Cascadia Ultra High-Speed Rail Independent Review Study

Summary of Findings

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the science of insight

June 20, 2023

Presented to: Joint Transportation Committee

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Our Charge

Conduct an independent, unbiased review of previous UHSGT studies to inform future funding and project development activities.

Recent UHSGT Studies

- Ultra-High-Speed Ground Transportation Study (2018)
- Ultra-High-Speed Ground Transportation Business Case Analysis (2019)
- Cascadia Ultra-High-Speed Ground Transportation: Framework for the Future (2020)

Evaluate

Due Diligence Analysis

Was the core work done properly and reasonably?

Educate

Trade-Off Analysis

What factors need to be considered when evaluating next steps?

Inform

Best Practices Analysis

What can be learned from others when considering implementation?

Next Steps

Our Findings

Due Diligence Analysis

- The methods, assumptions, and analysis tools used to support existing UHSGT studies are consistent with industry standards, were appropriately built and applied, and generated reasonable results.
- However, there are features and assumptions that limit appropriateness for investment-grade analyses. Key areas of improvement include:
  - Survey methods
  - Induced demand and economic impact considerations
  - Travel time assumptions
  - Cost assumptions

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Our Findings

Trade-Off Analysis

- Both a “state-of-the-art” high-speed rail system (new infrastructure, dedicated corridor) and “hybrid” (mix of existing and new corridors) would generate improved ridership and economic benefits as compared to an “incremental” scenario (existing infrastructure, shared corridor)
- But costs to achieve these benefits vary widely, driven primarily by:
  - Construction and operational complexity
  - Environmental and community impacts

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Our Findings

Best Practices Analysis

- A range of procurement methods have been used to design, build, and operate similar systems
  - But timeframes are long (measured in decades)
  - Cross-border investments present unique challenges in governance, community mitigation requirements, and permitting
- Gordie Howe Intl Bridge provides useful lessons on cross-border planning, budgeting, and oversight

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Cascadia Ultra High-Speed Rail Independent Review Study

Detailed Findings

Setting the Stage

Moving from Concept to Implementation

Recent UHSGT Studies

- Ultra-High-Speed Ground Transportation Study (2018)
- Ultra-High-Speed Ground Transportation Business Case Analysis (2019)
- Cascadia Ultra-High-Speed Ground Transportation: Framework for the Future (2020)

Timing

All three studies were conducted before COVID

Travel patterns, demand, and costs have all changed significantly

Scope

Feasibility level only; not an investment-grade analysis

Affects selection and sensitivity of analysis tools, input data

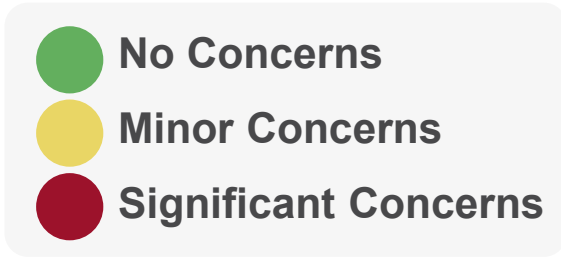
Context

Conceptual only; no detail on alignment, preferred tech

Affects ability to generate accurate level-of-service and cost estimates

Detailed Findings

Due Diligence Analysis



TOPIC AREA	ANALYSIS ELEMENTS	FINDINGS
Ridership and Revenue	Analysis Tools	
	Population and Employment Forecasts	
	Level of Service Assumptions	
	Travel Survey	
	Demand Estimation	
Economic Impact Analysis	Tools & Methods	
	Results	
Cost Analysis	Capital costs	
	O&M Costs	
	Cost Recovery Ratio	

Detailed Findings

Level-of-Service Assumptions

What's included in LOS?

- Frequency
- Travel Time
- # of Stations Served

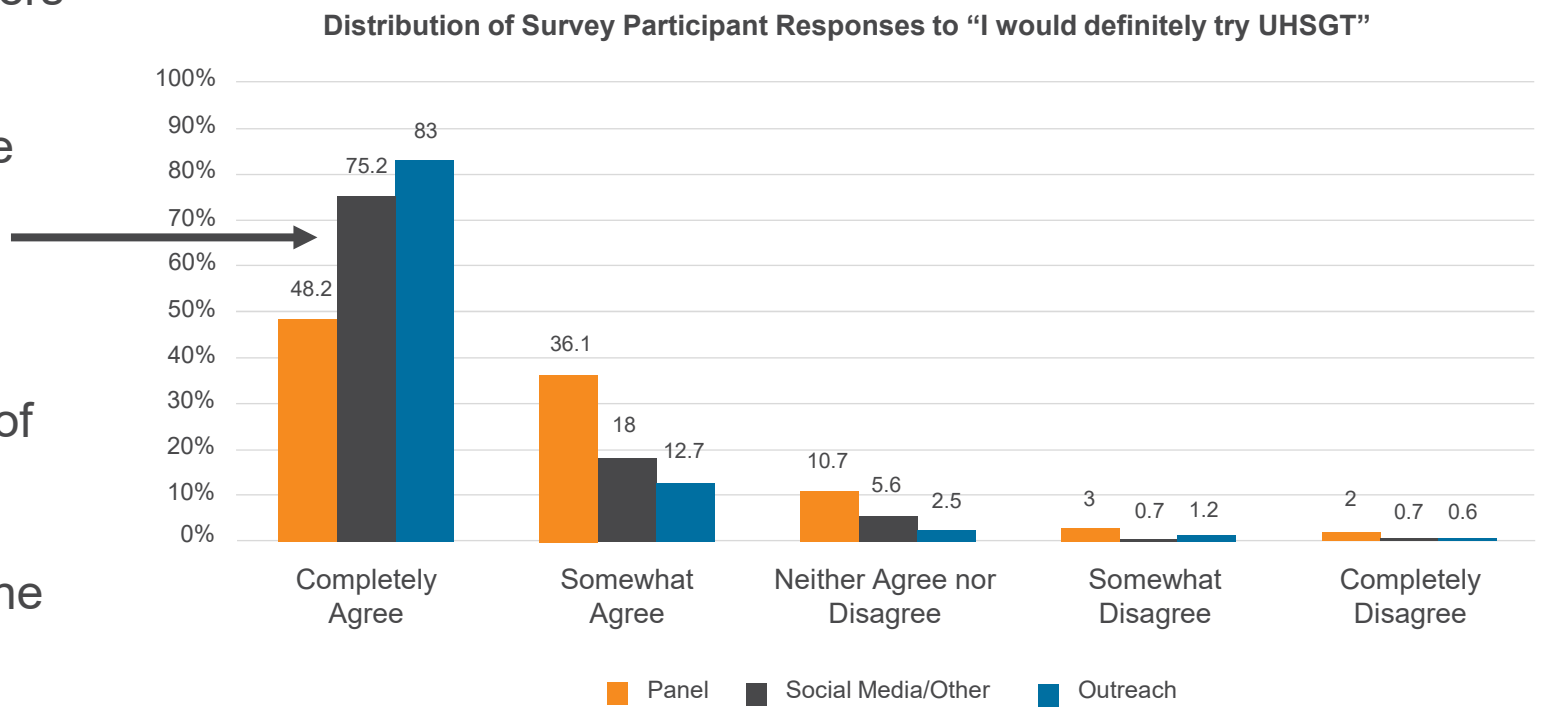
SYSTEM/ROUTE	LENGTH (MI)	TRAVEL TIME (MIN)	AVG. SPEED (MPH)	MAX SPEED (MPH)
Existing Systems				
Amtrak Acela (NYC-Washington DC)	226	177	77	150
China Railway HSR (Beijing-Nanjing)	639	193	199	217
Tokaido Shinkansen (Tokyo-Kyoto)	298	129	139	168
France TGV (Paris-Lyon)	291	120	146	186
Thayls (Paris-Brussels)	203	82	148	186
Proposed Systems				
Cascadia HSR (2018 Study) (Vancouver-Portland)	289	83	209	250
Cascadia HSR (2019 Study) (Vancouver-Portland)	306	105	175	220
California HSR (SF-LA)	472	160	177	220

Detailed Findings
Travel Survey

- Survey sample not representative of potential riders
- Social media and outreach recruits had significantly more favorable views of HSR than would likely exist in the full travel market
- Impacts were diluted as part of the overall ridership analysis, but respondents should have been segmented out during the model estimation process

Why a Travel Survey?

- Understand travel behavior and "willingness to pay" for improved travel times
- Informs mode choice embedded in ridership model



Detailed Findings
Demand Estimation

- The Business Case Analysis (2019) increases the total ridership forecast by 12-14 percent due to “induced demand” impacts
- This increase is on the high side of accepted practice in North America, particularly on the Cascadia corridor, which has high levels of automobile usage
- While overestimate of induced demand is not a fatal flaw, it should be noted if and when an investment grade analysis is conducted

What is Induced Demand?

- The phenomenon whereby construction or expansion of transportation infrastructure leads to an increase in the overall demand for travel
- Incorporated into overall demand estimates

Detailed Findings

Economic Benefit Results

- The economic impact assessment tool used to support economic impact analysis (TREDIS) was appropriately built and applied and generated reasonable results
- However, because the Portland metropolitan area was not included in the model, the full economic impacts are likely underreported.
- Finally, a true “cost-benefit” analysis (BCA), was not conducted—only an assessment of potential impacts on business output, labor income, GRP
- These limitations should be addressed if and when a more robust, investment-grade analysis is undertaken

What Impacts are Included?

- Employment, income
- Productivity, business attraction
- Overall economic growth (GRP)

Detailed Findings
Capital Costs

Cost Analysis Elements?

- Changes since 2018
- Accuracy of unit costs
- Assumptions on alignment parameters (at-grade, tunnel, aerial)

Escalating Overall Construction Costs

- 50 percent materials/labor cost increase from 2018-2023
- 2018 cost estimates ($24-$42B) now equivalent to $36-$63B

Cost of Tunneling

- Existing studies estimate $230M/mile of tunnel
- More likely cost is $450M/mile, particularly in urban areas

Areas of Major Constraint

Significant infrastructure investments could be required to support 200+ mph operation, particularly in urban areas

Detailed Findings
Trade-Offs

- Previous studies were “technology agnostic” and evaluated a range of technologies
- However, our assessment is that only HSR are sufficiently mature and capable of meeting the objective of one-hour travel times between major city pairs (Vancouver-Seattle-Portland)
- We focused analysis on differences in:
  - Ridership
  - Cost
  - Economic potential
  - Environmental impacts
  - Constructability
  - Governance

Why Scenarios?

- Allow for realistic comparisons between different track & speed configurations
- High level and used only for the purpose of comparison—not actual or proposed alignments

Incremental Scenario
Existing Cascades corridor
79+ mph

State of the Art Scenario
Dedicated corridor
200+ mph

Hybrid Scenario
Mix of existing (urban) & new (rural) corridor
79 to 200+ mph

Detailed Findings

Trade-Offs

- State-of-the-art & hybrid scenarios result in faster travel times & higher ridership
- But these benefits come with increased costs and impacts

	INCREMENTAL	STATE-OF-THE-ART	HYBRID
Ridership	○	●	◑
Capital costs	○	●	◑
O&M costs	○	●	◑
Community & enviro. impacts	○	●	◑
Construction complexity	○	●	◑
Operational complexity	●	○	◑

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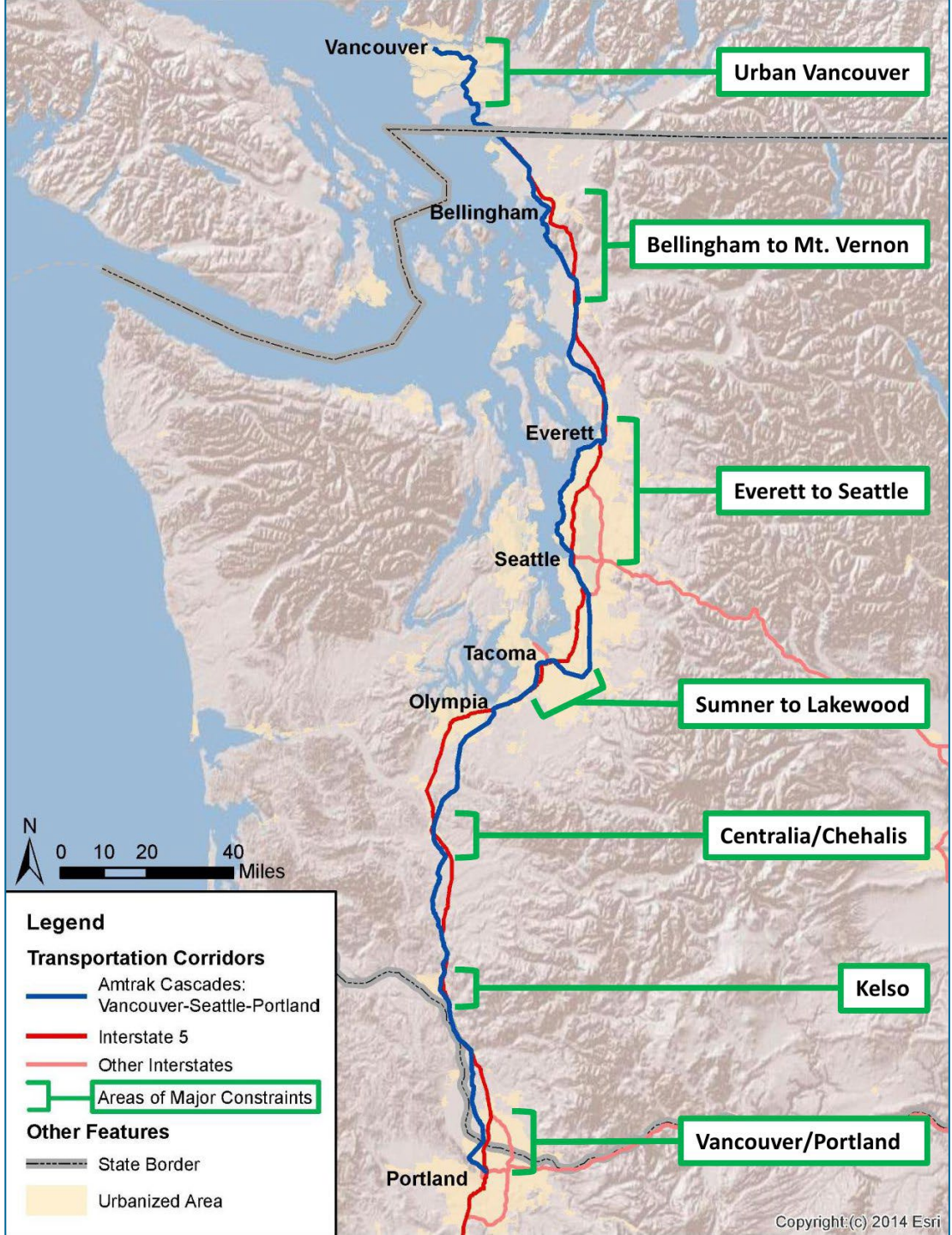
○ Lower → ● Higher



Detailed Findings

Governance Best Practices and Challenges

- The findings and recommendations from previous reports on governance and delivery are comprehensive
- A two-step governance model is recommended:
  - **Forming a Coordinating Entity** and identifying dedicated resources for project planning requires strong, consistent political support across all three jurisdictions over an extended timeframe
  - **Establishing a Development Entity** with the right level of decision-making authority, financial management capacitates, and procurement experience often requires enabling legislation or additional partnership agreements
- Unrealistic schedules, both for the establishment of governance structures and project delivery can be corrosive

Best Practices Scope?

- We scanned mega-projects from across North America to identify lessons learned in governance & procurement approaches
- Important to inform next steps in project development

NOTABLE EXAMPLE

The Gordie Howe International Bridge serves as an excellent model of a multinational governance structure for a complex megaproject and provides a realistic expectation for the timeline needed for delivery.

Detailed Findings
Procurement Models

What Approach is Best?

Each method has advantages and disadvantages, primarily related to level of risk (owner vs. contractor), delivery timeframes, and contracting complexity.

Extent of Private Sector Participation

Lower → Higher

- **Design-Bid-Build** — *Traditional Procurement*
- **Design-Build**
- **Construction Manager/ General Contractor**
- **Progressive Design-Build**
- **Design-Build-Operate-Maintain**
- **Design-Build-Finance (Operate/ Maintain)**

Alternative Procurement Methods

- **Privatization** — *Market-Based*

Thank you

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