Teton Pass Tunnel Feasibility Study
Planning Level Review

Introduction

State Highway 22 in northwestern Wyoming traverses the Teton Mountain Range via Teton Pass, and serves as an important connection between the communities of Jackson, WY and Victor, ID. The road climbs from an approximate elevation of 6150' in Jackson, through the community of Wilson, to the summit of 8450' before descending the western slope of the Tetons into Idaho. Heavy snows, blizzard conditions, and avalanche danger frequently close the highway for short periods of time resulting in an approximate 85 mile circuitous re-route through Swan Valley, ID and Alpine Jct., WY.

Due to the extremely high cost of living in Jackson and Teton County, WY, many people who work in the area have elected to live in and around the communities of Victor and Driggs, ID, and make the daily commute over Teton Pass. In addition to the local workforce that commutes daily, heavy summer tourism and winter skiing adds to the traffic on WY 22. On average, there are approximately 5000 vehicles that traverse Teton Pass every day.

In an effort to alleviate the treacherous winter driving conditions in the Glory Bowl slide area, and to reduce road closures due to snow and avalanche conditions, it has been suggested that a tunnel could be constructed to avoid the highest, most hazardous locations. This feasibility study will ascertain whether the concept of a tunnel is physically possible, financially viable, and worthy of a more comprehensive analysis. This is a planning-level study, and as such extensive investigation into geologic features and in-depth financial analysis will not be undertaken. Financial analysis will be constrained to existing conditions, and cost estimates will be conservative.

Tunnel Location

Several alignment alternatives were considered for tunnel construction, with departures at various locations including immediately west of Wilson, the vicinity of Crater Lake, near Philips Canyon Trail, and just east of Glory Bowl slide area. Exit areas were limited to the switchback at approximate milepost 11.6, and near the turn-off for Mail Cabin Creek Road at approximate milepost 13.5.

The most desirable alignment would ultimately be the shortest possible route that would still bypass the most hazardous areas of Teton Pass. Taking this into consideration, the selected alignment that will be studied in this report will depart the existing alignment east of, and prior to, the Glory Bowl slide area, and rejoin the highway at the switchback at milepost 11.6. This route would avoid the slide area and the summit of the pass, and result in a tunnel with a length of approximately 1.4 miles, or 7400 feet. See Figure 1 for tunnel location.

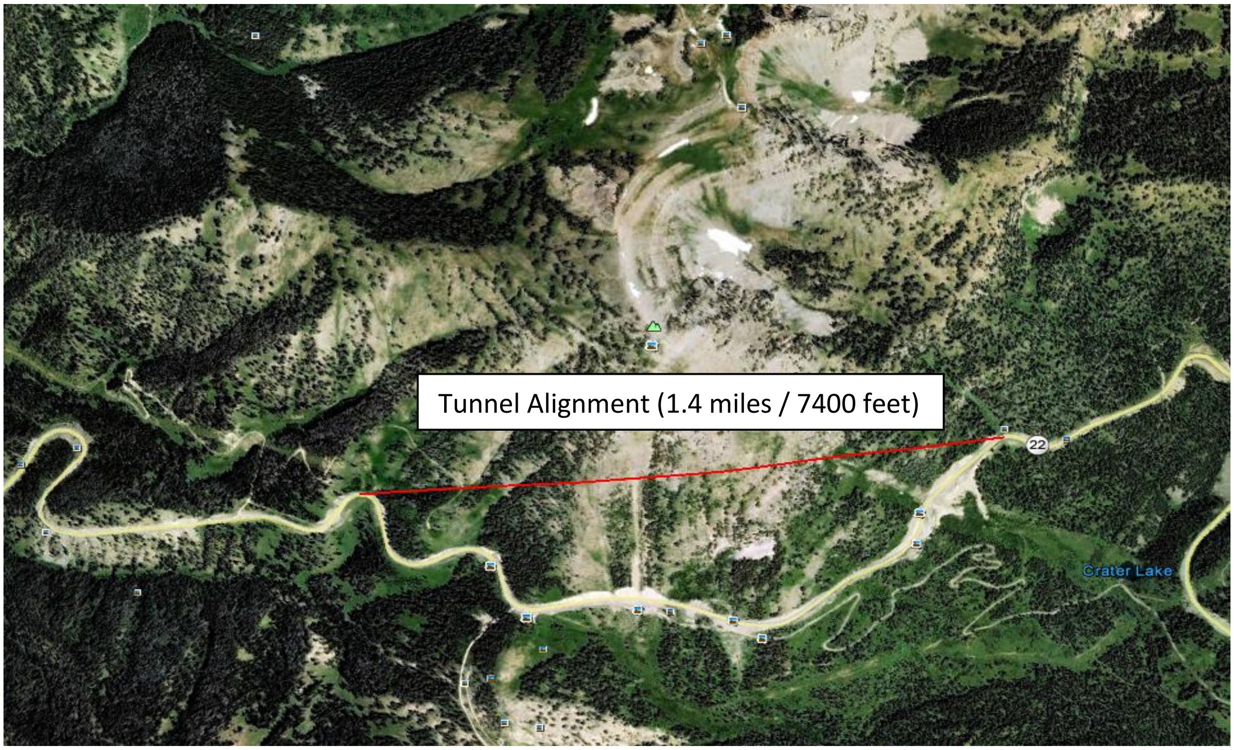

Figure 1. Approximate tunnel location

Geology and Seismic Considerations

The Tetons are the youngest mountain chain within the Rocky Mountain region. They are what is known as a fault block mountain range, which means they have been carved from a segment of the earth's crust and uplifted along a fault. This uplifting caused extreme pressure and heat along the fault, which resulted in the metamorphic rock that the Tetons are comprised of. Pre-cambrian aged gneisses and schists are overlaid with much younger granites and quartz. These types of rock are extremely hard and durable, and taken by themselves would be acceptable material to bore a tunnel through. However, the fault that created the Tetons is still active, and poses seismic concerns.

The Teton fault is a youthful (in relative terms to other faults) normal-fault that is a key feature to the Intermountain Seismic Belt, and extends from the Star Valley area north to the Yellowstone Plateau volcanic field. Due to its age and proximity to the Yellowstone hotspot, the Teton region remains a very active seismic area. The Jackson Lake Seismic Network, consisting of 20 recording stations throughout the area, reported over 8000 earthquakes (ranging in magnitude from 0.1 to 4.7) within a 14 year period from 1986 to 2002.

In addition to the Teton fault (which runs north-south along the Teton range), there are several faults that cross the Tetons in a southeast-to-northwest direction. Two of these, the Jackson Thrust fault and the Cache Creek Thrust fault, follow the alignment of Highway 22 from Jackson to Victor.

The presence of faults in the vicinity of the proposed tunnel site does not preclude the tunnel construction. Additional seismic investigation would be required and extensive design consideration would have to be taken into account during the design process.

Construction Costs and Impacts

Tunnel construction costs vary widely depending on the size of the tunnel and the type of construction methods used. For this study, it was assumed that the tunnel would be a single bore, two lane tube with a width of approximately 40 feet (2 – 12' lanes and 2 - 8' shoulders) and an approximate height of 15'.

Boring, drill and blast, excavation, and cut-and-cover are the basic methods of construction, depending on the depth and type of material that the tunnel will be going through. For this location, with the hard gneisses, schists, and granites that are present, it is assumed that conventional drill and blast would be the preferred method.

Research into tunnel construction costs has resulted in a wide range of drill and blast estimates. One of the lower costs is approximately $10,000 per linear foot of tunnel, based on the Eisenhower tunnels on Interstate 70 in Colorado. The first bore (1.7 miles long) was completed in 1973 at cost of $108 million, and the second bore was completed a few years later at a cost of $103 million. Using a conservative estimate of 3.5% average inflation over the past forty years, this would equate to roughly $39,000 per linear foot of tunnel in the current year. Similar conditions (size of tunnel, length, type of material, and environmental conditions) were evident on a recent tunnel study from the United Kingdom, in which the costs of the tunnels equated to approximately $32,000 per linear foot. Other drill and blast locations have been estimated at up to $1 million per linear foot (or more) for larger, more complex designs and locations.

Based on this information, this study will assume a construction cost of $35,000 per linear foot of tunnel, which equates to a total cost of $260 million for the construction of the tunnel at Teton Pass. This estimate is based solely on the tunnel itself, and does not include any contingencies for approach roadway work or reclamation of the old roadway.

The tunnel construction would also produce approximately 200,000 cubic yards of excavated rock that would require disposal. This could result in higher costs and/or detrimental impacts to the environmentally sensitive ecosystem within the Grand Teton National Forest.

Operation and Maintenance

The annual operation and maintenance costs for this study will be based on the Eisenhower tunnels on I-70 in Colorado, due to their similar environment, type of tunnel, length, and proximity. The two tunnels on I-70 have an annual maintenance budget of $1.27 million, which equates to approximately $71 per linear foot, per year. Using this estimate, a close approximation for the Teton Pass tunnel would be $500,000 per year ($40,000 per month) in annual maintenance costs. This would include additional employees, equipment, utilities, and maintenance of the facility.

Funding Options

A project of this size and magnitude would require funding capabilities that are beyond the realm of current highway project funding avenues. The $260 million dollar project would roughly equal the entire annual construction budget of the Department of Transportation. Other funding vehicles that could be explored include a combination of Public Private Partnerships, revenue bonds, and/or tolling.

In their most basic sense, a Public Private Partnership (PPP) is an agreement that transfers some or all of the functions of a piece of infrastructure to a private party. Depending on the needs of the public agency, various degrees of private involvement are available, including project development, design, construction, financing, operations, and maintenance. Obviously, the more responsibility that is transferred to the private sector, the higher the risk taken. On the low end of the risk scale (for the private sector) is the Design-Build option, where the private partner is responsible for the design and construction of the facility. At that point the public partner takes over for operations and maintenance. On the high end of the spectrum is a Concessionaire agreement, in which the private partner agrees to take over the entire operation (Design, Build, Operate, and Maintain) for a long-term period (generally 50 or more years). In this instance, the private partner charges tolls (with State oversight) in order to generate revenue to maintain the facility.

Another option for funding a project of this magnitude is to sell revenue bonds to finance the construction, and then make payments to pay off the revenue bonds. Simply put, this option would be similar to a family taking out a mortgage to purchase a house, then making monthly payments to pay off the mortgage. In order to make the payments on the revenue bonds, a system of tolls, or user fees would be established until the bond issuance was paid off.

There is a great deal of risk inherent to either one of these options, and that risk would play an important role in establishing financing. It would be extremely difficult to convince a private investor to enter into a PPP for this project because of the large capital outlay and the relatively small opportunity to make that money back in tolls. The traffic volume on Teton Pass (5000 vehicles per day) is around 10% of the volume (50,000 vehicles per day) generally considered by private investors to be the low end of profitable for PPPs.

If revenue bonds were considered, the interest rate would be set according to the rating given. Investment grade debt carries a rating from AAA (best) to BBB (minimum investment grade) established by rating agencies, and the interest rate is based on this rating. Similar to the PPP situation, the low volume of cars, i.e. the low opportunity to generate necessary funding, would result in a lower grade and a higher interest rate.

Statutory Requirements

Title 23 of the United States Code, section 129 allows for the use of tolling to generate revenue for the purpose of constructing new facilities. However, legislation at the state level does not exist that would allow either Public Private Partnerships or tolling. If either of these types of funding avenues (PPPs or revenue bonds) were to be pursued for the construction and operation of a tunnel on Teton Pass, there would have to be changes made to state law. Any legislative changes made should allow the State or an authorized State entity to finance, construct, operate, regulate, and maintain a toll facility.

Funding and Financing

This financial analysis will be performed at an extremely high level, without taking into account the flexibility of Senior Current Interest Bonds (CIB), Capital Appreciation Bonds, and subordinate CIB Bonds. Actual bond issuance would more than likely have a range of maturities, which would improve the marketability of the debt. Additionally, based on the risk of the debt, rating agencies would establish a rating that would govern the interest rate, and would also specify a debt coverage ratio. For example, a debt coverage ratio of 2.0 would mean that the tolling facility would have to generate twice the amount of the payment due. This is established in order to reduce the risk to the debt holder.

For this simpler analysis, bonding interest rates will be based on a straight amortization schedule. Assuming an initial debt of $260 million, a 4% interest rate, and a period of 40 years, the monthly payment for the bond issuance would be approximately $1,090,000. A debt coverage ratio of 1.5 would increase that to $1,635,000. With a monthly operations and maintenance need of $40,000, a total of $1,675,000 would be needed each month in order to meet the financial burden. On average, there are 5000 vehicles a day, or 150,000 vehicles a month, that traverse Teton Pass. This equates to a toll rate of $11.10 for every vehicle that passes through the facility. For daily commuters, that means a price tag of $22.20 a day to commute from Idaho to Jackson and back.

Conclusion

There are many variables to consider when determining the feasibility of constructing a tunnel through Teton Pass. The physical geology of the area, with its active faults, known earthquakes, and geothermal activity would most certainly require extensive investigation and a more complex design. To what extent these considerations would increase the cost of construction remains unknown. From a financial standpoint, there are many obstacles to consider, including overall cost, private investment feasibility, ability to obtain bonding capacity, required legislative changes, and individual cost per vehicle to use the facility. At this time the costs are too high and there are too many variables and unknowns to justify the continued investigation of constructing a tunnel through Teton Pass.