ST2 Update
Benefit-Cost Analysis

Sound Transit Board of Directors
June 12, 2008
Why Conduct B-C Analysis?

- RCW 81.104 requires ST’s system plan conform with the regional transportation plan (Destination 2030)
- Benefit-cost (B-C) analysis required by Destination 2030 for projects over $100M
- B-C analysis performed for ST2 light rail and commuter rail investments
What is B-C Analysis?

• Economic tool used to measure the relative difference between benefits and costs of a given project or investment
  – Converts quantifiable benefits into constant dollar amounts (2007 dollars)
  – Benefit estimation based on consumer surplus theory

• Benefit-Cost ratio greater than 1.0 can be justified from public investment standpoint
## Results by Option

<table>
<thead>
<tr>
<th></th>
<th>0.4% 12 Year</th>
<th>0.5% 12 Year</th>
<th>0.5% 20 Year</th>
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</thead>
<tbody>
<tr>
<td><strong>Net Present Value</strong></td>
<td>$7.0 B</td>
<td>$7.8 B</td>
<td>$16.3 B</td>
</tr>
<tr>
<td><strong>Economic Rate of Return</strong></td>
<td>7.7 %</td>
<td>7.5 %</td>
<td>9.1 %</td>
</tr>
<tr>
<td><strong>B-C Ratio</strong></td>
<td>2.3</td>
<td>2.2</td>
<td>2.7</td>
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</tbody>
</table>
Cumulative Present Values
(0.4% 12-Year Draft Plan)

![Graph showing cumulative benefits and costs over years.]

- Environmental Benefits: 2%
- Accident Reduction Safety Benefits: 5%
- Vehicle Operating & Ownership Cost Savings Benefits: 21%
- Highway Commercial Vehicle Mobility Benefits: 6%
- Transit User Benefits: 31%
- Highway Auto User Mobility Benefits: 35%
Cumulative Present Values
(0.5% 12-Year Draft Plan)

Environmental Benefits 2%
Accident Reduction Safety Benefits 5%
Vehicle Operating & Ownership Cost Savings Benefits 21%
Highway Commercial Vehicle Mobility Benefits 6%
Highway Auto User Mobility Benefits 35%
Transit User Benefits 31%
Cumulative Present Values
(0.5% 20-Year Draft Plan)

- Vehicle Operating & Ownership Cost Savings
- Highway Commercial Vehicle Mobility Benefits
- Highway Auto User Mobility Benefits
- Transit User Benefits
- Environmental Benefits
- Accident Reduction Safety Benefits

Billions of 2006 Dollars
PSRC Conformity Schedule

• June 12\textsuperscript{th} Transportation Policy Board
  – Board briefed on draft results
• June 26\textsuperscript{th} Executive Board
  – PSRC staff presents status report to Executive Board
• July 10\textsuperscript{th} Transportation Policy Board
  – Board recommends conformity finding to Exec Board
• July 24\textsuperscript{th} Executive Board
  – Board certifies ST2 Plan conformity
Appendix

ST2 Update Benefit-Costs Analysis
Economic Evaluation Measures

• **Net Present Value (NPV)**
  – Indication of the overall dollar magnitude of the ST2 net benefits in today’s dollars
  – Net Present Benefit – Net Present Cost = Net Present Value

• **Economic Rate of Return**
  – Real discount rate that makes the present value of all costs equal the present value of all benefits
  – Percentage “return on the investment”
  – If return > low-risk bonds it is “economically worthwhile”

• **Benefit/Cost Ratio**
  – Present value of benefits divided by present value of costs
  – Ratio of > 1.0 is necessary for project to be economically feasible
Model Assumptions

• Evaluation Period
  – Construction only/No benefits 2012-2018
  – Partial operations/Partial benefits 2019-2020
  – Full operations/Full benefits 2021-2060

• Discount rate of 3%
  – Indication of the real time value of resources after controlling for inflation
  – Benefits and costs are valued less today the further out in time they occur
Benefits Included in the Analysis

• Transit user travel time savings
• Mobility benefits for non-transit users
• Auto operating & ownership cost savings
• Accident reduction / safety benefits
• Reduced parking requirements
• Environmental/air quality benefits
Benefits NOT Included in the Analysis

- Travel time reliability improvements
- Newly induced travel attributable to transit investments
- Multiplied employment, earnings and income effects of investment expenditures
- Property value increases near stations
- Reduced requirements for “un-priced” parking (e.g., free parking at employment sites)
- Greenhouse gas reduction impacts (global warming)
- Accident/safety benefits of rail over bus
Costs Included in the Analysis

- Capital expenditures for the rail system
- Annual operating and maintenance (O&M)
- Periodic rehabilitation and replacement (e.g., new vehicles)
- Residual values
  - Unused/remaining value of long-lived assets at the end of evaluation period (“resale” value)
Costs NOT in the Analysis

• ST Express projects
• Light rail studies and ROW preservation
Sensitivity Tests

1. 15% increase in all calculated benefits
2. 15% decrease in all calculated benefits
3. 15% increase in initial capital costs
4. 15% decrease in initial capital costs
5. 10-year increase in the evaluation period
6. No real wage growth in calculating the value of time (reduces future value of benefits)