarking

Several comparable toll roads have been included below to provide a benchmark toll charge per vehicle and a truck toll factor. While these comparables provide valuable information, it is important to recognize that each toll facility is unique in terms of travel corridor demand characteristics, congestion levels and the availability of alternative routes. Note that examples of tolled bridges, tunnels and long distance toll roads have been purposefully omitted to improve the comparability of the data.

Estimated Toll Charge Rates*

Facility	Length (miles)	Car Toll		Truck toll factor
		Full Length	Per Mile	
Foley Beach Express, AL	6.0	$2.00	$0.33	1.5 - 4.5
San Joaquin Hills, CA	15	$3.50-$4.25	$0.23-$0.28	2.0 - 4.0
E470, CO	10	$2.75	$0.28	1.75 - 6.0
Bee Line West, FL	8.4	$0.75	$0.09	2.0 - 5.0
Veterans Expressway, FL	16	$1.75	$0.11	2.0 - 5.0
Georgia 400 Extension, GA	6.2	$0.50	$0.08	3.0 – 10.0
Southern Connector, SC	16	$2.00	$0.13	1.8 – 3.6
Cross Island Parkway, SC	7.5	$1.00	$0.13	1.75 – 5.00
Dulles Greenway, VA	12.5	$3.00 – $3.20	$0.24 - $0.26	1.88 - 2.00

NOTE: * Assumes cash tolls, discounts available for ETC

The table shows the average toll per mile at $0.18 ranging from $0.33 for Foley Beach Express in Alabama to $0.08 for the Georgia 400 extension.

10.4.2 Vehicle toll classifications

Typically on a toll road or bridge the users are tolled according to vehicle classification. Although there is no 'standard' classification of vehicles into tolling categories, it is usually determined by one or more key characteristics including weight, length, height, vehicle type or number of axels.

Vehicle Toll Classifications

Facility	Categories	Description
Foley Beach Express, AL	6	By number of axles: 2, 3, 4, 5, 6 and More than 6
San Joaquin Hills, CA	3	2 axles/3-4 axles/5 or more
E470, CO	8	By number of axles: 2, 3, 4, 5, 6, 7, 8, 9
Indiana Toll Road, IN	9	Ranging from 2 axle-4 tire to oversized vehicles
E407 Toronto, ON	3	Light vehicles (less 5,000kg), Heavy single unit (over 5,000kg) and Heavy multiple unit (over 5,000kg)
Cross Island Parkway, SC	By axle	Base toll rate + $0.75 per additional axle

10.4.3 Truck toll factors

Trucks are typically tolled at a higher rate than passenger vehicles given their additional wear and tear on the road surface. Truck tolls are usually expressed in terms of a 'truck

toll factor' which is simply a multiple of the passenger vehicle toll. There is a wide range of truck toll factors but the majority start at around double the passenger vehicle toll rate. The higher truck toll factors for each facility are typically applicable to vehicles with a high number of axles, and as such represent a very small proportion of the total traffic.

10.4.4 Differential tolling

Toll charges can be set to vary based on a fixed schedule (peak/off peak, weekday/weekend) or they can be dynamic where toll rates change depending on the levels of congestion that exist at a particular time. This ensures that motorists travelling at the most congested times of the day pay a greater toll than at less congested times. I-15 in San Diego is the most advanced example of differential tolling in the US, where tolls can vary by up to $4 based on real time travel conditions with a maximum variation of $8 during severe congestion. The development of electronic tolling now allows facilities to offer reduced toll rates for certain categories of electronic transponder users.

10.4.5 Exemptions

On-duty public service vehicles such as police, ambulances, fire trucks and official government vehicles are generally exempt from tolls. In this way, toll roads offer public benefits as emergency vehicles are able to travel faster during peak congestion periods.

10.4.6 Toll level changes over time

The concession agreement typically defines how often and how much toll rates are allowed to increase. In most cases, tolls are permitted to increase annually and are linked to an escalator such as inflation, nominal GDP/capita, average weekly earnings or specified fixed increments.

Toll levels at some of the older toll facilities in the US are set by toll agency boards or transportation commissions. Toll rates on some of these facilities have been frozen for many years (e.g. the I-87 section of the New York State Thruway last had a rate change in 1997). The result is that large increases are often applied when facilities are faced with mounting maintenance or capital expenditure costs.

10.5 Interoperability

Interoperability allows the extension of existing tolling arrangements to include any future toll road into the network. Although Oregon does not currently have a toll road network, there may be plans to expand the system in the future and to integrate this system with neighboring states. This is one of the main developments in other toll road networks in the US where Florida has moved to one interoperable system (Sun Pass), while in the northeast US E-Z pass operates as one system which continues to expand, with New Hampshire and Maine soon to join.

10.6 Newberg-Dundee Options

10.6.1 Options Considered

Four toll scheme options, distance, exit, point and access, have been considered in the preliminary forecasting activity for the Newberg-Dundee Project. This will form the basis for further analysis and ultimately the preparation of an investment grade traffic forecast. The preliminary analysis assesses the impact of both including and excluding the I-5 -

99W Connector. The impact of the McMinnville extension will be assessed through sensitivity testing at a later stage.

OTIG has tested the distance and exit toll option for both the Newberg-Dundee Project alone and together with the I-5 - 99W Connector. OTIG has tested a range of toll levels and "truck toll factors" in the preliminary forecasting phase to provide guidance as to relative toll revenue levels for these alternatives. The exit toll option is clearly more conceptually appropriate for the shorter of the two options.

OTIG has tested a point toll option for the Newberg-Dundee Project only. OTIG will test a range of toll levels and "truck toll factors" in the preliminary forecasting phase to provide guidance as to relative toll revenue levels for this alternative.

The access toll option has been proposed to address concerns regarding diversion associated with only tolling the bypass. The proposal is that a "point toll" is introduced on the existing 99W immediately to the north of Dundee (at Rex Hill). All vehicles using 99W (irrespective of whether they use the new bypass) will pay a toll. Traffic not using the new bypass gain a benefit due to reduced traffic and congestion on the existing 99W. Such an approach also ensures the maximum economic and environmental benefits are delivered by the Newberg-Dundee Project to local residents.

The estimated impact of local user discounts has also been included in the preliminary analysis. This analysis will be refined once the definition of a local user and the discount offered have been determined. The discount is likely to be in the form of a lower charge per trip or an annual payment to obtain unlimited access (a vignette).

OTIG proposes this toll option be tested for the Newberg-Dundee Project only. OTIG has tested a range of toll levels and local discounts (both quantum and scope of application) in the preliminary forecasting phase to provide guidance as to relative toll revenue levels for this alternative. A summary of the options considered is provided below:

Type of Toll	Newberg–Dundee Bypass	Newberg–Dundee Bypass + I-5 – W99
Distance	• Preliminary traffic and revenue analysis • Range of toll levels and truck toll factors	• Preliminary traffic and revenue analysis
Exit	• Preliminary traffic and revenue analysis • Range of toll levels and truck toll factors	• Preliminary traffic and revenue analysis
Point	• Preliminary traffic and revenue analysis • Range of toll levels and truck toll factors	• Not considered
Access	• Preliminary traffic and revenue analysis • Point toll at Rex Hill • All vehicles crossing Rex Hill pay a toll • Different levels of discounts for local residents • Range of toll levels and truck toll factors	• Not Considered

10.6.2 Qualitative Analysis of Options Considered

The analysis of tolling options considered are in the table below.

Newberg-Dundee Options Qualitative Assessment

Scheme	Toll Regime	Scheme Comment	Potential Problems			
			Local Traffic	Truck Traffic/EIS ROD	Tolling	Acceptability
Newberg-Dundee & I-5 - 99W	Distance	Most equitable as links the level of toll paid to the distance travelled on the road.	Charged according to what distance they travel on the road.	Truck traffic using bypass not matching level specified in EIS ROD.	If considered too high, potential for traffic to utilize free alternative, especially in off-peak periods. If manual toll collection system is implemented it requires vehicles to stop twice.	There could be legibility issues (given the different tariffs depending on the entry and exit points). There could be complaints due to the need to stop twice (entry and exit) if manual toll collection system implemented.
Newberg-Dundee & I-5 - 99W	Exit	Users know exactly toll to pay (flat fare on all exits) Requires stop/gantries only at exits	Locals driving for short sections could be deterred with high tolls.	Truck traffic using bypass not matching level specified in EIS ROD. .	If considered too high, potential for traffic to utilize free alternative, especially in off-peak periods.	Short trips may find the toll too high.

Scheme	Toll Regime	Scheme Comment	Potential Problems			
			Local Traffic	Truck Traffic/EIS ROD	Tolling	Acceptability
Newberg-Dundee	Distance	Most equitable as links level of toll paid to the distance travelled on the road.	Charged according to what distance they travel on the road.	Truck traffic using bypass not matching level specified in EIS ROD. .	If considered too high, potential for traffic remaining on free alternative, especially in off-peak periods.	There could be legibility issues (given the different tariffs depending on entry and exit), although less combinations possible without the Connector. There could be complaints due to the need to stop twice (entry and exit) if manual toll collection.
Newberg-Dundee	Exit	Users know exactly toll to pay (assuming flat toll on all exits). Requires stop/gantries at the exits.	Locals driving for short sections could be deterred with high tolls.	Truck traffic using bypass not matching level specified in EIS ROD. .	If considered too high, potential for traffic remaining on free alternative, especially in off-peak periods.	Short trips could find the toll too high.
Newberg-Dundee	Point	Only requires one stop/gantry and users know exactly toll to pay. "Free riders" on some sections of the road.	Locals driving for short sections and not passing through the toll point would use the road for free.	Truck traffic using bypass not matching level specified in EIS ROD. .	If considered too high, potential for traffic remaining on free alternative, especially in off-peak periods. The non-tolled sections on the bypass could experience high traffic flows.	Location of point of toll can have large effect on number of vehicles affected
Newberg-Dundee	Access	Only requires one stop/gantry and users know exactly toll to pay "Free riders" on some sections of the road.	"Local resident" discount available. Issues with: • Definition of local resident • Level of discount	Ensures all non-local truck traffic uses the bypass	If toll too high, potential land use and development effects in Newberg-Dundee area.	Removes the free alternative

11. PRELIMINARY TRAFFIC AND REVENUE FORECASTS

OTIG has prepared preliminary traffic and revenue forecasts based upon existing traffic data. While the forecasts are not precise, they do represent, in our view, a reasonable expectation for the future, based on the information available as of the date of this Review. The purpose of these forecasts is to provide an initial overview of issues relevant to traffic and revenue projections for the Newberg-Dundee Bypass and I-5-99W Connector. This Review does not provide investment grade analysis.

The estimates discussed in this Review rely on numerous assumptions and judgments and are influenced by external circumstances that are subject to change. Any changes in these circumstances may materially affect the conclusions drawn. In addition, the estimates rely on data collected by third parties. Steer Davies Gleave has conducted independent checks of this data where possible, but does not guarantee the accuracy of this data.

11.1 Data Sources

Steer Davies Gleave has reviewed and analyzed existing data only in order to prepare preliminary forecasts for the Newberg-Dundee Bypass. The principal data sources are:

Source	Date	Description
FHWA & ODOT	June 2005	• EIS Bypass Element Location (Tier 1) Final.
David Evans Associates	January 2006	• Technical Memorandum (Transportation Conditions) for the I-5 to 99W Corridor Project .
ODOT	2004	• ATR counts provided by ODOT, with one site northeast of Newberg (36-004) which has historical as well as daily and monthly traffic for 2004.
Kittleson	1998	• Data provided by Kittelson, including travel time surveys, PM peak classified traffic counts, tube counts at 9 locations on the 99W and McMinnville Survey information.

11.2 Analysis of existing data

11.2.1 ATR traffic data

ATR counts provided by ODOT are key component of the preliminary traffic and revenue forecast, specifically from the site located 0.3 miles east of Newberg, denominated 36-004. This site is a close approximation for the volume of traffic occurring near Rex Hill, although the composition between local traffic and through-traffic is not known at this time. Traffic growth has been relatively limited over the last 10 years, with traffic levels around 33,500 vehicles per day in 2004. Annual traffic growth from 1996 to 2004 is presented in the following table:

Year	Average Daily Traffic	Annual Traffic Growth
1995	29,440	
1996	30,770	4.5%
1997	31,824	3.4%
1998	32,174	1.1%
1999	32,417	0.8%
2000	32,292	-0.4%
2001	32,158	-0.4%
2002	33,361	3.7%
2003	33,269	-0.3%
2004	33,463	0.6%
Average		**1.4%**

The following table presents monthly traffic information for 2004, showing seasonality effects during the year. Traffic is below average during winter, with January being considerably lower than any other month. The highest traffic months are during summer, primarily July and August.

Seasonality: Monthly average daily traffic

Month	Average Daily Traffic	Percent of ADT
January	27,344	82%
February	32,754	98%
March	33,81	101%
April	34,218	102%
May	33,589	100%
June	34,441	103%
July	35,460	106%
August	35,598	106%
September	34,356	103%
October	33,905	101%
November	33,064	99%
December	33,051	99%

11.2.2 EIS Tier1 Traffic Forecasts

Forecasts have been developed for the bypass and existing route as part of the environmental approval process. These forecasts assume that no toll is charged for vehicles traveling through the corridor. The key average daily traffic statistics are located

in Table 4-1 of the original study[1], which are summarized below. Only results for option *Modified 3J* have been included in the table.

Traffic forecasts from EIS (ADT in thousand vehicles)

Location	Existing ADT (2002)	No Build (2025)	Implicit Growth p.a.	"Modified 3J" (2025)
Oregon 99W:				
East of Rex Hill	32	55	2.4%	52
East Newberg	36	48	1.3%	29
Newberg Couplet	40	56	1.5%	30
Between Newberg & Dundee	34	49	1.6%	20
Dundee at 5th Street	32	47	1.7%	13
South of Dundee	25	40	2.1%	5
Bypass:				
East Segment	N/A	N/A		27
Central Segment	N/A	N/A		33
West Segment	N/A	N/A		33

This table shows traffic on the bypass, with no toll, to be in the order of 26,500 to 33,000 vehicles per day, with more traffic on the southern end of the facility. This represents more or less between 48% and 87% of the traffic in the corridor. The implicit traffic growth rate in the corridor from 2002 to 2025 is around 1.7%.

11.3 Preliminary Forecast Methodology

Steer Davies Gleave has prepared a preliminary set of traffic and revenue forecasts for different project options, previously described, for the Newberg-Dundee Bypass, both including and excluding the I-5 - 99W Connector project.

The forecasts have been generated using a spreadsheet model. The benefits of the bypass relative to the existing network have been analyzed to estimate the level of traffic capture by the Bypass and the Connector extension.

The model has been based on local data together with data drawn from US and international experience. Professional judgment has been applied in those cases where there is no data available to make a direct estimation or calculation.

The main components of the model are:

a. Annual Average Daily Traffic (AADT)

   Derived from different sources including the ATR site (36-004), EIS and Kittelson's data. AADT data has been disaggregated into four periods (AM peak, PM peak,

[1] EIS Bypass Element Location (Tier 1) Final (FHWA & ODOT, June 2005)

interpeak and night), and then expanded to obtain annual traffic and revenue. Seasonality has also been analyzed from the ATR count information.

b. Travel Cost Estimates

Road lengths, assumed speeds and toll levels have been used to calculate the travel costs for each travel option, which affect the user's choice between the existing route and the bypass.

c. Forecasting

Once the traffic capture rates have been established in the base year, growth factors and other parameters are applied in order to create future year scenarios (2020, 2030 and 2040, plus interpolation for the years in between)

11.4 Key Assumptions and Parameters

The main assumptions used to generate the preliminary forecasts are presented in the following table:

Assumption	Values	Comments
Base toll rate	$0.18 - $0.30 per mile	Values based on literature and US experience. It implies a toll for the Newberg-Dundee Bypass of $1.98 to $3.30
Through Traffic	30% - 50%	At Rex Hill
Bypass Speed	55 mph	Taken from the EIS study. An increase in this speed would improve the competitiveness of the Bypass.
Discounts	50%	Local trips (short distance) have been assumed to pay half of the access toll. For medium distance trips, it is assumed that half are eligible for the discount and half pay the full toll.
I-5 - 99W Traffic	60% potential user of the I5-99W connector	It has been assumed that 60% of traffic south of Sherwood will consider the Connector as a potential alternative route, with the rest remaining on 99W.
% of trucks	5.1%	Trucks are assumed to pay twice the base car toll.
Growth	1.9% – 2.5% and 1.0% after 2035	The growth has been taken from figures in the EIS.
Ramp-up	0	The impact of traffic ramp-up has not been included in the forecasts.
Value of Time		From Vancouver, BC Stated Preference surveys and adjusted to US$ based on Oregon GDP estimates.
Value of Time growth		A slight growth has been applied to the VoT, reflecting the increase in wealth (GDP) of users over time.
Travel time increases on 99W	0.3%	A slight increase in travel time on the existing 99W has been considered, which by 2040 implies a 10% increase in travel time.
No inflation has been assumed on revenues.		

11.5 Preliminary Forecasts

Based upon the assumptions in the above table, OTIG has compiled preliminary revenue estimates for numerous scenarios including different levels of tolls, concession length, local traffic make-up and traffic growth. Sensitivities have not yet been performed on truck traffic as it is assumed to be a relatively small component of total traffic (5.1% of traffic volume).

As described in Section 11.2.2 the annual average daily traffic near the Rex Hill Interchange is approximately 32,000 to 36,000. The annual average daily traffic south of Dundee is approximately 25,000. The Project's ability to generate revenue is heavily dependent upon the proportion of this traffic that is through-traffic or, in other words, the amount of traffic that moves between Rex Hill and south of Dundee. The data obtained by OTIG does not contain a break-down of local traffic versus through-traffic and therefore the preliminary forecasts are forced to assume a percentage of through traffic, currently estimated to be between 30% and 50%.

If the proportion of through-traffic is determined to be much lower, the financial viability of the Project will be diminished given the deep discounts provided to local residents of Newberg and Dundee. As the proportion of local traffic versus through-traffic is critical to the financial feasibility of the Project, detailed Origin-Destination and other surveys will need to be conducted in the next phase of the Project. As such, the preliminary forecasts are simply a best estimate and further detailed study is required to reach a conclusion.

I-5 – 99W Connector

The distance and exit toll options that include the I-5 – 99W connector as an extension to the Newberg–Dundee Project demonstrate significantly higher revenues than the distance and exit toll options that exclude the connector. While including the connector does increase revenue for the project, the connector also increases capital costs.

The connector also presents added tolling complexity due to the integration of the Project into a larger road network, notably I-5. Tolling the connector alone may not be feasible as the estimated time savings realized by the 5.4 mile extension could be limited.

Distance, Exit and Point Toll Options

Within each scenario, the distance, exit and point toll options are calculated in reference to tolling the Bypass alone. These options generate are less successful in generating revenue than access tolling as they fail to divert traffic from congested areas towards the Bypass. The cause of this failure is largely due to the existence of a free alternative on 99W for through-traffic. In OTIG's experience, commercial truck drivers are amongst the most resistant to paying a toll and will often seek the free alternative regardless of the congestion on the free alternative.

There are several ways to counter this including local by-laws prohibiting truck traffic in downtown areas, traffic calming measures such as traffic signalization, removal of downtown couplets etc. The operating costs of a distance or exit toll option would also be higher than that of an access tolling option as more gantries or toll plazas would need to be installed.

Access Toll Option

Preliminary results indicate that access tolling, i.e. tolling the Newberg-Dundee Bypass together with the existing 99W, results in the greatest revenue for the Project. This option also most closely serves the Purpose and Need identified by NEPA for the Project in improving mobility and safety for inter-regional highway traffic through Newberg and Dundee and to relieve congestion by reducing vehicle traffic on 99W.

The results are presented in the following table.

Preliminary Revenue Forecasts Newberg - Dundee
Results in Million US$ at current prices

Scenario 1:
Concession 30 Years
Toll / mile 0.18 $
Local Traffic 50% of total traffic
Traffic growth 1.90% thru 2020
Traffic growth 1.00% after 2020

Base Toll (US$/mile)	Infrastructure Scenario	Tolling Scenario		Year 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
0.18	ND Bypass & I5-99W	Distance	Base Toll (US$/mile) - Distance	**14.2**	14.8	15.4	16.0	16.6	17.2	17.9	18.6	19.3	20.0	20.8	**21.6**	22.3	22.9	23.7	24.4	25.1	25.9	26.7	27.5	28.4	**29.3**	30.2	31.1	32.1	33.1	34.1	35.2	36.3	37.5	38.6	**39.8**
		Exit	Base Toll (US$/mile) - Exit	**6.5**	6.8	7.0	7.3	7.6	7.9	8.2	8.6	8.9	9.3	9.6	**10.0**	10.4	10.8	11.2	11.6	12.0	12.5	13.0	13.4	13.9	**14.5**	15.1	15.8	16.5	17.3	18.0	18.9	19.7	20.6	21.6	**22.5**
	Only ND Bypass	Distance	- Distance	**4.9**	5.0	5.1	5.2	5.4	5.5	5.6	5.8	5.9	6.1	6.2	**6.4**	6.5	6.6	6.7	6.8	7.0	7.1	7.2	7.4	7.5	**7.6**	7.8	7.9	8.1	8.2	8.4	8.6	8.7	8.9	9.1	**9.2**
		Exit	- Exit	**2.8**	2.9	3.0	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	**3.8**	3.8	3.9	4.0	4.1	4.2	4.4	4.5	4.6	4.7	**4.8**	4.9	5.1	5.2	5.4	5.5	5.7	5.9	6.0	6.2	**6.4**
		Point	- Point	**3.2**	3.2	3.3	3.4	3.4	3.5	3.6	3.7	3.7	3.8	3.9	**4.0**	4.0	4.1	4.1	4.2	4.3	4.3	4.4	4.4	4.5	**4.6**	4.6	4.7	4.8	4.9	4.9	5.0	5.1	5.2	5.2	**5.3**
		Corridor (Access)	- Corridor (Access)	**16.9**	17.2	17.6	17.9	18.3	18.6	19.0	19.4	19.8	20.2	20.6	**21.0**	21.2	21.4	21.6	21.9	22.1	22.4	22.6	22.8	23.1	**23.3**	23.6	23.8	24.1	24.3	24.6	24.9	25.1	25.4	25.7	**25.9**

Scenario 2:
Concession 40 Years
Toll / mile 0.20 $
Local Traffic 50% of total traffic
Traffic growth 2.50% thru 2035
Traffic growth 1.00% after 2035

Base Toll (US$/mile)	Infrastructure Scenario	Tolling Scenario		Year 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
0.20	ND Bypass & I5-99W	Distance	ND Bypass & I5-99W connector - Distance	**14.9**	15.6	16.4	17.2	18.0	18.8	19.7	20.6	21.6	22.6	23.7	**24.8**	26.0	27.2	28.5	29.9	31.3	32.8	34.4	36.0	37.8	**39.6**	41.1	42.8	44.4	46.2	48.0	49.9	51.9	53.9	56.1	**58.3**	58.9	59.6	60.2	60.9	61.6	62.2	62.9	63.6	64.3	**65.0**
		Exit	ND Bypass & I5-99W connector - Exit	**6.5**	6.8	7.2	7.5	7.9	8.2	8.6	9.1	9.5	10.0	10.4	**10.9**	11.5	12.1	12.8	13.5	14.2	15.0	15.8	16.6	17.5	**18.5**	19.5	20.5	21.7	22.8	24.1	25.3	26.7	28.2	29.7	**31.3**	31.6	32.0	32.3	32.7	33.0	33.4	33.8	34.1	34.5	**34.9**
	Only ND Bypass	Distance	Only ND Bypass - Distance	**5.1**	5.3	5.5	5.7	5.9	6.0	6.2	6.5	6.7	6.9	7.1	**7.4**	7.6	7.9	8.1	8.4	8.7	9.0	9.3	9.7	10.0	**10.3**	10.6	10.9	11.2	11.5	11.8	12.2	12.5	12.8	13.2	**13.5**	13.7	13.8	14.0	14.2	14.3	14.5	14.6	14.8	14.9	**15.1**
		Exit	Only ND Bypass - Exit	**2.9**	3.0	3.1	3.2	3.3	3.5	3.6	3.7	3.8	3.9	4.1	**4.2**	4.4	4.6	4.7	4.9	5.1	5.3	5.6	5.8	6.0	**6.3**	6.5	6.8	7.0	7.3	7.6	7.9	8.2	8.5	8.8	**9.2**	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0	10.1	**10.2**
		Point	Only ND Bypass - Point	**3.4**	3.5	3.6	3.7	3.8	4.0	4.1	4.2	4.3	4.4	4.6	**4.7**	4.8	5.0	5.1	5.3	5.4	5.6	5.8	5.9	6.1	**6.3**	6.4	6.6	6.7	6.9	7.1	7.2	7.4	7.6	7.7	**7.9**	8.0	8.1	8.2	8.3	8.4	8.4	8.5	8.6	8.7	**8.8**
		Corridor (Access)	Only ND Bypass - Corridor (Access)	**17.8**	18.3	18.8	19.3	19.8	20.3	20.9	21.5	22.0	22.6	23.3	**23.9**	24.5	25.2	25.9	26.5	27.3	28.0	28.7	29.5	30.3	**31.1**	31.7	32.3	32.9	33.5	34.1	34.8	35.4	36.1	36.8	**37.5**	37.9	38.3	38.7	39.2	39.6	40.0	40.5	40.9	41.4	**41.8**

Scenario 3:
Concession 40 Years
Toll / mile 0.25 $
Local Traffic 50% of total traffic
Traffic growth 2.50% thru 2035
Traffic growth 1.00% after 2035

Base Toll (US$/mile)	Infrastructure Scenario	Tolling Scenario		Year 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
0.25	ND Bypass & I5-99W	Distance	ND Bypass & I5-99W connector - Distance	**15.0**	15.8	16.6	17.5	18.4	19.3	20.3	21.4	22.5	23.6	24.8	**26.1**	27.5	28.9	30.5	32.1	33.8	35.5	37.4	39.4	41.5	**43.7**	45.5	47.3	49.3	51.4	53.5	55.7	58.0	60.4	62.9	**65.5**	66.2	67.0	67.7	68.4	69.2	70.0	70.7	71.5	72.3	**73.1**
		Exit	ND Bypass & I5-99W connector - Exit	**6.1**	6.4	6.7	7.1	7.4	7.8	8.2	8.6	9.0	9.5	10.0	**10.5**	11.1	11.7	12.4	13.0	13.8	14.6	15.4	16.3	17.2	**18.1**	19.1	20.2	21.3	22.5	23.7	25.0	26.4	27.9	29.4	**31.0**	31.4	31.7	32.1	32.4	32.8	33.1	33.5	33.9	34.2	**34.6**
	Only ND Bypass	Distance	Only ND Bypass - Distance	**5.3**	5.5	5.7	5.9	6.1	6.3	6.5	6.7	7.0	7.2	7.5	**7.7**	8.0	8.3	8.6	9.0	9.3	9.6	10.0	10.4	10.8	**11.2**	11.5	11.9	12.2	12.6	12.9	13.3	13.7	14.1	14.6	**15.0**	15.2	15.3	15.5	15.7	15.8	16.0	16.2	16.4	16.5	**16.7**
		Exit	Only ND Bypass - Exit	**3.0**	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.9	4.0	4.1	**4.2**	4.4	4.6	4.8	4.9	5.1	5.3	5.6	5.8	6.0	**6.2**	6.5	6.8	7.1	7.4	7.7	8.0	8.4	8.7	9.1	**9.5**	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.5	**10.6**
		Point	Only ND Bypass - Point	**3.7**	3.8	3.9	4.1	4.2	4.3	4.4	4.6	4.7	4.9	5.0	**5.2**	5.3	5.5	5.7	5.8	6.0	6.2	6.4	6.6	6.8	**7.0**	7.2	7.4	7.5	7.7	7.9	8.1	8.3	8.5	8.7	**8.9**	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	**9.9**
		Corridor (Access)	Only ND Bypass - Corridor (Access)	**21.8**	22.4	23.0	23.7	24.3	25.0	25.7	26.4	27.1	27.9	28.7	**29.5**	30.3	31.1	31.9	32.8	33.7	34.6	35.5	36.5	37.5	**38.5**	39.2	40.0	40.8	41.5	42.3	43.1	44.0	44.8	45.7	**46.5**	47.1	47.6	48.1	48.6	49.2	49.7	50.2	50.8	51.4	**51.9**

Scenario 4:
Concession 40 Years
Toll / mile 0.30 $
Local Traffic 50% of total traffic
Traffic growth 2.50% thru 2035
Traffic growth 1.00% after 2035

Base Toll (US$/mile)	Infrastructure Scenario	Tolling Scenario		Year 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
0.30	ND Bypass & I5-99W	Distance	ND Bypass & I5-99W connector - Distance	**14.4**	15.2	16.0	16.9	17.8	18.8	19.9	21.0	22.1	23.4	24.7	**26.0**	27.6	29.2	30.9	32.7	34.6	36.6	38.8	41.1	43.5	**46.0**	48.1	50.3	52.5	54.9	57.4	60.0	62.7	65.5	68.4	**71.5**	72.3	73.1	73.9	74.7	75.5	76.4	77.2	78.1	78.9	**79.8**
		Exit	ND Bypass & I5-99W connector - Exit	**5.7**	6.0	6.3	6.6	6.9	7.3	7.7	8.1	8.5	9.0	9.4	**9.9**	10.5	11.1	11.8	12.5	13.2	14.0	14.8	15.7	16.6	**17.6**	18.5	19.6	20.7	21.9	23.1	24.4	25.8	27.2	28.8	**30.4**	30.7	31.1	31.4	31.8	32.1	32.5	32.8	33.2	33.5	**33.9**
	Only ND Bypass	Distance	Only ND Bypass - Distance	**5.2**	5.4	5.6	5.8	6.1	6.3	6.5	6.8	7.0	7.3	7.5	**7.8**	8.1	8.5	8.8	9.2	9.5	9.9	10.3	10.7	11.2	**11.6**	12.0	12.4	12.8	13.2	13.7	14.1	14.6	15.1	15.6	**16.1**	16.3	16.4	16.6	16.8	17.0	17.2	17.4	17.6	17.7	**17.9**
		Exit	Only ND Bypass - Exit	**3.1**	3.2	3.3	3.4	3.5	3.6	3.7	3.9	4.0	4.1	4.2	**4.3**	4.5	4.7	4.8	5.0	5.2	5.4	5.6	5.8	6.0	**6.2**	6.5	6.7	7.0	7.3	7.6	8.0	8.3	8.7	9.0	**9.4**	9.5	9.6	9.7	9.8	9.9	10.0	10.2	10.3	10.4	**10.5**
		Point	Only ND Bypass - Point	**3.9**	4.0	4.1	4.2	4.4	4.5	4.7	4.8	5.0	5.1	5.3	**5.5**	5.7	5.8	6.0	6.2	6.4	6.7	6.9	7.1	7.3	**7.6**	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.3	9.5	**9.7**	9.8	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.8	**10.9**
		Corridor (Access)	Only ND Bypass - Corridor (Access)	**25.7**	26.4	27.1	27.9	28.7	29.5	30.3	31.2	32.1	33.0	33.9	**34.8**	35.8	36.8	37.8	38.8	39.9	41.0	42.2	43.3	44.5	**45.7**	46.6	47.5	48.5	49.4	50.4	51.3	52.3	53.4	54.4	**55.5**	56.1	56.7	57.3	57.9	58.6	59.2	59.9	60.5	61.2	**61.9**

12. INVESTMENT GRADE TRAFFIC AND REVENUE FORECASTS

The preliminary traffic and revenue forecasts are intended to provide a best estimate based upon existing data. OTIG's preliminary view is that for the Project to achieve its purpose and be financially viable, an access tolling scheme should be implemented with a single toll plaza at the Rex Hill Interchange.

Steer Davies Gleave prepares demand and revenue forecasts for toll roads using an approach that examines the key features that determine traffic capture within a rigorous and well understood modeling methodology that includes:

- Defining the traffic demand that could use the new toll road: the **In-Scope Market;**
- Estimating the proportion of 'in-scope' traffic that will use the new toll road: **Traffic Capture;**
- Forecasting future year traffic growth and changes in behavior as external conditions change over time, in order to estimate demand and revenue during the life of the concession: **Traffic Forecasting.**

Steer Davies Gleave, as part of OTIG, will develop a robust traffic model to provide an investment grade traffic and revenue forecast for the Project. A number of technical papers are envisaged to be drafted as the Project progresses through the feasibility analysis of Milestone 1 and 2, including:

- A Survey Report that summarizes the number, type, location, and methodology of surveys undertaken (e.g. origin-destination, travel time, traffic counts, and stated preference surveys);
- A Model Development Report that summarizes the definition of the network as well as development of the demand matrix together with traffic model calibration;
- Traffic and Revenue Memorandums that summarize the traffic and revenue forecasts, growth assumptions used, options tested and further sensitivity tests.

Following a period of analysis, OTIG will submit the Investment Grade Traffic and Revenue Report for the preferred option identified in Milestone 2. This document will form the basis for discussions with financial institutions.

13. TOLLING POLICY LEGAL ISSUES

13.1 Oregon Law

To be determined following further study.

13.2 Tax and Legal Issues

Most toll roads in Europe include VAT (Value Added Tax) in the calculation of the toll rate. However we currently understand that there are no state sales taxes in Oregon and as such toll rates would not include any such tax.

Enforcement can take the form of penalties applied for non- or late payment (usually set to recover costs), a regular commercial collection process, cancellation of a user's toll device and license renewal/plate denial as a final step.

Approaches similar to those listed above have been applied in other jurisdictions where free flow toll roads exist. Alternatively, legal measures can be applied but this may require new legislation or amendments to current regulations. In this scenario, if a toll remains unpaid for a specified period, it may become a legal offence and a penalty notice could be issued to the registered vehicle owner and dealt with in a similar manner to traffic offences.

14. FINANCIAL MODEL OVERVIEW

The Financial Model takes the revenues identified from the funding sources and uses them to support the financing for the Project.

The Model can analyze the following major options or a combination of these options:

- Upfront grant funding of design and construction costs
- Public sector tax exempt or taxable bond issues
- Private Activity Bonds (tax exempt)
- Private taxable debt and equity financing

Upfront grant funding of design and construction costs may be realized in the form of various federal and/or state level funds. The inclusion of upfront grant funding contributes to the overall funding of the Project and thereby reduces its capital requirement from other sources. Upfront grant funding from state or federal sources is the least costly form of finance, although grants may not be sufficient, timely, or practical to include in the financing package for the Project.

Public sector taxable and tax-exempt bond issues raise capital for specific projects. Interest on tax exempt bonds is generally exempt from federal tax, and in the case that the bond is bought by a resident of the state that issued the bond, the interest payments are also exempt from state tax. Interest payments are also exempt from local tax if they are purchased by residents of the locality that issued the bond. Issuance of public sector bonds reduces the requirement for private taxable debt. Public sector tax-exempt bonds have a high issuance cost.

Private Activity Bonds (PABs) are tax-exempt bonds issued by or on behalf of local or state governments for the purpose of providing special financing benefits for qualified projects. PABs have been included in the most recent Federal Transportation reauthorization bill (SAFETEA-LU), although allocation is limited and it is not clear if an allocation would be available for this Project.

Private taxable debt can be in the form of bank debt or capital markets debt. Bank debt is debt sourced directly from one or more banks that may or may not syndicate the debt by on-selling it to other banks at a later date. Bank debt allows for funding to be drawn down as required and provides repayment and refinancing flexibility, although the term may be shorter than desired. Capital markets debt are bonds and/or credit agreements issued by the developer through an underwriter. The underwriter bears the risk that there is insufficient demand for the bonds in the market. Capital markets debt can take on a variety of forms to suit the project, however there are additional credit rating costs as well as cost of carry considerations due to the upfront drawdown.

Private sector equity financing for the Project will be provided by Macquarie Infrastructure Group (MIG), one of the largest and most experienced private developers of toll roads in the world. It is anticipated that 100% of the equity required for the Project will be funded by MIG. Obtaining an equity provider with significant toll road experience, such as MIG, will help minimize the cost of equity as an experienced toll road operator is better equipped to accurately judge the appropriate risk premium.

14.1 Primary Assumptions

Assumption	Unit	Value
Construction Costs	[$ 000]	382,940
Debt contribution	[%]	70%
Equity contribution	[%]	30%
Concession	[years]	40
Toll	[$ / mile]	0.30
Local traffic	[%]	50%
Traffic growth: up to 2035	[%]	2.50%
Traffic growth: after 2035	[%]	1.00%

14.2 Sources and Uses of funds

As a primary assumption, the amount of debt as a percentage of total capital employed (debt plus equity) is assumed to be 70% at the completion of construction, implying that 70% of all construction costs will be funded by debt. By extension, the remaining 30% of construction costs will be funded by equity. In addition to debt and equity, projects may receive grants from various bodies to help defray construction costs. While such grants reduce the total amount of debt and equity required, the remaining capital contributions are still assumed to be 70% debt and 30% equity.

The primary use of funds will be the cost to construct the project, however there are several other costs that are secondary in nature. These include various financing fees that typically vary according to whether bank debt or bonds have been employed, and then again as to which type of bank or bond debt. Payments of interest or even principal on debt facilities is quite common in the event of extended construction periods and this is an additional use of funds. Finally, there are often costs related to establishing a management team for the project as well as insurance costs, independent certifier reporting costs and trustee fees.

15. FUNDING GAP

15.1 Funding Gap by Method of Tolling

One of the objectives of this Review is to identify the potential for different tolling methods to fund the project and to identify any funding gaps which may require funding from other sources. It is important to note that this analysis is based on very preliminary information and accordingly any funding gap results should not be regarded as conclusive at this stage. They simply provide some information to assist in focusing attention for the next stage of data collection and analysis.

The funding gaps are calculated on the Base Project configurations. Consideration is then given in broad terms as to how the extension options may affect this funding gap. As the design and construction costs for the Newberg-Dundee Project are still under development, they carry a wide range of estimate between $325 million at the low end to $425 million at the high end.

In addition traffic composition, notably the proportion of local traffic and the proportion of through traffic, has not yet been determined at this point as OTIG does not have good quality data. Traffic composition will be a key objective of the Traffic and Revenue Forecasting studies that are scheduled to follow. As an interim assumption the funding analysis assumes that 50% of total traffic is local. This is a key assumption as local traffic is assumed to receive a significant toll discount, which in turn significantly reduces toll revenue.

The funding gap varies considerably with the tolling method employed. Tolling the new Bypass alone results in the Bypass only attracting a portion of total traffic, capturing very little traffic during off-peak periods but up to 70% during peak periods. Traffic which is sensitive to paying a toll or less sensitive to the travel savings available from using the bypass will continue to travel on the existing 99W through Newberg and Dundee. This diversion effect to the existing highway becomes more pronounced as toll levels on the Bypass increase.

As a result of the configuration of the proposed interchanges, the Bypass is a useful addition to the local road network as well as a route for through traffic. The local trip assumption is therefore key to Bypass traffic and the toll rate charged for local trips.

The level of annual revenue generated under each of the tolling options varies as can be seen in the preliminary revenue forecasts in Section 11.5. As the level of annual revenues differs between tolling options, so does the funding gap under each of the tolling options used.

Tolling the Bypass alone results in a significant funding gap, which is consistent with previous studies. The point and exit tolling options result in the largest funding gap. Point tolls do not capture all traffic utilizing the road, and while exit tolls do capture all traffic, the toll structure is based on a flat toll rate scheme. A distance based tolling option does captures all usage on the road and charges according to the distance travelled, resulting in the greatest amount of revenue generated. A distance based tolling option requires a fully electronic tolling system capable of capturing vehicle information at each of the four interchanges.

Access tolling, which avoids diversion effects between the new Bypass and the existing highway 99W, generates stronger revenues and minimizes the funding gap. This funding gap is highly sensitive to the local traffic assumption and is reduced if the proportion of local traffic of total trips is reduced.

This provides some useful information for further analysis and sensitivity testing. However, given the importance of local trip data as well as the diversion factors between the existing and new routes, no firm conclusions should be drawn from the funding analysis at this early stage.

The impact of the extensions is also unclear at this stage. However early indications are that the Tualatin-Sherwood Connector would add both significant traffic flows to the Base Project and increase annual revenue significantly. However these flows would be offset by the additional capital costs estimated at $519 million, and may not necessarily decrease the funding gap, although further analysis is required. It is highly unlikely that the Tualatin-Sherwood Connector will satisfy the requirements of the RFP as an extension to the Newberg-Dundee project and therefore will likely not proceed forward on that basis.

The McMinnville extension would be unlikely to add significantly to traffic volumes but would provide additional value for the toll paid in terms of distance travelled and travel time savings. Again, further traffic and revenue studies are required to reach firm conclusions.

15.2 Methods to Bridge the Funding Gap

There are several methods available to help bridge the funding gap:

1. Reduce project capital costs. To date, cost has not been used as part of the criteria to evaluate design alternatives. OTIG estimates that design changes resulting from value engineering (e.g. replacing bridges with culverts) have the potential to realize significant construction cost savings. There may also be some potential to reduce the costs of the interchanges depending upon the tolling method preferred. Such costs savings, if realized, would substantially improve the economic viability of the Project. A similar approach to the extension projects could also substantially improve their economic viability.
2. Higher tolls. Setting a higher initial toll rate results in an immediate increase in the cash flows received under the tolling scheme. This appears to be the most direct and logical way to generate sufficient revenue to close the funding gap. However, tolls that become excessive may be subject to unfavorable price elasticity and may also be politically unpopular.
3. Longer concession period. Increasing the length of the concession increases the number of periods in which revenue is received, which in turn increases the returns available to satisfy bondholder and equity holder requirements. Unfortunately, given the time value of money, extending the concession provides rapidly diminishing marginal returns. Concessionaires that receive an additional 10 years of revenue, say, from extending the concession from 40 to 50 years only experience a minor increase in value measured in today's dollars.
4. Reduce the local discount. Reducing the local user discount will reduce the funding gap. The extent of the funding gap reduction will depend upon the

percentage of drivers that receive the local discount. In a scenario where a high proportion of total drivers are local, a reduction in, or elimination of, the local discount generates significantly higher revenue. Alternatively, adjusting the definition of a local user to include a narrower base of eligible users would also result in a substantial increase in annual revenue.

5. Increased toll rate growth. Allowing tolls to increase at a faster rate is akin to setting higher tolls at opening or reducing the discount, although not as effective. Higher toll growth has more impact on later periods than earlier periods which, according to the time value of money, has a smaller impact on closing the funding gap.

16. RECOMMENDED OPTIONS FOR STAGE 2 ASSESSMENT

OTIG recommends introducing cost as part of the criteria for evaluating design alternatives. OTIG and ODOT should work collaboratively to seek out cost reduction opportunities. As part of this strategy OTIG recommends conducting value engineering of the high-cost areas of the Project, while maintaining an acceptable design. OTIG also recommends identifying areas of the Project that could be scaled back while retaining overall public acceptance. It is important that all stakeholders understand that the Project's cost affects the project economics and in turn the viability of the funding options.

OTIG recommends further study of the McMinnville and OR18 extension options. In particular, additional design should be completed in relation to the McMinnville extension interchanges to verify type, layout and cost. In addition, the environmental process should begin as soon as feasible. The environmental process for these extensions should not delay the development of the baseline Project. Further costing estimates for the OR18 extension should be undertaken. Further design in relation to the Tualatin-Sherwood option should be undertaken as appropriate, albeit highly unlikely as an extension to the Project.

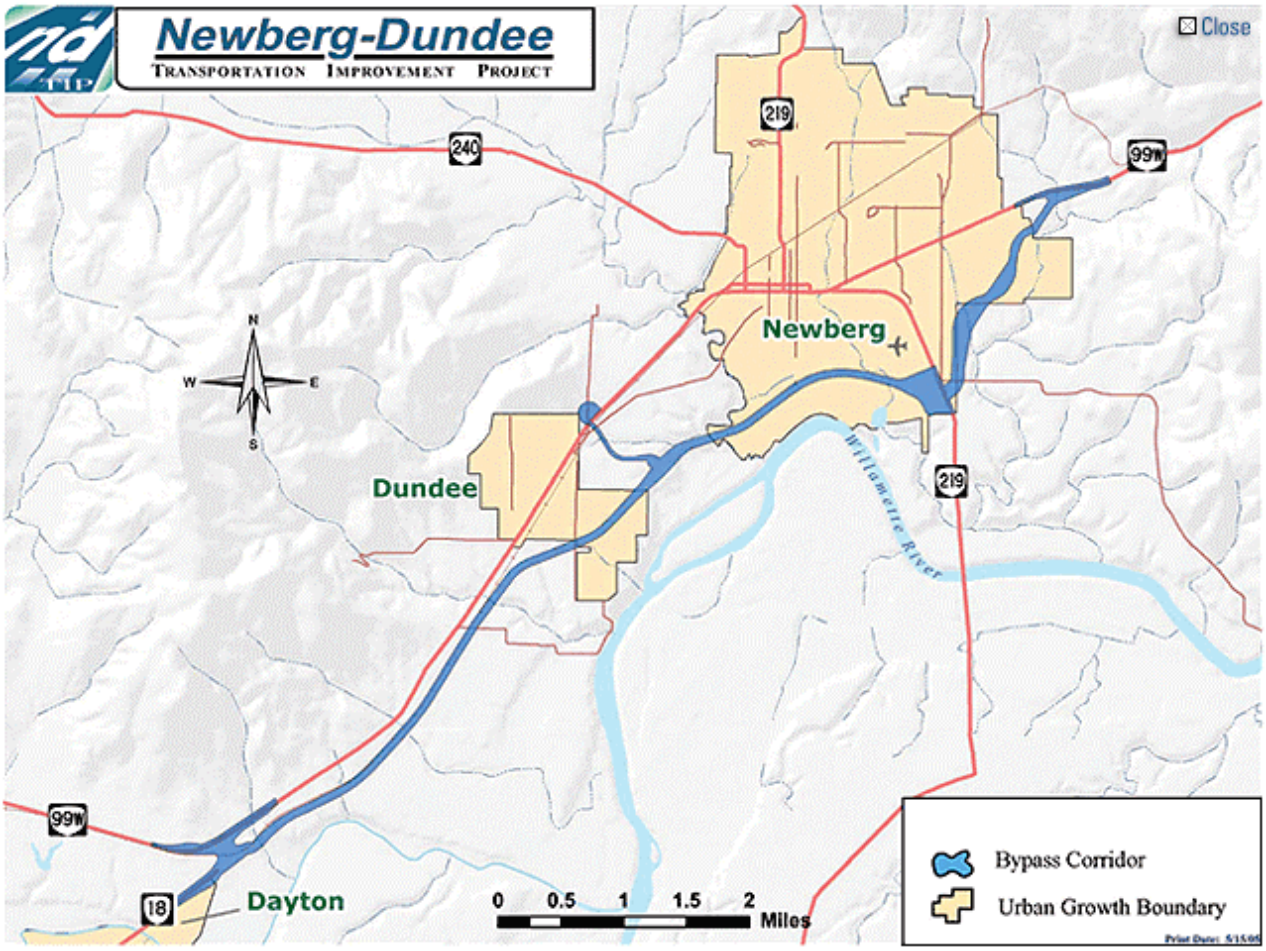
Direct toll revenue is the recommended source of funding for the Project. Toll revenue is the largest source of potential revenue for the project and is likely to have greater public acceptance than increases in property or gas taxes, and more certainty than federal or state funding. Capturing any increases in property values and using this as a funding source is likely to be challenging as property values may appreciate only several years after project completion and with a low degree of certainty.

OTIG recommends that for tolling to be effective, a direct toll should be levied on the corridor as a whole rather than just the new bypass. The traffic profile of the Newberg-Dundee Project is such that travel time savings will probably only justify the toll level necessary to finance the Project during peak periods of congestion on weekends. This may leave the bypass underutilized during off-peak periods. Access tolling would utilize the capacity of the Newberg-Dundee Project and reduce the impact of traffic through the city centers of Newberg and Dundee. This is particularly the case for truck traffic, the least desirable form of traffic on 99W.

Direct tolls can be levied on a distance, trip or period basis. Collection of tolls can be implemented in a number of ways, including via barrier or free flow. The recommended type of toll and form of collection will in part depend on the decision to move ahead with one or more of the extension options. OTIG will continue to study tolling options in conjunction with the extension options, taking into account the impact of traffic diversion.

In the event that the level of tolls required to make the Project feasible to equity and debt holders is publicly unacceptable, non-ODOT sources of funding such as property or gas taxes, land value capture, or federal and state funding may need to be utilized as a secondary source. Any of these sources of funds, however, would likely require additional legislation and have a low degree of certainty. As such, in the event that direct tolls are not sufficient to recover the capital costs of the project, a more favorable approach would be to seek to reduce these capital costs.

APPENDIX A – NEWBERG-DUNDEE BYPASS ROUTE PROPOSAL



Source: www.newbergdundeebypass.org

APPENDIX B - INVESTMENT GRADE TRAFFIC AND REVENUE FORECASTS

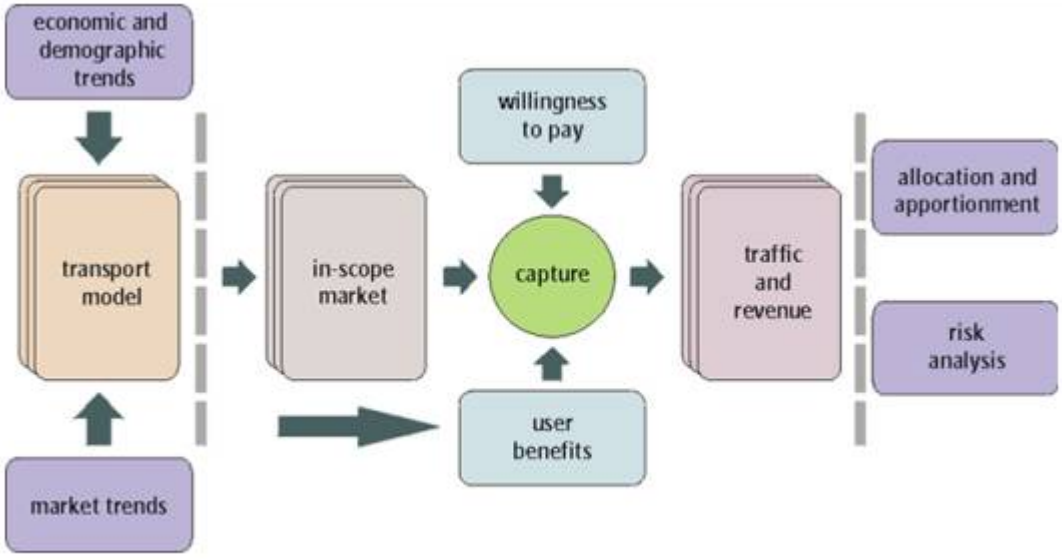
Overall Approach to Forecasting Traffic and Revenue

Steer Davies Gleave prepares demand and revenue forecasts for toll roads using an approach that examines the key features that determine traffic capture within a rigorous and well understood modeling methodology:

- Defining the traffic demand that could use the new toll road; the **In-Scope Market**.
- Estimating the proportion of 'in-scope' traffic that will use the new toll road; **Traffic Capture**.
- Forecasting future year traffic growth and changes in behavior as external conditions change over time, in order to estimate demand and revenue during the life of the concession; **Traffic Forecasting.**

The following figure summarizes the methodology, where also the external elements that change in time are presented.

Steer Davies Gleave Approach to Toll Road Forecasting



A full understanding of the trip movements using both the toll road and any free alternatives and an assessment of route choice options must be obtained first.

The proportion of 'in-scope' traffic likely to be 'captured' then depends on:

- The advantages (or benefits) of the toll road over the existing road.
- The willingness of drivers to pay for those advantages.

Once the existing level of capture has been identified and understood, the future level of traffic capture can be 'forecast' taking into account changes in the future size and

composition of the in scope market (traffic growth), the benefits of alternative route choice (congestion) and willingness to pay tolls (increases in real wealth).

The main elements will be analyzed in more detail.

In-Scope Demand

As mentioned, this is the traffic that would use the road if it were free and defines the maximum market the toll road can capture demand from.

A full understanding of the trip movements using the existing road and an assessment of route choice options are obtained from traditional traffic data. In the case of this project, the 'in-scope' traffic – the total traffic that could potentially use the proposed toll road – is equivalent to those origin/destinations observed on places where the future toll plazas would be located.

Therefore the current in-scope demand will be estimated from:

- **Origin/Destination data:** will provide the trip structure, which will allow estimating the components of trips which are through traffic, medium distance or local, which will affect the assignment decision and any definition of resident users that could be used in the toll scheme.
- **Automatic traffic counts:** will provide volumes of traffic at relevant sections of the road. It will also allow us to know the seasonality along the year on this road, and any historic trends. There are two ATR stations (36-004 and 36-006) located in the study area that will be used for this purpose.
- **Manual classified counts:** will provide composition of traffic on sections of the relevant road network, in different times of the day and days of the week.

Capture Model

The capture model basically combines the following elements:

- Advantages (or benefits) of the toll road over the existing road.
- Behavior: the willingness of drivers to pay for those advantages.

The *advantages* or *user benefits*, relate to the estimation of benefits of the toll scheme over the alternative free routes. The key issue will be the estimation of time saved, although reliability, safety and convenience can also influence route choice decisions. The current delays at the existing 99W and other alternatives, and how they vary during the day and week will be the main issue to analyze. Also the assessment on how it is expected these conditions will change in the future is another relevant element to review in this analysis.

The *behavior* specifically relates to how drivers "balance" a cash payment to use the new toll road against a non-cash time/fuel/convenience cost of remaining on the existing free roads. The most relevant element here is the denominated Value of Time (VoT)**.**

We propose the collection of Stated Preferences (SP) surveys to estimate the *value of time* of users in the area.

Data Collection Program

Currently, we anticipate the following data to be collected:

- Journey time surveys
- Origin-Destination survey
- Manual classified counts
- Stated Preference (SP) survey

Please note that the surveys proposed are for the development of investment grade forecasts for the Newberg-Dundee scheme only and do not include the I5-99W Connector.

Given the tourist use of the road, we intend to gather information during both the “high season” and “normal season”. A suitable period to replicate high season data within the existing project timescales would be the Easter Holiday break in April (12^{th} –15^{th} April). However we require permission from OTC to carry out these surveys and it is unlikely that permission will be granted before that date and therefore we would have to aim for a weekend in May.

We propose to collect data representative of a “normal season” day for a weekday in May considering that permission required by OTC. Since we have already data on seasonal patterns, data will be collected for four time periods as follows:

- Morning peak: 7:30-8:30
- Off peak: 12:00-14:00
- Evening peak: 16:00-18:00
- Weekend: 12:00-17:00 (Saturday or Sunday)

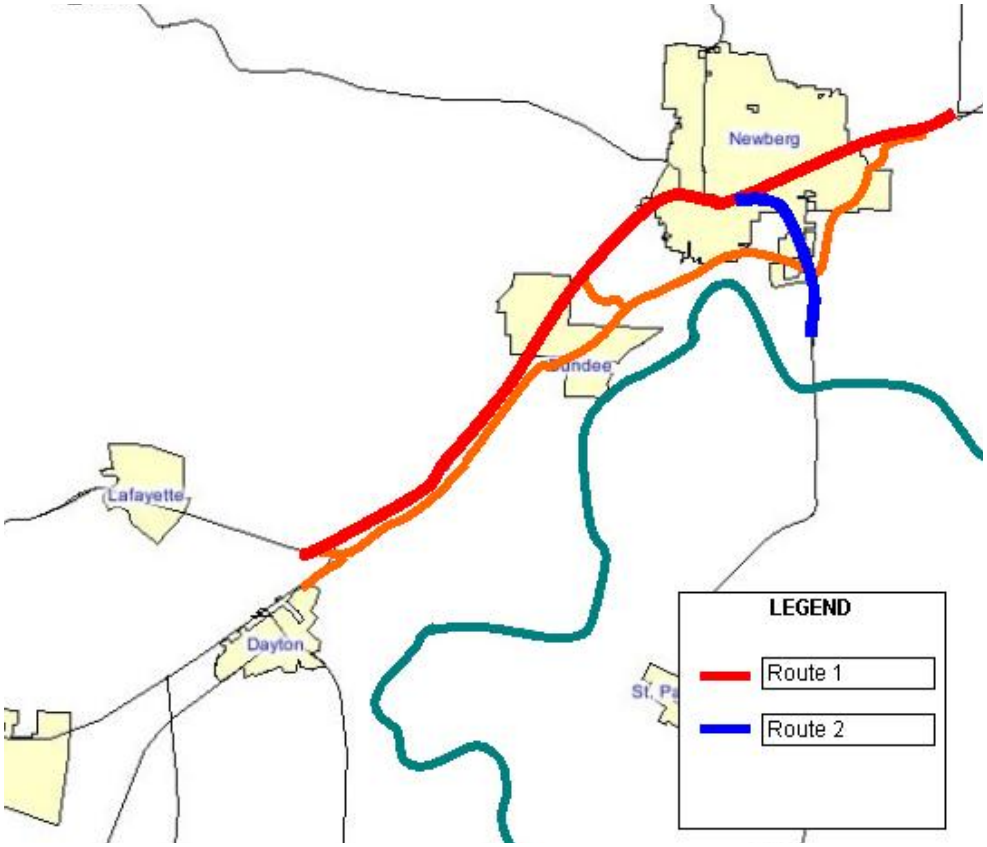
In order to have representative data, the surveys will be undertaken in two working days, ideally Tuesday and Thursday, and for the weekend both Saturday and Sunday.

Travel time surveys

The willingness of road users to pay tolls is closely (although not exclusively) related to the time being saved when using the toll road. Consequently, any toll road forecast relies heavily on the modeled estimate of time saved. Therefore, journey time surveys will be conducted to represent the current travel time on the existing road for an accurate representation in the assignment model.

Figure below shows the proposed journey time routes.

Journey time routes



Travel time surveys will be conducted for each route during the four periods; we will aim for a minimum of 6 runs for each time period in each direction to ensure an adequate sample rate has been collected.

Various control points will be predefined on the selected routes. At intersections, travel time will be collected after the vehicle has passed the stop line, and hence including the intersection delay. At highway interchanges, travel time will be collected when the vehicle either merges or diverges from the mainline road.

Origin-Destination Surveys

A roadside interview is the most reliable method to collect Origin-Destination information, because it ensures a good sample of trip information is collected. However it has the inconvenience that vehicles need to be stopped for a length of time (a few minutes) while the interview is carried out.

They also require a lane to direct traffic into to carry out the interview (allowing non-interviewed traffic to flow) and initial site visit to the Newberg-Dundee area suggested there are few suitable sites.

Thus we have considered two alternatives, but complementary, methods.

- Postcard mailback handouts at traffic lights
- Number plate matching

Postcard mailback

Postcard mailback handouts are used when is not possible to stop the traffic and carry out the survey on site. In this case, survey staff distribute postcards to all passing light vehicle drivers, taking advantage of red lights or traffic merges. A Business Reply Mail facility needs to be set up for the mail back of the postcards to encourage replies and increase the sample rate.

Traffic control measures will be required at surveyed sites, consisting of:

- A flag person for traffic control to slow down and direct traffic.
- Advance signing (“Traffic survey”, “Be prepared to stop”, “Please accept card”).
- Coning of the survey area to provide a refuge for observers and to slow down drivers.

A telephone number will be provided on the questionnaire, so the drivers could make their comments or ask questions about the survey.

Apart from trip origin and destination questions, the questionnaire includes a set of questions related to the vehicle type, the vehicle occupancy, trip purpose for the origin and destination trip and trip frequency.

Postcards will be pre-numbered for distribution and numbers recorded by location of distribution and time of the day. In this way we would be able to identify, for each mailed back postcard, the 30 minutes period in which the survey was handed out and the location.

Control counts (Manual Classified Counts - MCC) need to be conducted simultaneously with the O/D survey distribution to control and expand samples.

Each site will be surveyed during the following periods:

- Morning peak: 7:30-8:30
- Off peak: 12:00-14:00
- Evening peak: 16:00-18:00
- Weekend: 12:00-17:00 (Saturday or Sunday)

The proposed sites are the following:

Location	Town	Observation
Hwy 99W and Brutscher St.	Newberg	Traffic on Hwy 99W only
Hwy 99W and Hwy 140 (219)	Newberg	Traffic on both Hwy 99W and Hwy 140
Hwy 99W and College St.	Newberg	Traffic on both Hwy 99W and College St.
Hwy 99W and Main St.	Newberg	Traffic on both Hwy 99W and Main St.
Hwy 99W and 5th St.	Dundee	Traffic on Hwy 99W
Hwy 99W	Lafayette	
Hwy 18	Dayton	

Ideally, we would survey heavy trucks separately, in one direction, at the weigh scale. In this case the questions to be included are:

- Time of travel;
- Trip origin and destination;
- Intermediate stops for pick-up or delivery;
- Trip frequency;
- Owner of the vehicle; Name of company
- State of load (loaded or empty) and type of load
- Origin of registration plate; and
- Number of axles.

However considering the relatively low number of trucks on 99W (around 5%) we consider the postcard mailback for car users of more importance.

Number Plate Matching Survey

We would carry put a complementary survey to the postcard mailback, with a plate number survey providing information on through traffic. We propose to undertake this at three locations:

- Hwy99 North of Dundee (Rex Hill),
- Hwy99 arriving at Dayton (I-18) and
- Hwy 219 South of Dundee.

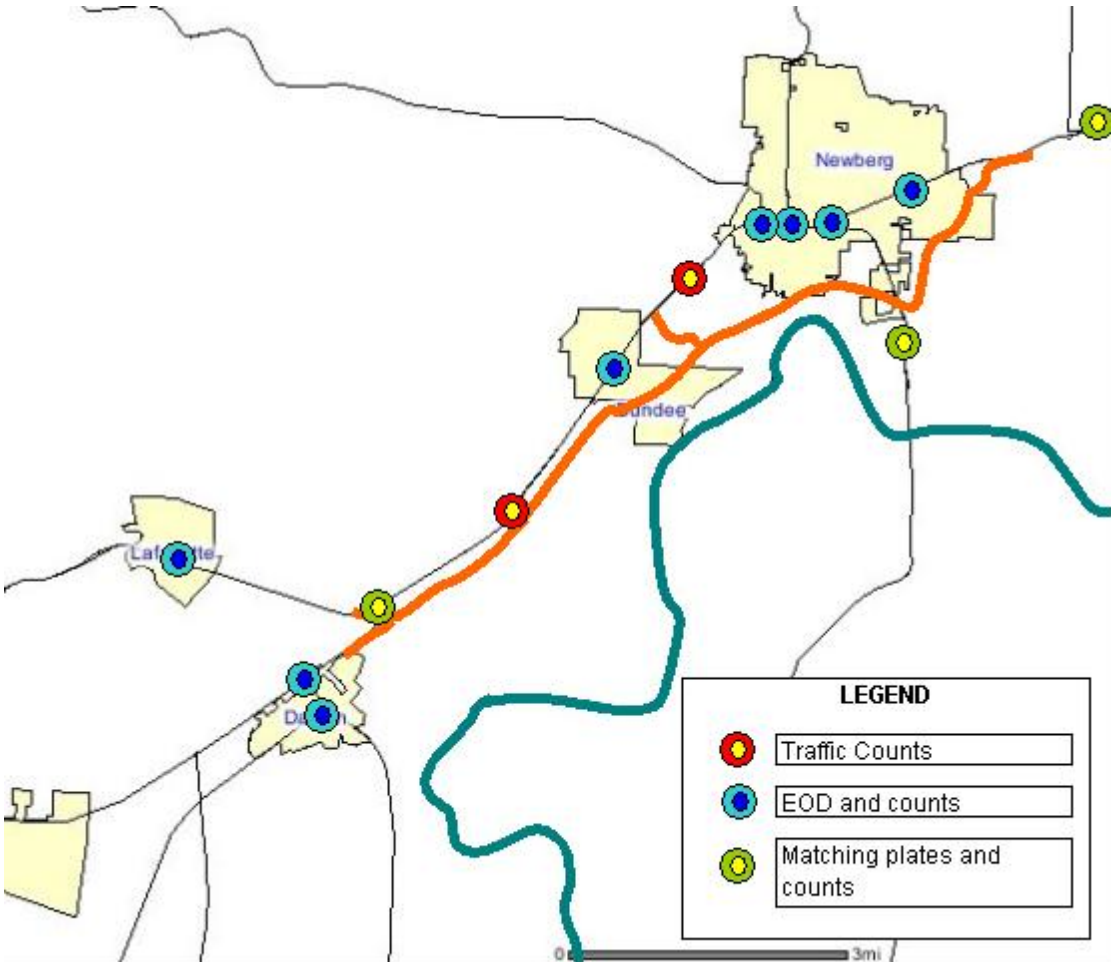
The survey periods will be the same as the previous survey methods.

As with the previous postcard survey, manual classified counts will be carried out simultaneously at the same location to obtain sample rates. These surveys can be done with video cameras recording traffic (and then being transcribed), or by surveyors writing down (for example) the first characters of the number plate.

Additional traffic counts

Additional classified traffic counts will be collected in other locations to complement and to validate information for the modeling process. Again, the data will be collected during the same four periods mentioned previously.

The figure below summarizes the suggested location of the surveys.



Stated Preference Surveys

An important data collection exercise will be the Stated Preference (SP) to provide estimates of Value of Time (VOT) for modeling purposes. We strongly believe that personalizing SP surveys is essential to obtain good and reliable results.

The SP survey will be designed to measure VOT for a variety of trip purposes and might have other variables for segmentation.

The design of the SP surveys has to be done considering the use of the outputs in the traffic model (assignment model). The precise details of the survey design will be defined

later in the study, but we outline some of the issues to be addressed, and give our preliminary views on this exercise.

The rule of thumb on sample size is that if sectors of the traveling population can be distinguished that are known to have, or are likely to have, distinctly different values of time etc *and* they are represented separately in the model or evaluation framework, then it would be wise to estimate their values separately. If, within these segments, there are other factors likely to influence the valuations but are not represented separately in the model/evaluation framework, then effort should be made to avoid sampling bias associated with these factors. Sex or age of travelers would be an example of the latter.

The study must encompass all modes of mechanized transport and major trip purposes. There are likely to be at least three trip purposes and these will probably be sub-divided into at least two segments (possibly based on trip length or trip frequency) plus light and heavy trucks.

Based on previous experience we usually recommend SP samples of 75 to 100 per segment, so with as many as six segments for personal travel this suggests between 450 and 600 interviews. For light and heavy truck trips there is presumably only one trip purpose, so these may require some 200 additional interviews.

For all but light and heavy truck trips, the interview structure is likely to be as follows:

- Information is gathered about a recent trip – the purpose, time of day, travel time and costs, trip frequency and so on.
- One of more SP exercises is constructed and offered.
- Closing questions collect information about the respondent, such as household structure, occupation, income, age and so on.

The SP exercises are constructed around the actual trip made, in order to introduce realism to the survey. This, we believe, is essential to encourage responses that are as realistic as possible. Each respondent will be offered up to two exercises: value of time, and use of e-tags.

The value of time exercise will offer trade-offs between travel time and the cost of travel. The format will be binary choice: two alternatives will be offered at a time, and the respondent asked to state, which they prefer to use.

We will also investigate how responses vary by frequency of travel (both in terms of use of the road in question and the impact of a network of toll schemes).

This degree of flexibility and customization can only be achieved with computerized SP. We use specialized SP interviewing software available (*Explicit)*. Using a computerized survey method allows data entry and validation checks to be programmed into the questionnaire, and all the responses are stored on the computer hard-disk ready for analysis.

The options for fieldwork are:

- *Hall tests.* In this case respondents are recruited on-street and interviewed either on the spot or in nearby hired rooms. This is often quite efficient, because the interview rate can be high, and it is well suited to computerized SP. There may be sampling biases however that need to be guarded against;

- *Self completion.* Paper questionnaires are distributed by post or handed out at strategic locations where trip makers of the required type can be found. This can make it easier to contact certain types of traveler who may not have time to complete a face-to-face interview. On the other hand it is subject to uncontrolled non-replies, and the questionnaire itself must be kept very simple. Usually it is not possible to customize the questionnaire to individuals' circumstances;
- *Household interviews.* This can give a good sample of the population if a database is available from which samples can be drawn. On the other hand it can be slow and expensive. For some categories of travel, interviews in business locations can also be used;
- *Telephone interviews.* These provide good samples of the population, assuming high ownership of telephones. However it is difficult for any but the simplest SP questions to be offered over the telephone, and this is therefore not an approach we recommend.

Our proposition is to use a combination of hall tests at a variety of locations across the study area and telephone interviews for all but the light and heavy truck trips.

To improve the response rate we would offer some form of inducement such as entry to a prize draw, a gift voucher or confectionery. In our experience, even with inducements, it can be difficult to recruit commuters who are available only a limited time each day and may be reluctant to give their time when available.

In order to increase the interview rate for commuters we propose:

- To carry out fieldwork on a number of Saturdays when commuters may be recruited more easily.
- If necessary to interview at selected employers in the study area.

Heavy and light truck trips are rather different in that the driver may not be the person responsible for decisions about routes and costs. We propose therefore to undertake half these interviews with business fleet managers in their offices and half at roadside rest locations. Computerized interviews will be used, once again. In this case the use of computers demonstrates a degree of professionalism that can help increase the response rate.

We would carry out at least one pilot survey, with a minimum of 30-40 respondents. In our experience this is sufficient to test:

- That the questionnaire works, in the sense that there are no bugs or routing errors in it.
- That respondents understand the questions and what they are being asked to do in the SP exercises.
- That the SP is designed so that people vary the choices they make in response to the attributes offered.
- Provide indicative estimates of the model parameters.

The pilot would include some exploratory questions to test how well respondents understand the SP. This would be via a supplementary questionnaire in which they are asked to comment on some of the screen layouts shown to them in the SP task.

Analysis of the SP responses will be carried out using logit estimation software. However all data will be pre-screened for outliers, incomplete records and so on.

Once the data has been analyzed and behavioral parameters established, the findings will be benchmarked against data from other schemes.

Forecasting Methodology

Model development

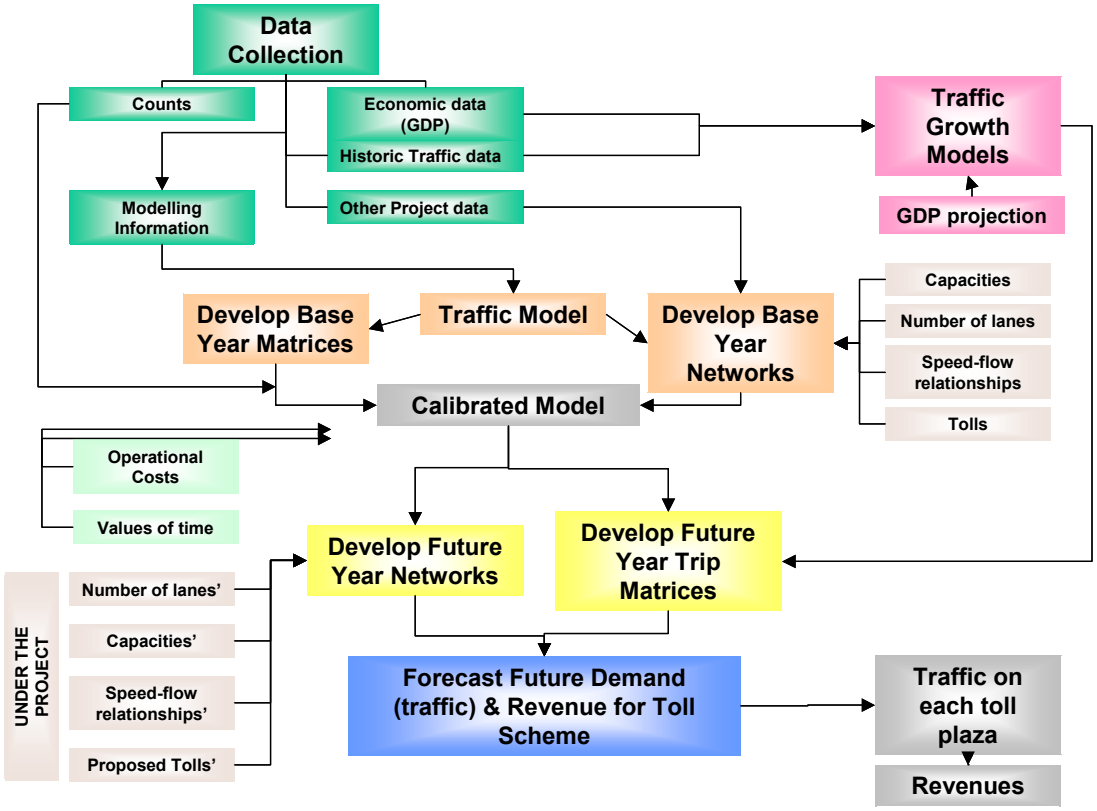
We therefore propose to build a new traffic assignment model for the Newberg – Dundee corridor. The key attributes of the model will be:

- The network and zone system will be limited to addressing the key issue of traffic movement in the corridor. A preliminary review of the scheme would suggest something of the order of 30 zones. The network would focus on the choice between the existing through route and the new toll road, with very limited detail on feeder routes into and out of this network system.
- Surveys discussed previously would be undertaken to observe through traffic (i.e. the in-scope market), but more local trip movements will be in filled using “matrix estimation techniques”.
- Base year model validation would be based on traffic count and journey time data collected as part of this study. Given the relatively straight forward nature of the network we would expect this process to be relatively straight forward.
- The modeling periods are defined according to traffic conditions, in this case we recommend modeling two ‘seasons’: high and normal. We propose representing a normal season as a typical weekday with 3 sub-periods: morning peak, off peak and afternoon peak and the high season will be represented by a weekend day. The results would be separately factored to derive daily totals.
- Traffic growth would be focused on understanding any “relative” differences between the growth of local and through traffic. Through traffic growth would be based on more generic state wide growth rates while local traffic growth would reflect local data on land use and micro-economic trends.
- The model would reflect the different behavior of vehicle types (car, truck etc).

We believe a network model, rather than a spreadsheet based model, is the correct approach for this work as we feel it is important to develop a model that has the flexibility that can quickly and easily address alternative layouts for the project. Spreadsheet models are very good for testing sensitivity to inputs such as growth, toll level and value of time but not for testing schemes that are of different lengths and have different junction arrangements.

Additionally a network model can more accurately reflect the change in journey times on the existing free route as a consequence of diversion to the toll road (there being a dynamic relationship between the toll level, the degree of diversion, the speed on the free route, the diversion to the toll road etc).

There are several software packages available for this purpose, including EMME/2, SATURN, CUBE and VISSUM. Proposed modeling framework is summarized in the figure below.



Sensitivity Tests

A number of sensitivities, including a range of tolls, a variety of growth rates and effects on the 99W will be tested. This will provide a range of values for the proposed toll scheme.

Outputs

A number of technical notes will be drafted at different stages of the project. We envisage the following:

- Survey report – summarizing the number, type, location and methodology of the surveys undertaken (origin-destination, journey time, traffic counts and Stated Preference). It will also describe the main results collected. Raw survey data will be made available electronically if required.
- Model development report – summary of the network and demand matrix development together with model calibration.
- Traffic and revenue memorandum – development of the traffic and revenue forecasts. This will build on the model development work and will include growth assumptions, options tested and sensitivity tests

These will form the deliverables for the milestone 1 stage 2 feasibility analysis.

Following a period of analysis to be undertaken in close consultation with OTIG, we would then submit the formal "Investment Grade" forecast report for the preferred option in milestone 2. However it is important that the majority of the work will have been undertaken in Milestone 1 and will represent the traffic and revenue forecasts for the

preferred option only. This document will form the basis for discussions and presentation to financial institutions.

Work Program

We have presented an extensive and detailed survey program which is the basis for the development of investment grade traffic and revenue forecasts for the Newberg-Dundee Project only.

Assuming permission from OTC is forthcoming at its April meeting (due to take place on the 27th) surveys could begin the week of the 15th May in order to enable time to organize the surveys. The proposed work program shown below is a modified version of the one presented at the Traffic and Tolling Working Subgroup on February 15th. It is a 'worst case' scenario as some of the work could not be 'front loaded'. However the survey information represents the main building block in the development of the forecasts and as such it is of critical importance.