From: Holly Furen [hollyfuren@msn.com]
Sent: Sunday, December 12, 2010 7:23 PM
To: AWV SDEIS Comments
Subject: Essay regarding the Alaska Way Viaduct Replacement
Attachments: Persuasive Research Final Draft.rtf; thesafechoice.rtf

I-049-001

On the same day that this essay was due for my English 102 college class, Governor Gregoire made the announcement that "the apparent best-value proposal to design and build the SR 99 bored tunnel. The tunnel is the preferred alternative for replacing the seismically unsafe Alaskan Way Viaduct along Seattle's waterfront" (WSDOT).

My essay was a persuasive research essay that was based on a community issue that we as students felt passionately about. I chose the bored tunnel option of the AWV replacement as the issue because from the start as a Seattle native, I have felt consistently that the bored tunnel is not the best option at all.

Through my research process I have learned much more about bored tunnels and the political agenda proposing the bored tunnel option as "the preferred alternative". During my research I was surprised that the WSDOT interviews I conducted all had similar results. Each interviewee attempted to refute that the bored tunnel was the only option being reviewed however, at all of the meetings, tours, and hearings I attended constantly they only discussed the bored tunnel. I did not see any consistent information to cover all options including a current structure replacement or the cut-and-cover options.

Regardless, I have maintained my conclusion that the bored tunnel is definitely not a good option and should not be considered an option at all. Most Seattle residents either don't realize the enormity of this issue or as usual they really don't care. They will only consider the problem when they attempt to travel in and out of the city once the bored tunnel is in place.

Unfortunately I feel that my final persuasive research essay is only a summary of the information I uncovered to dispute Governor Gregoire's statement made on Thursday, December 9th. I am submitting the attached essay to explain the issues not mentioned, looked at, considered, or strictly ignored along with other risks and issues that have been mentioned but not completely covered during my research process by all political parties involved. I am also including my previous essay that was an informational essay project earlier in the semester which details safety issues more in depth. Please consider the issues that I have uncovered to include in consideration of hopefully discontinuing this unsavory plan.

-Holly Furen
Seattle Resident

I-049-001

FHWA, WSDOT, and the City of Seattle appreciate receiving your comments on the Bored Tunnel Alternative. The Final EIS Chapter 2, Alternatives Development, describes the environmental documentation and alternatives analysis that occurred prior to the 2010 Supplemental Draft EIS. The lead agencies have identified the Bored Tunnel Alternative as the preferred alternative due to its ability to best meet the project's identified purposes and needs and the support it has received from diverse interests. Specifically, compared to the Cut-and-Cover Tunnel and Elevated Structure Alternatives, it avoids substantial closure of SR 99 during construction and it can be built in a shorter period of time than the other two alternatives. Extended closure of SR 99 would have severe adverse effects on Seattle and the Puget Sound region. Chapters 5 (Permanent Effects) and 6 (Construction Effects) in the Final EIS provides a more in-depth comparison of tradeoffs for the build alternatives.

Furen 1

Holly Furen

Kingston

English 102

9 Dec 2010

I-049-002

No Tunnel

Information provided by the Washington State Department of Transportation contains a list of key benefits regarding the bored tunnel option to indicate why it is the preferred alternative to a cut-and-cover tunnel and the elevated structure to replace the existing structure that is known as the Alaska Way Viaduct or State Route 99. The benefits listed include, minimized disruptions during construction, improved safety, maintains SR 99 through Seattle, reconnected neighborhoods, more pedestrian and bicycle paths provided, and the waterfront of downtown Seattle is to be improved. While some of these benefits are justified, there are several issues that stand in the way of going forward with the proposed bored tunnel option which is not the best option to replace Seattle's Alaska Way Viaduct (AWV) such as costs, increased traffic, and safety issues both during construction and travel through the proposed tunnel.

While it is true that the current Viaduct causes dirt and noise that would be avoided with a tunnel replacement the construction phase is not without its disruptions. Placing the 99 way underground would indeed eliminate the unsightly viaduct that has been a part of Seattle's waterfront for the past 50 years, but it is also the most expensive choice of the proposed options.

I-049-002

The lead agencies have identified the Bored Tunnel Alternative as the preferred alternative due to its ability to best meet the project's identified purposes and needs and the support it has received from diverse interests. Specifically, compared to the Cut-and-Cover Tunnel and Elevated Structure Alternatives, the Bored Tunnel Alternative avoids substantial closure of SR 99 during construction and can be built in a shorter period of time than the other two alternatives. Extended closure of SR 99 would be more disruptive to Seattle and the Puget Sound region. Chapters 5 (Permanent Effects) and 6 (Construction Effects) in the Final EIS provide a more in-depth comparison of trade-offs for the alternatives.

Mr. Everett of the Federal Highway Administration stated that the quote attributed to him in this essay was inaccurate and taken out of context. The "contingency fund" as referenced in this essay is budgeted to cover risk. As for cost overruns, the lead agencies are managing this risk closely through careful cost estimating and contracting. Governor Gregoire has created a Program Oversight Committee of state and local elected officials to manage and resolve issues such as cost overruns, if they arise.

I-049-002

Costs continue to plague the proposed bored tunnel option. Seattle City and Washington State leaders lack the proper funding and have consistently avoided determining where funding will come from which has merely scratched the surface of cost concerns. Construction hazards such as sinkholes and most importantly the tunnel boring machine which could get stuck and cause delays are realistic risks that could lead to added costs. Traffic will be displaced to other areas that already suffer from traffic congestion, and adding tolls to the Viaduct will only increase traffic problems. Additionally, removing the Viaduct displaces parking around the city which cannot afford to lose these important features. Fires and collisions in a tunnel are much more difficult to clear, especially when there is lack of proper emergency vehicle lanes. Earthquakes are a constant threat to Seattle's region; a tunnel that runs underground alongside the water front is a serious risk to those who will be travelling in the tunnel, and also there are far too many political discrepancies and contradictions regarding the procedure of implementing the bored tunnel as the primary replacement choice.

Taxpayers should be concerned and subsequently outraged if cost overruns happen due to many unforeseen risks involved with the bored tunnel option and they likely will. A $415 million contingency fund that would have cushioned some of the overruns has already been drained since $255 million of the fund was given away in concessions to bidders in November of 2010. I asked Randy Everett of the Federal Highway Administration why a WSDOT worker said the contingency fund is a cushion for cost overruns. Everett claims, "The contingency fund is for paying for concessions and other costs that are considered important to the project." Everett also agrees that

I-049-002

since tolls have been the only answer to buffer the lack of funding, the only option then will be to foot the bill to Seattle area taxpayers, which will inevitably happen.

Other tunnel projects have proven to be extremely expensive. The "Big Dig" in Boston proved to be the most expensive after a $14 billion cost completed the project. Fortunately for Boston, they were able to secure its funding from the federal government. Boston first spent 4 years convincing the federal government through a relentless Tip O'Neill to convince Congress to approve the funding (Vanderwarker 13). Washington does not have the ability to request the kind of funding it needs from the Federal Government which has only committed a total of $339.8 million for the project (Web). With the state of the current economy of the United States, the federal government cannot afford to commit any extensive funding to projects for Washington State in that capacity.

Another cost factor is time. The bored tunnel approach extends construction time far longer than other alternatives. An estimate of 9.5 years is currently the time frame that has been focused on. Time length becomes costly because of inflation and potential delays. Delays alone could be the sole issue creating further cost overruns. Many delays have already occurred and the WSDOT is fully aware that if they are to come across a Native American burial site, the delays could prove to be tremendous.

A disturbing aspect about costs has come from one consultant firm involved in the advising on the AWV replacement project, specifically Bruce Agnew of the Discovery Institute. On December 22, 2008, Bruce Agnew initially concluded that, "Based on a survey of other tunnel projects, both in the U.S. and internationally, the reported AWV replacement cost is higher than might be expected." He adds, "The 9.5 year construction schedule also appears long when compared with other projects" (Web). Then on June 25,

I-049-002

2010 he contradicted himself by stating, "At 55 feet in diameter, the Puget Sound's deep-bore tunnel is in the higher range of tunnels around the world that have been completed largely on time and within budget." He goes on to list a handful of tunnel projects that were completed on time. However, the projects he lists are smaller projects. According to Mega-Projects & Risk, the difference between actual and estimated cost overruns is often 50 – 100%.

Both Governor Gregoire and City Councilman Mike Conlin have been vague about who will pay cost overruns. Basically their explanation is "we won't go over the budget." However in 2002 Professor Bent Flyvbjerg at Oxford did a study and found that 90% of the world's mega projects exceeded their original budgets and those tunnels were worse than most average costs at 33% over budget. He claims that you can't declare "no overruns." Although Flyvbjerg's estimation only a year prior was significantly lower, the fact that cost overruns are to be expected is where the concern stands. An expert in July of 2010 for the mayor claims "there is no way to predict the full cost" (Web). To merely attempt to stay within the budget is fundamentally unrealistic.

Seattle City counsil member Mike Conlin has flip-flopped on his support of the bored tunnel option; initially, he was a supporter for the surface street and now insists the tunnel to be the best idea is a political concern. When the current Mayor Mike McGinn challenged Conlin to a public debate, Conlin declined. Conlin seems to think there are fewer risks with the tunnel, and it creates a "great waterfront" and provides security and reliability to the transportation system. He appears to be very delusional about what the tunnel benefits are. I could not locate any straight answers from Conlin when asking a question regarding who should pay for any cost overruns. His only statement was that,

I-049-002 "the budget should be followed" (Web). When asked what will happen in the event of overruns he claimed, "We will just have to figure it out" (Web). He did not answer any questions directly as to whether he thinks that Seattle taxpayers should have to pay (Web).

I-049-003 To resolve the cost issue, toll booths are the option currently on the table for resolution. Initially Governor Gregoire agreed that toll booths were a problematic idea. However, all accounts show that the Governor agrees it is the one of the few resolutions to the cost issue. Toll booths remain to be a difficult resolution to covering costs, especially as they relate to traffic.

So far there is no answer regarding when toll booths will cease if they are implemented in this project. When installed, they are estimated to cost a driver $4.00 per trip into downtown Seattle on the new proposed Alaska Way route. Once the cost of the project is covered there is no definite plan to remove the tolls.

I-049-004 Additionally, toll booths will force drivers who have not budgeted for the extra expense of toll booth charges to avoid the tolls. Toll avoidance will increase traffic into other areas of the city such as the Interstate 5 route which already has traffic issues of its own. To burden high traffic areas with more traffic will create more frustration for drivers attempting to get into and around the city if they must compete with more traffic from those who are avoiding the tolls.

I-049-005 Although SR 99 will be maintained as a route through Seattle it will no longer be a great route to Seattle. The current design of the bored tunnel eliminates current ramps that stream traffic from the south end of the region into downtown where traffic will become spread out to already congested areas such as the lower Queen Anne

I-049-003

Toll structures would be located within the highway right-of-way. SR 99 would use "open road" tolling, similar to what is being used on SR 520, so the toll structures would consist of gantries above the roadway, not toll booths used elsewhere.

Long-range planning documents, such as the Puget Sound Regional Council's long-range transportation plan, Transportation 2040, have identified system-wide highway tolling as a funding source for future transportation projects as revenues from taxing gasoline continue to diminish. Ultimately, the state legislature must decide whether the state will continue to impose tolls on SR 99 even after the viaduct replacement is funded.

I-049-004

Yes, diversion is expected if the facility is tolled. A detailed tolling analysis is included in the Final EIS Appendix X, Tolling Re-evaluation Memo. Chapter 8 of the Final EIS discusses strategies that could be implemented to reduce diversion due to tolling. A Tolling Advisory Committee (TAC) will be established to consider such strategies and to advise the lead agencies. Initial recommendations from the TAC are expected in 2012.

I-049-005

With the Bored Tunnel Alternative, traffic using the Stadium area ramps to access downtown would disperse over several city arterials, including the improved Alaskan Way, First, Second, and Fourth Avenues. Traffic analysis indicates that this arrangement would result in comparable or better overall traffic distribution and flow than is experienced with the current ramps. This is because the current ramps concentrate traffic to a single, congested location in the central downtown. The relocated ramps would instead allow drivers to diffuse through the street grid using many different paths.

I-049-005

neighborhood that already has to contend with traffic attempting to exit the city via I-5 during rush hour as well as attracting visitors to the Seattle Center or through Pioneer Square toward the stadiums that struggle with traffic the most on a game day. Most of Seattle's stadiums and event centers are located in the same area as the proposed new exit and on ramps. When game days are in progress, commuters currently have the ability to avoid most of the event traffic by taking express ways and transit options rather than risk taking a longer route by traveling the stadium areas. Typically as it is currently with the Alaska Way Viaduct, the common bus-riding commuters will find that if they have to travel through downtown on a game day for either the Mariners, the Sounders, or the Seahawks, it can take up to an hour longer just to make it through routes that on a typical day may only take 10 to 20 minutes to exit the city. However, with the new proposed project, commuters do not have this ability. Matt Preedy of WSDOT claims that, "There will be commuter routes created to avoid event traffic" (Interview). He did not elaborate on what those routes would be and did not point out how it would be conducted. The way the map is shown, mid-town commuters will have to make a choice to put themselves in event traffic, go out of their way to enter the tunnel from the north end where there is an abundance of drivers trying to enter both the new north tunnel entrance along with drivers attempting to make it toward I-5, or just attempt to reroute to I-5. Currently 99 traffic routes moves fairly smoothly whereas the I-5 traffic is consistently a time constraint to get entrance on from downtown Seattle, even with alternative access points.

Drivers will be dealing with far more road rage as it will take commuters much longer to get to their destinations once traffic becomes displaced with lessened parking,

For event traffic, improved access to and from SR 99 near the north portal and added network redundancy across SR 99 would result in reduced congestion before and after Seattle Center events. In the Stadium area, the First Avenue S. ramps to and from the north (SR 99) would be removed but replaced by similar connections to and from the north of S. Royal Brougham Way and the East Frontage Road and ramps to from the south (SR 99) would be added. These roadway changes would likely improve circulation and reduce overall congestion levels at critical intersections near the stadiums during large events by providing more direct access to regional facilities such as SR 99 and I-5. In addition, due to less reliance on First Avenue S. for access to and from the north in the modified roadway network, traffic levels on First Avenue S. between S. Royal Brougham Way and S. King Street may be reduced before and after events.

I-049-005 newly imposed tolls, lack of on and off ramp options as well as sports game activities.

I-049-006 Consider this scenario; a mother with small children wants to visit the downtown area of Seattle. She is planning to take her children to the Seattle Aquarium and finds parking under the current structure of the Alaska Way Viaduct. She and her boys merely cross Alaska Way to get to the Aquarium. Now let's consider the scenario with the bored tunnel in place. 570 parking places that once existed underneath the Viaduct are now removed and a new city parking guide is in place. The mother finds the closest parking available is now ten blocks away in the Pacific Place building. She may consider cancelling the Aquarium trip should she not have the convenient parking. Most drivers are driving for convenience and without convenience Seattle may lose tourist revenue and create more traffic issues by removing crucial parking spaces currently residing under the Alaska Way Viaduct Structure.

I-049-007 City leaders who assume people will find a better ride on the current Metro transit system may not be aware that riders will become frustrated because some buses will pass them by at last stops where most commuters find that they can park and ride, such as under the West Seattle Bridge. When busses are overcrowded and standing room only during high traffic peek commuter times, riders that attempt the park and ride (or suffer living near the last stops to downtown) understand that there are days that they run the risk of being late to work due to busses passing them by, especially during winter months when there are fewer busses and more riders. On those freezing cold days it can literally take hours before a rider even gets a chance to get on a bus from Andover and Delridge or on Charlestown and Avalon. Most people are forced to find a ride or take a sick day,

I-049-006

The lead agencies recognize that businesses along the central waterfront, Western Avenue, and Pioneer Square rely on the short-term parking in the area. The City of Seattle Department of Transportation (SDOT), in coordination with the project, has conducted parking studies as part of the process to develop mitigation strategies and better manage the city's parking resources. SDOT's studies identified a number of strategies to offset the loss of short-term parking in this area, including new or leased parking and the increased utilization of existing parking. Although the mitigation measures would be most needed during construction, many of them could be retained and provide benefits over the longer term. Specific parking mitigation strategies have not yet been determined, but the project has allocated $30 million for parking mitigation. The parking mitigation strategies will continue to evolve in coordination with the project and community partners. Parking measures under consideration and refinement include:

- Encourage shift from long-term parking to short-term parking
- Provide short-term parking (off-street), especially serving waterfront piers, downtown retail, and other heavy retail/commercial corridors
- Implement electronic parking guidance system
- Provide alternate opportunities to facilitate commercial loading activities
- Develop a Center City parking marketing program
- Use existing and new social media and blog outlets to provide frequent parking updates
- Establish a construction worker parking policy that is implemented by the Contractor

Refer to the Parking Mitigation during Construction section in Chapter 6 of the Transportation Discipline Report (Appendix C of the Final EIS) for additional information.

I-049-007

and some employers even will force their employees to use up their vacation days. With the new system, the busses will become a difficult option to some commuters.

I-049-008

The safety benefits WSDOT claims are that the bored tunnel will be able to withstand earthquakes but other safety risks are not mentioned. Tunnels do have some issues to be aware of before the excavation process is started. "Tunnel excavations are at risk of various issues such as costs, construction time, safety, and the impact on surroundings" (Sejnoha). Not only are there many hazards that go along with tunnel excavation, "risk factors such as surface settlements that cause damage to structures and land above the compromised land" (Hashash), but also safety issues once the tunnel is completed. A main issue with regards to safety issues for drivers inside a tunnel is fires. Tunnels have proven to be extremely unsafe, especially in the cases where collisions may cause fires.

Even without a collision, a fire could occur in a driver's vehicle, such as in the case of a tragedy that struck in the Mont Blanc tunnel located in the Alps of Western Europe. A fire occurred that killed 39 people in 1999. The University of Manchester has conducted case studies of infrastructure fires. Their findings include that some drivers in the Mont Blanc disaster only made it a little over 300 feet before they were overcome by the smoke. Additionally Professor Colin Bailey indicated that the fire raged for two days. The incident closed the tunnel for three years; "No one wants to be trapped in a tunnel during a fire. Smoke and heat can build up quickly in such a tight space" (Vanderwarker 25). If a fire were to occur in a tunnel that replaced the current viaduct structure, then traffic would have to be diverted into the already overcrowded alternate routes that

I-049-007

The Final EIS identifies estimated travel time variations along major transit corridors for the project and alternatives. Relatively minor variations in travel times are estimated and the share of travel that would be met by transit would not vary in a major way. Transit reliability during inclement weather is not within the scope of this project.

I-049-008

The concerns raised here are discussed in the 2010 Supplemental Draft EIS. Chapter 6, page 131, discusses the soil improvements and stabilization measures that are necessary along the bored tunnel alignment to protect existing structures and utilities from settlement and to strengthen existing soil so that it can better accommodate tunnel construction.

Chapter 5, pages 95 and 123, of the 2010 Supplemental Draft EIS explain that in addition to emergency exits at least every 650 feet, the tunnel will be equipped with ventilation, a fire detection and suppression system, and drainage. The tunnel ventilation system would be designed in accordance with National Fire Protection Association standards. Video cameras would provide real-time information to the operators at WSDOT's 24-hour tunnel control center to allow them to respond quickly to emergencies. The control center would have direct lines to the Seattle Fire Department, Police Department and other emergency responders. Also, real-time traffic technology would minimize delays caused by collisions, stalled vehicles or other similar disruptions in the tunnel. If a collision occurs, incident detection systems would allow tunnel operators to view and respond to the incident. WSDOT's tunnel operators would have access to real-time information about the tunnel's safety systems. Access to the tunnel would be maintained at all times to ensure prompt emergency response times.

I-049-008

Seattle has. Not only does Seattle lose toll revenues that are desperately needed to fund the tunnel but traffic increases citywide as well.

There are risks associated with tunnel construction and function. Case studies of fire damage show not only how fires perform but also how drivers react. Current fire regulations provided by the National Fire Protection Association, an international non-profit advocate of fire safety, seem to be out of touch with the way drivers react in real life during a fire in comparison to research findings. Recent history of tunnel fires world-wide, such as the Mont Blanc disaster, confirm a concern of fire risks.

The NFPA research goes on to say that recent studies are limited to only a few test programs and do not have actual adequate information related to tunnel fire safety due to the size and structure of the tunnels in combination with the fire scenarios. They also claim that fire detection systems in tunnels are often unreliable (Web).

I-049-009

Also a huge risk factor is the Tunnel Boring Machine (TBM). TBM's are at risk of getting stuck while in the construction phase which is a serious risk of cost overruns. The Brightwater sewage treatment project, also in King County, has had delays due to two of the three TBM's used for the Brightwater project becoming damaged during the excavation process. The Brightwater delay should serve as a reminder that cost overruns remain a serious risk when using unpredictable technology.

Imagine that the world record holding TBM with a diameter of 55' gets stuck underneath a historic building. It would be highly unlikely that the TBM could be easily removed from above ground. More digging around the TBM to retrieve it out of the ground would have to occur causing further delays and costs to rise during the project.

I-049-009

The cost estimate for the Bored Tunnel Alternative includes $205 million to cover project risk, such as the the need to retrieve a stuck bored tunnel machine. Independent experts and cost estimators experienced in tunnels, underground construction, and megaproject delivery have reviewed the bored tunnel cost estimate. The viaduct replacement project also has a technical advisory team with more than 295 years of collective experience delivering projects around the world that provides guidance on risk management, construction methods, and oversight. It is expected that this pool of money set aside for risk will cover the cost of tunnel boring machine maintenance and/or repair.

I-049-010

Improving the downtown waterfront is a benefit in order to reduce the noise and dirt. However, the urban space that will be created where Alaska Way currently is located could potentially attract additional problems such as use by the homeless and drug criminal activity. Such issues are what the city already has problems with in other urban spaces that are meant for the city visitors and residents to enjoy. Nearby the proposed urban pedestrian promenade is the tainted Victor Steinbrueck Park that sits close by to the popular Pike Place Market that is often affected by constant drug deals and violent crimes like the recent stabbing of three men in September of 2010 (staff). Seattle police continue to battle the crime that thrives at this particular park that historically has the highest crime rate in Seattle (Sullivan).

Political issues continue to arise throughout the planning process of the bored tunnel option of the Alaska Way Viaduct replacement project. Seattle City Mayor Mike McGinn has been against the proposed tunnel option from the beginning and was recently quoted by a Seattle area reporter that city council member Mike Conlin signed an environmental impact statement within an hour after the Mayor had gained approval from WSDOT which promised a week long extension for the Mayor to have adequate time for review (Shay 4). There is a dilemma between city leaders that is creating an uprising of distrust between them and additionally causes further delays of any potential AWV replacement option.

An opposition group known as Seattle Citizens Against the Tunnel also understands that the political agenda has been forcing the bored tunnel option into effect and has made attempts to stop the project and demand a more simple replacement of the current stacked road structure. SCAT members filed a complaint against WSDOT to

I-049-010

Under the Bored Tunnel alternative the City of Settle is leading the project to rebuild and improve the Alaskan Way Surface Street between S. King Street and Pine Street. Generally, the new street would be located east of the existing Alaskan Way surface street where the viaduct is today to create a wider public space along the waterfront the new street would include sidewalks, bicycle facilities, parking/loading zones, and signalized pedestrian crossings at cross-streets

Environmental documentation for the project has been prepared in compliance with the National Environmental Policy Act (NEPA)(42 U.S.C. 4322(2)(c)) and the State Environmental Policy Act (SEPA)(Ch. 43.21 C RCW). The lead agencies have identified the Bored Tunnel Alternative as the preferred alternative due to its ability to best meet the project's identified purposes and needs and the support it has received from diverse interests. Specifically, compared to the Cut-and-Cover Tunnel and Elevated Structure Alternatives, it avoids substantial closure of SR 99 during construction and it can be built in a shorter period of time than the other two alternatives. Extended closure of SR 99 would have severe adverse effects on Seattle and the Puget Sound region. Chapters 5 (Permanent Effects) and 6 (Construction Effects) in the Final EIS provides a more in-depth comparison of tradeoffs for the three alternatives.

I-049-010

challenge the environmental review of the bored tunnel and its sufficiency. The group SCAT is dedicated to eliminate the bored tunnel option, even collecting signatures for an initiative number 101 to stop the bored tunnel project to avoid tolls on city drivers.

With all of the safety risks, traffic problems and cost issues the bored tunnel option should not be the preferred alternative and should not even be considered with all of the considerations of the effects the tunnel could have. Since even city leaders have discounted the bored tunnel option in the past they should stick to their instincts. A replacement of the current Alaska Way Viaduct structure, constructed with seismically sound materials and design, should suffice to replace the dilapidated Viaduct that could collapse with an earthquake strong enough to bring it down.

Works Cited

Agnew Bruce. Email Message to Dave Dye. *Seattle Citizens Against The Tunnel*. 24 Dec 2008. Web. <http://www.scatnow.com/WSDOTEmailsCostRelated.pdf>

Agnew, Bruce. "World is Watching Alaskan Way Viaduct Tunnel". *Puget Sound Business Journal*. 25 June 2010. Print.

Bailey, Colin. "Infrastructural Fires" One Stop Shop in Structural Fire Engineering, University of Manchester. Web. <http://www.mace.manchester.ac.uk/project/research/structures/strucfire/CaseStudy/HistoricFires/InfrastructuralFires/mont.htm>

De Place, Eric. "Cost Overruns For Seattle-Area Tunnel Projects." *Sightline Institute*. 16 Oct 2009. Web. <http://www.sightline.org/research/sprawl/res_pubs/cost-overruns-for-seattle-area-tunnel-projects>

Everett, Randy. Federal Highway Administration. Alaska Way Viaduct Hearing. 16 Nov 2010. Interview.

Flyvbjerg, Bent. "Megaprojects and Risk". *Cambridge University Press*. 2003. Print

Hashash, Youssef M. A., Abdolreza Osouli, and Camilo Marulanda. "Central Artery/Tunnel Project Excavation Induced Ground Deformations." *Journal of Geotechnical & Geoenvironmental Engineering* 134.9 (2008): 1399-1406. *Academic Search Complete*. EBSCO. Web. 10 Oct. 2010.

Kohler, Jochen, Matthias Schubert, and Michael Faber. "Analysis of Tunnel Accidents

Using Bayesian Networks." *5th International Probabilistic Workshop.* Institute of Structural Engineering IBK, ETH Zurich. 28 Nov 2007: Print.

Kashef, A. et al. "Findings of the International Road Tunnel Fire Detection Research Project". *The Fire Protection Research Foundation*, Quincy, MA. Web. <http://www.nfpa.org/assets/files/PDF/Foundation%20proceedings/Kashef.pdf>.

Linea Laird, P.E. Director of Central and North End Projects, Alaskan Way Viaduct and Seawall Replacement Program. "RE: Alaskan Way Viaduct and Seawall Replacement Program". Message to Holly Furen. 21 Oct 2010. E-Mail.

Preedy, Matt. *Tour of the Viaduct.* WSDOT. 16 Oct 2010. Interview.

Seattle Citizens Against The Tunnel. "Tunnel Safety" *SCAT.* Web. <http://scatnow.com/index_files/TunnelAccidents.htm>.

Seidenfuss, Timo. "Collapses in Tunnelling" *International Tunnelling and Underground Space Association*. July 2006. Essay. <http://www.ita-aites.org/index.php?id=89&L=0>

Šejnoha, J., et al. "Risk Quantification for Tunnel Excavation Process." *Proceedings of World Academy of Science: Engineering & Technology* 58.(2009): 393-401. *Academic Search Complete.* EBSCO. Web. 10 Oct. 2010.

Shay, Steve. "Deep-bore tunnel Controversy." *West Seattle Hearald*. 5 Nov 2010. Print

Staff. "Three men stabbed near Seattle's Victor Steinbrueck Park." Seattle Times. 16 Sep 2010. Print.

Sullivan, Jennifer. "Tourists, drug deals odd mix at Victor Steinbrueck Park." Seattle Times. 1 Jul 2008. Print.

"Timeline: Past tunnel disasters." CNN World. 25 Oct 2001. Web

<http://articles.cnn.com/2001-10-25/world/switzerland.tunnel.factfile_1_tunnel-roof-tauern-tunnel-mont-blanc?_s=PM:WORLD>

Van Dessel, Johan. "European Thematic Network – Fire In Tunnels" March 2001. *Fire In Tunnels (FIT)* 1 Mar 2001. Press Release. <http://www.etnfit.net>.

Vanderwarker, Peter. "The Big Dig". *Boston: Little, Brown and Company*, 2001. Print.

Washington State Department of Transportation. "Proposed bored tunnel – facts and figures." *WSDOT*. 2010. Web. <http://www.wsdot.wa.gov/Projects/Viaduct/tunnelfacts.htm

Washington State Department of Transportation. "SR 99 – Alaskan Way Viaduct and Seawall Replacement. *WSDOT*. Nov 2010. Web. <http://www.wsdot.wa.gov/Projects/Viaduct/>

Holly Furen

Kingston

English 102

11 Nov 2010

The Safe Choice

I-049-011

There are risks associated with tunnel construction and function. Fires cause damage to tunnel structures and vehicles. Case studies of fire damage show not only how fires perform but also how drivers react. Current fire regulations seem to be out of touch with the way drivers react in real life during a fire. There is a recent history of tunnel fires world wide that verifies a concern of the fire risk. Safety remains a risk of Seattle's Alaska Way Viaduct replacement of an option known as the bored tunnel, especially when it comes to issues with fire.

Initially tunnels appear to be a cost effective alternative to roadways in order to create an easy flow of traffic. Yet tunnels do have some issues to be aware of before the excavation process is started. "Tunnel excavations are at risk of various issues such as costs, construction time, safety, and the impact on surroundings" (Sejnoha). Not only are there many hazards that go along with tunnel excavation, "risk factors such as surface settlements that cause damage to structures and land above the compromised land" (Youssef), but also safety issues once the tunnel is completed. A main issue with regards to safety issues for drivers inside a tunnel is fires. Tunnels have proven to be extremely unsafe, especially in the cases where collisions may cause fires.

Even without a collision, a fire could occur in a driver's vehicle, such as in the case of a tragedy that struck in the Mont Blanc tunnel located in the Alps of Western Europe. A fire occurred that killed 39 people in 1999. The University of Manchester has conducted case studies

I-049-011

Protecting public safety is the highest priority for both FHWA and WSDOT. The proposed bored tunnel would include safety features:

- Safe travel lanes: Two 11-foot travel lanes with shoulders in each direction would ensure enough space for legal size trucks. Long curves would allow for safe sight distances.
- Tunnel control center: The tunnel would have a 24-hour control center that would allow quick response to changing conditions and emergencies. WSDOT's tunnel operators would have access to real-time information about the tunnel's safety systems. The control center would have direct lines to the Seattle Fire Department, Police Department and other emergency responders.
- Incident response: Real-time traffic technology would minimize delays caused by collisions, stalled vehicles or other similar disruptions in the tunnel. If a collision occurs, incident detection systems would allow tunnel operators to view and respond to the incident.
- Emergency exits and refuge areas: Safe and effective evacuation routes would be provided for motorists. Enclosed emergency walkways, which would have independent ventilation and fire control systems, would run parallel to both traffic levels in the tunnel. The walkways would be separated from the tunnel's roadways by concrete walls and fire-rated doors. Access to the walkways would be provided about every 650 feet. In an emergency, travelers would walk along the shoulders to reach an emergency doorway and a safe refuge area. A flight of stairs would connect the refuge area to the emergency exit walkway and the non-affected level of the tunnel. Travelers unable to evacuate using the stairs would be protected by staying in the safe refuge areas, which would be equipped with fire-rated doors and lighting, ventilation and fire suppression systems. Refuge areas would also be monitored by cameras, provided with an emergency phone, and would be large

I-049-011

of infrastructure fires, their findings include that some drivers in the Mont Blanc disaster only made it a little over 300 feet before they were overcome by the smoke. Additionally Professor Colin Bailey indicated that the fire raged for two days. The incident closed the tunnel for three years; "No one wants to be trapped in a tunnel during a fire. Smoke and heat can build up quickly in such a tight space" (Vanderwarker 25). If a fire were to occur in a tunnel that replaced the current viaduct structure, then traffic would have to be diverted into the already overcrowded alternate routes that Seattle has.

On a recent tour of the existing Viaduct, Washington Sate Department of Transportation's (WSDOT) Matt Preedy was questioned about fire safety expectations in the new bored tunnel. He explained that emergency exits are to be spread out every 600 to 650 feet. In relation to the Mont Blanc disaster, if you have to walk over 300 feet in the smoke of a car accident that has caught fire then a pedestrian might not make it. And later WSDOT's viaduct replacement team responded about the 600 foot emergency exits, Linea Laird (Director of Central and North End Projects) replied,

> "The bored tunnel would be designed to provide emergency access, evacuation routes, ventilation, and fire suppression systems in accordance with National Fire Protection Association standards and other codes and regulations. In the event of a fire or other emergency, the tunnel would provide a separate evacuation corridor with an independent ventilation system. There would be emergency exits approximately every 600 feet in the bored tunnel and up to every 1,000 feet near the tunnel portals. A fixed fire control system would be used to control and extinguish any fires that may occur in the tunnel" (E-mail).

enough to accommodate several people, including those with wheelchairs. Fire, police or WSDOT incident response vehicles would be dispatched to those waiting in the refuge areas.

I-049-011

What is this National Fire Protection Association? NFPA is an international non-profit advocate of fire safety. An undated study on their website listed under "latest news" indicates that:

> "Fire detection systems are an essential element of fire protection for road tunnels... Their role can make the difference between a manageable fire and one that gets out-of-control. As such, fire detection systems play a crucial role in ensuring safe evacuation and firefighting operations" (Web).

The NFPA research goes on to say that recent studies are limited to only a few test programs and do not have actual adequate information related to tunnel fire safety due to the size and structure of the tunnels in combination with the fire scenarios. They also claim that fire detection systems in tunnels are often unreliable (Web).

The opposition to the proposed bored tunnel option has reason to be concerned. One opposing group found these to be the most serious issues of tunnel safety hazards: "People do not behave as engineers would like them to" (Kohler). Assuming that we expect people to get out of their cars and go toward the exits is a likeable idea but is it realistic when people are in panic mode fighting their way out of a smoke filled tunnel? "Fires can "jump" from one vehicle to another and involve more vehicles (and therefore more fuel) than expected" (Kohler). This will escalate the smoke to develop at a more rapid rate as well.

> "Although the severity of fires is normally discussed in terms of fire size, the rate of fire growth is equally or even more important and must be evaluated. The height of the tunnel ceiling affects the rate of fire growth. Low ceilings increase heat (the ceilings in the Alaska Way deep bored tunnel are only going to be 16.5' high). Ventilation promotes

I-049-011

the spread of fire, and longitudinal ventilation can promote the spread of fire longitudinally in the tunnel" (Kohler).

It is uncertain that Washington State and Seattle City leaders as well as drivers who use the Alaska Viaduct route are aware of these concerns.

A brief history of recent Tunnel Disasters might let us consider the dangers and risks of tunnel traffic. First The Channel Tunnel that connects France to the UK. 3 fires have closed this tunnel in the past, most recently on September 11, 2008 a fire in the tunnel caused by a freight vehicle caused several people to be hospitalized for smoke inhalation and caused the tunnel to be shut down for two days (Web). Then there is The Tauren Tunnel located in Austria. On May 29, 1999 with 12 deaths and 47 wounded, this fire continuously burned for 15 hours before firefighters had a chance to fight the remaining 1000 degree heated fire. And that same year in The Mont Blanc Tunnel fire on March 24, 1999 caused 39 people to die because the smoke from the fire of the collision caused their engines to stop. Lack of oxygen will stop an engine. They were forced from their vehicles and the inability to see and breathe caused drivers a serious calamity. Additionally, cars blocked the path for fire engines to adequately reach the scene of the accident. And even though fire cubicles were installed to help protect other drivers, they were only built to withstand a few hours while some people had to wait up to fifteen hours to be rescued (Web). Although most of these tunnel disasters occurred in the late 1990's, they are still recent enough that tunnel projects might take consideration of these hazards.

Once these historical disasters had shed some insight to potential tunnel problems, groups had formed to focus on these serious hazards. In 2001 a European press release indicated that traffic safety in general for tunnels is a very significant issue. They point out that safety regulations only become known as mistakes of past accidents are learned. And that ongoing

I-049-011 research is needed to maintain the ability to understand tunnel safety, specifically toward issues with fires (Press Release). With all of the history of tunnels in regards to safety, fires have proven to be a serious risk factor.

When the options of replacing a stacked roadway are presented with a replacement of the structure as it currently stands that has proven to remain safe over 50 years and a bored tunnel which has potential risks, safety concerns should overrule potentially unsafe alternatives.

Works Cited

Bailey, Colin. "Infrastructural Fires" One Stop Shop in Structural Fire Engineering, University of Manchester. Web. <http://www.mace.manchester.ac.uk/project/research/structures/strucfire/CaseStudy/HistoricFires/InfrastructuralFires/mont.htm>

Hashash, Youssef M. A., Abdolreza Osouli, and Camilo Marulanda. "Central Artery/Tunnel Project Excavation Induced Ground Deformations." *Journal of Geotechnical & Geoenvironmental Engineering* 134.9 (2008): 1399-1406. *Academic Search Complete*. EBSCO. Web. 10 Oct. 2010.

Kohler, Jochen, Matthias Schubert, and Michael Faber. "Analysis of Tunnel Accidents Using Bayesian Networks." *5th International Probabilistic Workshop*. Institute of Structural Engineering IBK, ETH Zurich. (2007): Print.

Kashef, A. et al. "Findings of the International Road Tunnel Fire Detection Research Project". The Fire Protection Research Foundation, Quincy, MA. Web. <http://www.nfpa.org/assets/files/PDF/Foundation%20proceedings/Kashef.pdf>.

Land Rover Club. "The Taruen Tunnel". The Internet Land Rover Club. 20 Feb 2001. Web. http://www.landroverclub.net/Club/HTML/Travel_TauerTunnel.htm

Linea Laird, P.E. Director of Central and North End Projects, Alaskan Way Viaduct and Seawall Replacement Program. "RE: Alaskan Way Viaduct and Seawall Replacement Program". Message to Holly Furen. 21 Oct 2010. E-Mail.

Seattle Citizens Against The Tunnel. "Tunnel Safety" Web. SCAT <http://scatnow.com/index_files/TunnelAccidents.htm>.

Šejnoha, J., et al. "Risk Quantification for Tunnel Excavation Process." *Proceedings of World Academy of Science: Engineering & Technology* 58.(2009): 393-401. *Academic Search Complete*. EBSCO. Web. 10 Oct. 2010.

Van Dessel, Johan. "European Thematic Network – Fire In Tunnels Launched The 1st March 2001. Fire In Tunnels (FIT) 1 Mar 2001. Press Release. <http://www.etnfit.net>.

Vanderwarker, Peter. The Big Dig. Boston: Little, Brown and Company, 2001. Print.