U.S. Department of Transportation, Office of the Secretary of Transportation

Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies (FASTLANE) FY 2016 Grant Application

Bridging the Valley:

Barker Road and Pines Road (SR 27) BNSF Grade Separation Project

Project Name.	**Bridging the Valley: Barker and Pines (SR 27) BNSF Grade Separation Project**
Previously Incurred Project Cost	$788,770.
Future Eligible Project Cost	$55,800,000.
Total Project Cost	$56,588,770.
NSFHP Request	$33,480,000.
Total Federal Funding (including NSFHP)	$44,640,000.
Are matching funds restricted to a specific project component? If so, which one?	No.
Is the project or a portion of the project currently located on National Highway Freight Network	No.
Is the project or a portion of the project located on the National Highway System	Yes.
• Does the project add capacity to the Interstate system?	No.
• Is the project in a national scenic area?	No.
Do the project components include a railway-highway grade crossing or grade separation project?	Yes.
Do the project components include an intermodal or freight rail project, or freight project within the boundaries of a public or private freight rail, water (including ports), or intermodal facility?	No.
If answered yes to either of the two component questions above, how much of requested NSFHP funds will be spent on each of these project components?	$33,480,000 for railway-highway grade separation.
State(s) in which project is located.	Washington.
Small or large project	Large.
Also submitting an application to TIGER for this project?	Yes (only for Barker/BNSF portion of project).
Urbanized Area (UA) in which project is located, if applicable.	Majority of project is rural. Part of project falls within Spokane, WA UA.
Population of Urbanized Area.	387,487 (2010 Census)
Is the project currently programmed in the:	
• TIP.	Yes.
• STIP.	Yes.
• MPO Long Range Transportation Plan.	Yes.
• State Long Range Transportation Plan.	No. (It defers to State Freight Plan)
• State Freight Plan?	Yes.

Table of Contents

Contact Information:
Steve M. Worley
Capital Improvement Program Manager
11707 E Sprague Ave, Suite 106
Spokane Valley, WA 99206
509-720-5014
sworley@spokanevalley.org

1 Project Description

This section describes the proposed project, the challenges the project aims to address, key project objectives and proposed solutions, and key benefits.

1.1 Project Description

The City of Spokane Valley requests $33,480,000 from the 2016 FY FASTLANE Grant Program to complete funding for both the Barker Road/BNSF Grade Separation Project and the Pines Road (SR 27)/BNSF Grade Separation Project. Collectively, these are herein referred to as the "Project". The Barker Road/BNSF Grade Separation Project replaces an at-grade crossing with an overpass of BNSF's railroad tracks and Trent Avenue (SR 290); incorporates interchange ramps to provide access between Barker Road and SR 290; connects Barker Road to a large residential area to the north; and closes the at-grade crossing of Flora Road at the BNSF railway. The Pines Road/BNSF Grade Separation Project replaces an at-grade crossing with an underpass of BNSF's railroad tracks; lowers the intersection and adds lanes at the nearby Pines Road/Trent Avenue (SR 290); and closes the at-grade crossing of University Road at the BNSF railway.

The project is classified as a large rural project. The total project size of $56,588,770 includes $788,770 previously incurred costs and $55,800,000 future eligible costs. This places the project in the large category because the total size exceeds 30 percent of Washington State's $100 million FY 2015 apportionment for projects located in one state. The project is also classified as rural based on the description in Section 2 (Project Location).

The construction of this project has both national and regional significance. At the national level, this project improves the safety and mobility of freight trains, passenger trains, and freight trucks. The BNSF railway carries freight and passenger trains between western ports and Midwest intermodal facilities. The elimination of four at-grade crossings will eliminate train/vehicle crash risks and improve train travel speeds through Spokane Valley. The elimination of delays at the rail crossings will improve the mobility of freight trucks traveling from

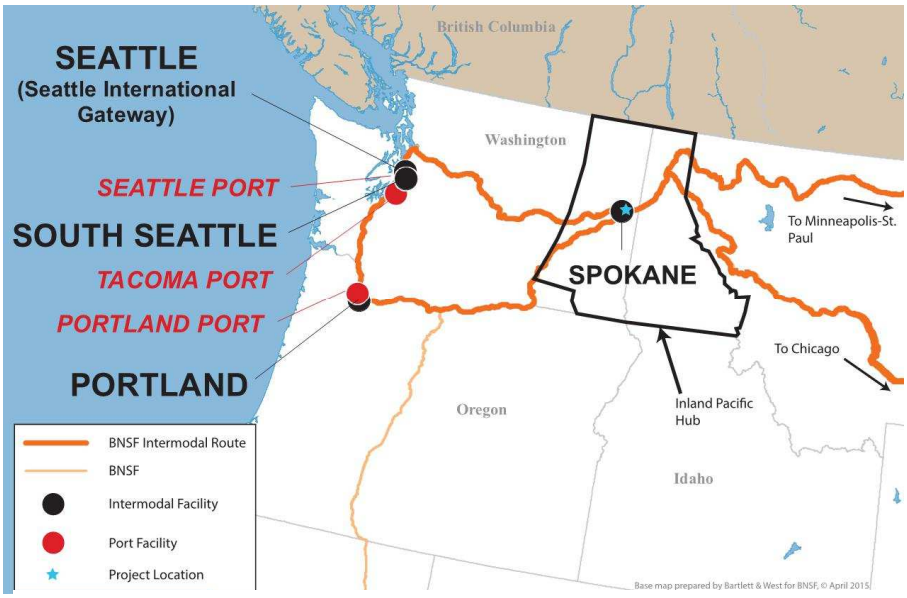


Figure 1. Project Location Related to National BNSF Intermodal Freight Movement

Canada to Interstate 90 just south of the project. Additional benefits at the regional level include unlocking the economic potential to develop prime vacant land zoned for industrial, mixed-use, and commercial uses; re-connecting communities and recreation areas; supporting active pedestrian and bicycle lifestyles; and improving the quality of life through noise and emissions reductions. The overall project supports regional commerce within the Inland Pacific Hub and helps achieve regional planning goals that have been in place for more than a decade.

Expected system users that will benefit from this project include:

- Travelers (automobile drivers/passengers, pedestrians, bicyclists)
- Trucking companies and the companies that use their services for freight transport
- BNSF Railway and companies that use the railway for freight transport
- Amtrak and their passengers
- Property owners near the project (businesses, residents, vacant land owners)

1.2 Challenges Project Aims to Address

This project aims to address safety, mobility, economic, and community challenges associated with the four existing at-grade crossings as described in this section.

1.2.1 Safety Risk at and Near the Crossings

All at-grade crossings have the potential for fatalities, serious injuries, and hazardous material spills (e.g. Bakken oil), particularly when there are high volumes of rail traffic and roadway traffic, such as at the Barker Road/BNSF rail line and the Pines Road/BNSF rail line crossings.

1.2.2 Long Delays at and Near Crossings

On average, people and freight are delayed 56 times per day at each roadway-railway crossing. With trains nearly one and a half miles in length, crossings are closed for approximately three to five minutes for each train to pass. Queuing vehicles on the crossing approaches compounds the delay once the train has passed. Additional delay is incurred at the nearby intersections at SR 290.

1.2.3 Inefficient Emergency Services Access

Key emergency services (fire, police, hospital) are located south of the railway. The long and frequent delays at the rail crossings cause delays for providing emergency services to the north.

1.2.4 Economic Development Standstill

Close to 600 acres of prime industrially-zoned parcels and 170 acres of mixed-use or commercially-zoned parcels are undeveloped because property owners and developers cannot afford to mitigate the LOS ‘F’ operating conditions at the Barker Road/Trent Avenue (SR 290) intersection or the LOS ‘E’

operating conditions at the Pines Road (SR 27)/Trent Avenue (SR 290 intersection). These parcels, and several hundred more acres beyond the city limits, are some of the last few undeveloped parcels available for industrial use in the area.

1.2.5 Inefficient Intermodal Activities

Frequent long delays at the crossings hinder long-haul and short-haul freight trucks from reaching destinations in a timely manner. Trent Avenue (SR 290), Barker Road, and Pines Road are preferred long-haul freight routes for accessing Interstate 90 to the south due to heavy congestion on Highway 95 through Coeur d'Alene, Idaho. Short-haul freight trucks also travel through both crossings to reach the many industrial land uses served by spur rail lines near the project sites.

1.2.6 Lack of Community Connectivity

The BNSF railway bisects the northern parts of Spokane Valley from the main city south of the railway. On Pines Road, the BNSF railways provides a barrier between neighborhoods, recreation areas, commercial retail sites, and schools located on both sides of the railway. On Barker Road, the BNSF railway provides a barrier between neighborhoods, industrial jobs, and recreation areas. Developers north of the Barker Road/BNSF crossing are seeking to expand the more than 300-acre Highland Estates neighborhood and develop 100 additional acres within the Vista Grande subdivision. While the Pines Road crossing has sidewalks (although no pedestrian gates), neither crossing provides bicycle facilities, making both routes unappealing to pedestrians and bicyclists.

1.2.7 Noise Pollution from Train Whistles

Spokane Valley residents have long complained about the noise pollution of the train whistles. Federal law requires locomotives to sound their horns at 96 to 100 decibels as they approach at-grade crossings and continue blowing the horn until the train clears the crossing. Not only do the horns disturb the peacefulness of the surrounding area, medical studies have linked loud noises, such as train whistles, to stress-related health problems, such as stroke and heart disease.

1.3 Key Project Objectives and Proposed Solutions

This section provides a summary of the key project objectives, proposed solutions, and a summary of the before and after conditions.

This project is part of the broader Bridging the Valley effort where the main goal is separating vehicle traffic from train traffic in the 42-mile corridor between Spokane, Washington and Athol, Idaho. Bridging the Valley includes project objectives to:

- Improve public safety by reducing rail/vehicle collisions
- Improve emergency services access to residents and businesses along the corridor
- Eliminate waiting times and improve traffic flow for all travel modes at rail crossings

- Reduce noise levels, particularly related to train whistles at crossings
- Enhance economic opportunities for a rail corridor served by a key regional railroad

Proposed solutions for the Barker Road/BNSF Railway part of the project include:

- Grade-separation so that Barker Road passes over the BNSF railway
- Add sidewalks and bicycle lanes to the Barker Road overpass
- Turn the Barker Road/Trent Avenue (SR 290) intersection into an interchange
- Close the Flora Road/BNSF at-grade crossing
- Realign Wellesley Road and close the Wellesley Road bridge over the BNSF tracks

Proposed solutions for the Pines Road/BNSF Railway part of the project include:

- Grade-separation so that Pines Road passes under the BNSF railway
- Add sidewalks and bicycle lanes to the Pines Road underpass
- Lower the Pines Road/Trent Avenue (SR 290) intersection and add lane capacity
- Close the University Road/BNSF at-grade crossing

Table 1 provides a summary of the before and after project impacts.

Table 1. Before and After Conditions at Barker Rd and Pines Rd BNSF Railway Crossings

Conditions	Barker Rd/BNSF		Pines Rd/BNSF	
	Before (2016)	After (2022)	Before (2016)	After (2022)
At-grade crossings	2	0	2	0
Train volumes (freight/passenger)*	54 / 2	63 / 2	54 / 2	63 / 2
Daily volumes at crossing (vehicles)	5,500	5,950	16,400	17,850
Crash risk (fatalities/year)	0.047	0	0.047	0
Annual automobile idling delay (hours)**	15,164	0	26,261	0
Annual truck idling delay (hours)	522	0	906	0
Fuel consumption (gallons/year)***	30,777	0	21,735	0
Level of Service at SR 290	F	A	E	D
Acres of undeveloped land	500	0	226	
Daily train whistles	112	0	112	0

* Current track capacity is 74 trains. Freight train volumes are increasing approximately three percent per year. In the future when BNSF adds a second mainline track, approximately 126 trains per day are anticipated.
** Vehicle delay also accounts for delay to emergency services and school buses.
*** Fuel consumption is correlated to emissions, which includes numerous measures of particulate matter such as CO. The fuel consumption includes idling delay at both crossings. At the Barker Road/BNSF project location, it also includes the fuel consumption for vehicles that currently travel out of direction to access the residential area directly north of the Barker Road/Trent Avenue (SR 290) intersection. The project will eliminate out of direction travel.

1.4 Key Benefits

This FASTLANE project will generate key long-term benefits that leverage federal investment by improving the mobility and safety of people and freight in the Inland Pacific Hub, while also providing economic opportunities and enhancing the environment and surrounding communities. This project will result in the following outcomes:

Cost-Effectiveness

- Overall project benefit-cost ratio is 2.1 (discounted at 7%) and 5.1 (discounted at 3%).

Economic Outcomes

- Decrease transportation costs and improve long-term efficiency, reliability, and costs in the movement of workers and goods
- Significantly reduce the cost of transporting export cargoes from Canada
- Enhance the access and reliability to close to 600 acres of prime, buildable industrial-zoned and 170 acres of mixed-use and commercially-zoned land
- Generate approximately $3.3 billion in state economic output, including 18,519 new jobs (7,612 of those in Spokane Valley) and new general fund taxes ($20.5 million for City and $152.7 million for State)

Mobility Outcomes

- Dramatically reduce delay to vehicles, bicycles, and pedestrians and improve traffic circulation
- Allows more efficient train operations due to the reduction in at-grade crossings
- Greatly enhance accessibility of pedestrians and bicyclists by eliminating infrastructure gaps and reducing delay

Safety Outcomes

- Eliminates the growing risk of conflict between roadway users and trains by separating uses
- Adds ADA-accessible pedestrian and bicycle features to increase safety
- Addresses existing safety concerns at roadway intersections

Community and Environmental Outcomes

- Improves community connectedness between neighborhoods, schools, and nearby recreational areas
- Reduces train horn noise due to safety requirements for trains crossing roadways at grade, which also improves the health and well-being of surrounding residents and businesses
- Reduces fuel consumption and tailpipe emissions for vehicles idling in delayed traffic

Partnership and Innovation

- Helps fulfill the vision of the MPO's "Bridging the Valley" and "Horizon 2040 Metropolitan Transportation Plan" to separate vehicle traffic from train traffic in the 42-mile corridor between Spokane, Washington and Athol, Idaho

Cost Share

- Helps a city with limited resources to reconnect communities that are bisected by a private railroad line

2 Project Location

Figure 2 shows the proposed project location and surrounding area. Key features shown include:

- **Project:** highway-rail crossing improvements on the BNSF rail line: grade separation at Pines Road and Barker Road and crossing closures at University Road and Flora Road
- **Freight Rail Routes:** BNSF and UPRR lines
- **Freight Roadway Routes:** designated freight routes and ton haulage per year
- **Traffic Data:** BNSF train volumes (56 per day) and average daily traffic on project roadways (up to 24,500 vehicles per day)
- **Traffic Signals:** existing signal included in the Pines Rd project and the nearby future signal at the Pines Road (SR 27)/Mirabeau Parkway intersection
- **Intersection Level of Service:** sub-standard service levels at the Trent Avenue (SR 290)/Pines Road (SR 27) and Trent Avenue (SR 290)/Barker Rd intersections
- **Land Use:** key industrial areas, parks and recreation areas, schools, and vacant land zoned for industrial, mixed-use, or commercial uses (more detail shown in Figure 3)
- **Urbanized Area (UA) Boundary from 2010 Census:** while the Pines Road project falls within the UA, the Barker Road project is located just outside the UA; since the majority of the project budget is for the Barker Road project, this overall project meets the rural requirements of the FASTLANE grant notice of funding opportunity

3 Project Parties

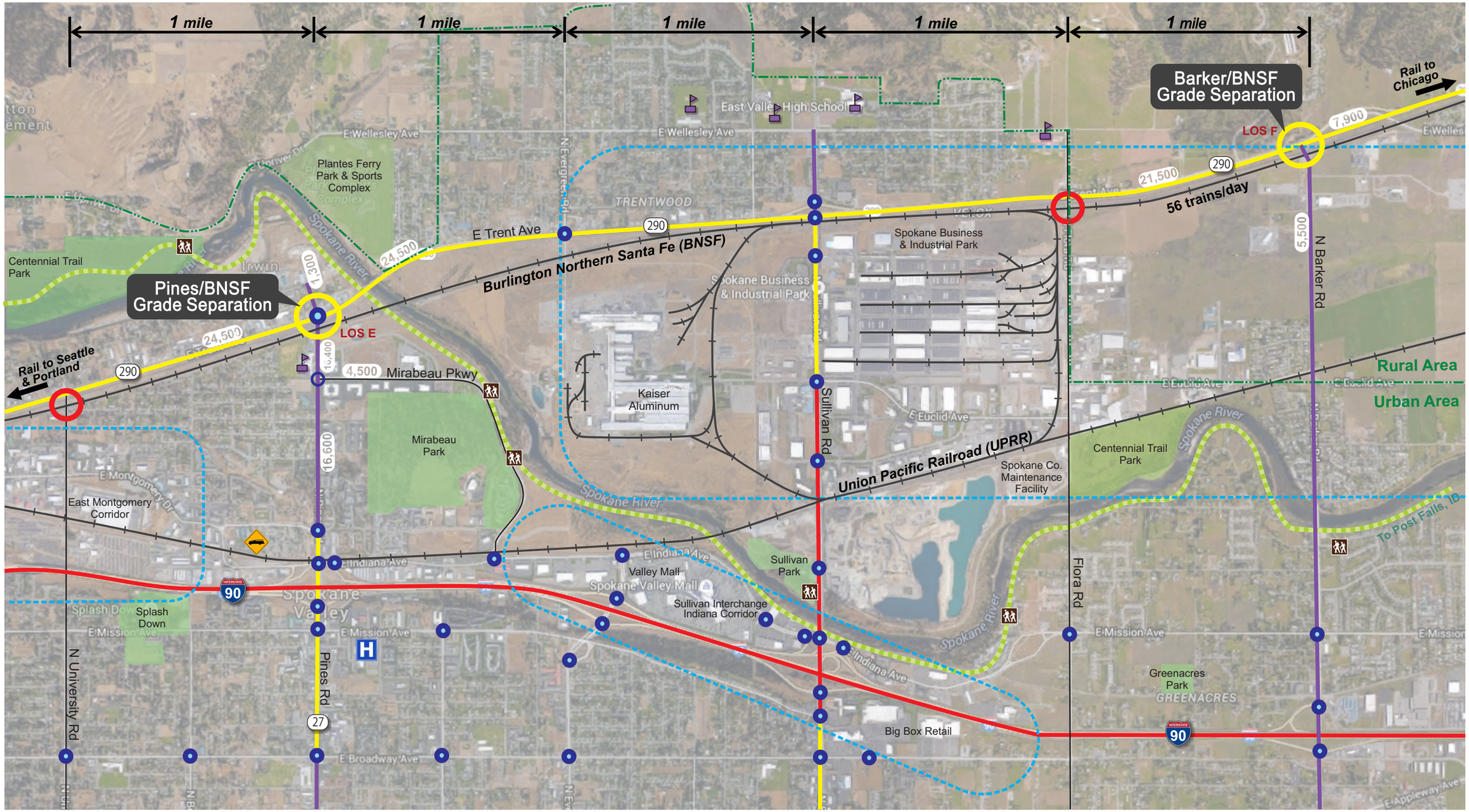
The City of Spokane Valley is the applicant for this project and will manage any grant funding awarded and all design and construction activities associated with the project. The City will work closely with the Washington State Department of Transportation (WSDOT) and BNSF Railway to deliver the project. Appendix A includes letters of support from all three partners.

The City of Spokane Valley is located near the eastern border of Washington and is the ninth largest city in Washington with a population of 93,340[1].

WSDOT is responsible for building, maintaining, and operating the state highway system and state ferry system. They are responsible for 26 miles of highway within Spokane Valley, including two project roadways: Trent Avenue (SR 290) and Pines Road (SR 27).

BNSF Railway operates the east-west Class I railway at the heart of this project. This railway connects Seattle and Portland in the west to Chicago and Minneapolis-St. Paul in the east with many service points in between. This railway also connects customers with the global marketplace.

[1] Washington State Office of Financial Management. http://www.ofm.wa.gov/pop/april1/default.asp. April 1, 2015.



LEGEND

- Traffic Signal
- Planned Traffic Signal
- Highway-Rail Grade Crossing Separation
- Highway-Rail Grade Crossing Closure
- Rail Lines
- Selected Employment Activity Centers
- Recreational Trail
- Urbanized Area Boundary (2010 Census)
- Hospital
- Fire Station
- School
- Trailhead
- Land Use: Parks & Rec

LOS - Level of Service

(7,900) - Average Daily Vehicles

Project Roadway Freight & Goods Designations:

- T-1 - > 10 Million Tons/Year
- T-2 - 4 to 10 Million Tons/Year
- T-3 - 300,000 to 4 Million Tons/Year

City of Spokane Valley

Figure 2

Project Location

No Scale

The project partners will coordinate closely and support project delivery:

Project Activity:	Spokane Valley	WSDOT	BNSF Railway
Manage Funding Allocations	✓		
Procurement	✓		
Project Reviews/Approvals	✓	✓	✓
Public Involvement	✓	✓	

4 Grant Funds, Sources, and Uses of Project Funds

We are requesting $33,480,000 in FASTLANE grant funds, which is 60 percent of the total $55,800,000 project future eligible cost. These funds will be used for project design, right-of-way acquisition, construction, and project oversight. This section provides discussion on the future eligible cost, committed and expected funding, federal funding overview, project budget, FASTLANE funding allocation, and the City's financial condition and grant management capabilities.

4.1 Future Eligible Cost

The future eligible project cost for this project is $55,800,000. Previously incurred project costs include $788,770 for planning (done in 2004), preliminary engineering (done in 2004), which included 30 percent design plans and cost estimates, and environmental documentation (NEPA approval in 2006). The future eligible costs will be used for the following activities:

- Pre-construction activities:
  - Preliminary and final engineering (this includes an update of the 30% plans and cost estimates to bring the plans to current standards, add bicycle facilities, and account for current costs)
  - Acquisition of real property
- Construction

4.2 Committed and Expected Funding

Committed funding sources have been secured for $10,127,000, or 18.2 percent, of the $55,800,000 total future eligible project costs. This includes 1.3 percent federal funds and 16.9 percent non-federal funds. The committed funds include a federal earmark and non-federal funds from the Washington Freight Mobility Strategic Investment Board (FMSIB) and the City of Spokane Valley. The City is pursuing the 78.7 percent of the expected funding from federal funding opportunities (a TIGER grant and this FASTLANE grant) 3.1 percent of the funding from non-federal sources. The City has the opportunity to receive additional matching funds through the Washington State Transportation Improvement Board (TIB) each year. The City fully intends on pursuing grant funds for these

projects in 2016-2018. In addition to the TIB funding source, the City may petition the Washington State Legislature for additional legislative discretionary funds. The City Council fully supports this project and may also consider additional city funding sources or alternate funding mechanisms, such as selling bonds. Table 2 provides a detailed breakdown of the committed and expected funding for both federal and non-federal sources.

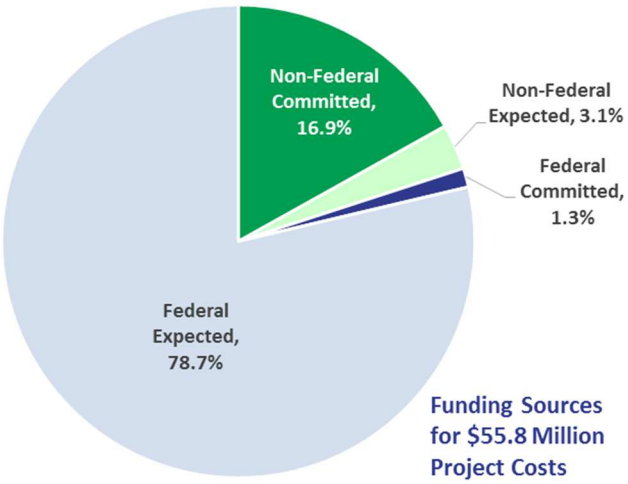


Table 2. Committed and Expected Funding

	Funding Source	Barker Rd/ BNSF Project	Pines Rd/ BNSF Project	Total ($)	Total (%)
Federal Funding					
Committed	2009 Federal Earmark	$720,000	-	$720,000	1.3%
Expected	FASTLANE FY 2016	$15,814,845	$17,665,155	$33,480,000	60.0%
	TIGER VIII FY 2016	$10,440,000	-	$10,440,000	18.7%
			Subtotal:	**$44,640,000**	**80%**
Non-Federal Funding					
Committed	Washington State FMSIB*	$7,207,000	-	$7,207,000	12.9%
	City of Spokane Valley	$1,420,735	$779,265	$2,200,000	4.0%
Expected	BNSF**	$432,420	$237,180	$669,600	1.2%
	Other (e.g., TIB, STP)	-	$1,083,400	$1,083,400	1.9%
			Subtotal:	**$11,160,000**	**20%**
	Total:	**$36,035,000**	**$19,765,000**	**$55,800,000**	**100%**

* FMSIB has committed to funding 20% of the total Barker Road/BNSF construction costs up to $10 million.
** Per 23CFR 646.210, BNSF will determine their funding commitment once the 30% design plans and cost estimates (done in 2004) have been brought up to current standards. Their letter of support demonstrates their willingness to contribute to the funding of this project.

4.3 Federal Funding Overview

The federal funding includes both committed and expected sources for a total of 80 percent of the project costs. As part of the 2005 - 2009 allocations for the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) High Priority Projects Program, the FHWA allocated $720,000 for the development of highway-rail crossings in Spokane County, Washington and Kootenai County, Idaho. These federal funds were provided at 100 percent with no local match required and make up 1.3 percent of the total project costs. In addition to this FASTLANE grant request for $33,480,000 (60 percent of project costs), the City is also submitting a TIGER VIII grant application for fiscal year 2016 for $10,440,000 (18.7 percent of project costs).

4.4 Project Budget

With a few exceptions, the City generally plans to apply each funding source proportionately throughout each phase of the project based on the funding source's percentage of the total project costs. The 2009 federal earmark is nearing its obligation date; therefore, it will be applied to the engineering for the Barker Road/BNSF Grade Separation project. The engineering can start later this year using committed funds once a STIP amendment is finalized during the second quarter of this year. The FMSIB funds were specifically allocated towards the construction of the Barker Road/BNSF Grade Separation project, so 100 percent of those funds will be used for the construction phase. The expected TIGER funds will only be applied to the Barker Road/BNSF Grade Separation project because the application will only include that project since TIGER reviewers have seen this project in the past and it has come close to securing funding.

Table 3. Project Budget

Barker Rd/BNSF	FASTLANE	Other Federal	Non-Federal	Total Cost
Right-of-Way Acquisition	$1,452,000 (60.0%)	$484,000 (20.0%)	$484,000 (20.0%)	$2,420,000
Engineering	$1,260,000 (50.9%)	$720,000 (29.1%)	$495,000 (20.0%)	$2,475,000
Construction	$17,705,000 (56.9%)	$6,228,000 (20.0%)	$7,207,000 (23.1%)	$31,140,000
			Barker Rd/BNSF Grade Separation Subtotal:	$36,035,000
Pines Rd/BNSF	**FASTLANE**	**Other Federal**	**Non-Federal**	**Total Cost**
Right-of-Way Acquisition	$2,636,590 (89.4%)	-	$313,410 (10.6%)	$2,950,000
Engineering	$1,064,991 (89.4%)	-	$126,426 (10.6%)	$1,190,000
Construction	$13,964,991 (89.4%)	-	$1,660,009 (10.6%)	$15,625,000
			Pines Rd/BNSF Grade Separation Subtotal:	$19,765,000
TOTAL:	**$33,480,000**	**$11,160,000**	**$11,160,000**	**$55,800,000**

4.5 FASTLANE Funding Allocation

If awarded $33,480,000 in FASTLANE funding, the City will allocate the funding to the engineering, right-of-way acquisition, and construction of the project elements. All of the funding will be spent on railway-highway grade separation.

4.6 City's Financial Condition and Grant Management

Spokane Valley Key Financial Features	
Capital Funding:	REET
Operations Funding:	Gas and Telephone Tax
Contingency Plan:	Capital Reserve Fund, General Fund
Grant Oversight:	Approximately $5 - $8 million per year; audited annually
Financial Condition:	Annual Budget

The financial condition of the City of Spokane Valley is reported in their comprehensive annual budget and monthly financial reports[2]. The City employs staff with experience in grant management. The City successfully manages approximately five to eight million dollars in grants (federal and non-federal) on an annual basis and documents this in the annual budget. The primary source of the City capital funding for transportation projects comes from the City's Real Estate Excise Tax (REET) Revenue and transportation operations funding comes from state gas tax revenue and a utility tax on telephones. The City's Street Fund has sufficient funding to cover operations and maintenance of the project. The City has a Capital Reserve Fund as a contingency for capital projects and the General Fund may be used as a contingency for operating costs. **Independent Audit Opinions** are performed annually for the City of Spokane Valley under the U.S. Office of Management and Budget (OMB) Circular A-133. The two most recent, for fiscal years 2013 and 2014, **reported no Significant Deficiencies or Material Weaknesses**.

The City is currently managing the $15 million Sullivan Road W Bridge Replacement Project, which combines four funding sources: one federal, two state, and a local city match. The City hired a consultant using a RFQ process. The design was completed, right-of-way was obtained, the project was bid, and construction began in the summer of 2014. The project is administered and inspected by the City. Construction is scheduled to be completed in late 2016.

5 Cost-Effectiveness Analysis

This $55.8 million capital project (in year of expenditure dollars) discounted at three percent has a net present value of $215.1 million, and a **benefit-cost ratio of 5.1**. Discounted at seven percent, the project has a net present value of $47,206,089 and a benefit-cost ratio of 2.1 as shown in Table 4. The cost-effectiveness of the project is largely due to the reduction of vehicle hours of delay but is

[2] Spokane Valley Budget & Financial Reports:
http://www.spokanevalley.org/content/6836/6902/7156/default.aspx

also attributed to eliminating the safety risks of at-grade crossings, reductions in emissions, and reduced operating costs over the life cycle of the project.

The factors (and their sources) used for the benefit-cost calculations are provided in Appendix B. The Excel spreadsheet included with this grant application shows results using discount rates of both three and seven percent as noted in the *2016 TIGER and FASTLANE BCA Resource Guide*.

Table 4. Benefit/Cost Analysis Summary

	Present Value of Capital Costs	Benefits Total	Net Present Value	Benefit/Cost Ratio
Discounted at 3%				
Barker Rd/BNSF	($34,707,273)	$109,086,327	$74,379,053	3.1
Pines Rd/BNSF	($18,186,387)	$158,970,700	$140,784,313	8.7
Total Project:	**($52,893,660)**	**$268,057,026**	**$215,163,366**	**5.1**
Discounted at 7%				
Barker Road	($28,298,283)	$40,102,238	$11,803,955	1.4
Pines Road	($15,732,226)	$51,134,360	$35,402,134	3.3
Total Project:	**($44,030,509)**	**$91,236,598**	**$47,206,089**	**2.1**

6 Selection Criteria

This section provides a summary of how the project meets the large project criteria, merit selection criteria, and other review selection criteria.

6.1 Large Project Criteria

The proposed project meets the large project criteria for FASTLANE funding (parenthesis indicate report section where each is discussed):

- ✓ Project generates national or regional economic, mobility, or safety benefits (6.2)
- ✓ Is cost-effective (5)
- ✓ Contributes to one or more goals described in 23 U.S.C. 150 (1.3)
- ✓ Based on the results of preliminary engineering (7.1)
- ✓ Has one or more stable and dependable funding or financing sources to construct, maintain, and operate and contingency amounts to cover unanticipated costs (4.2)
- ✓ Cannot be easily and efficiently completed without other federal funding or financial assistance (6.3.2)
- ✓ Reasonably expected to begin construction no later than 18 months after the date of obligation (7)

6.2 Merit Selection Criteria

This section describes how the project meets the merit selection criteria for outcomes related to the economy, mobility, safety, community, and the environment.

6.2.1 Economic Outcomes

The smooth flow of trade, so vital to U.S. economic competitiveness, is facilitated by addressing key deficiencies across the system. The Barker Road and Pines Road grade separations of the BNSF mainline provide an opportunity to target a local deficiency that effectively ripples benefit through the rest of the transportation system. The BNSF mainline that travels through the City of Spokane Valley is part of a broad rail network that moves freight between international marine ports and terminals on the west coast and points across the western half of the U.S. **Almost 94 percent of Washington's east-west bulk cargo rail traffic travels through this corridor.**[3] The BNSF rail line also serves interstate passenger rail service via Amtrak's Empire Builder route between Seattle and Chicago. Currently, the BNSF line carries an average of 54 freight and two passenger trains daily, and usage on the line is estimated to grow 143 percent by 2035.[4] Upon completion of the project, higher train speed limits may be used for approximately six miles between Harvard Road and Pines Road (SR 27), greatly improving travel times for trains along the corridor.

While the benefits to the velocity of trade by rail are substantial, the Barker Road and Pines Road grade separations also have a significant benefit to trade facilitated by trucking. Barker Road and Pines Road (SR 27) serve as arterial roadways directly connecting a State Highway (SR 290) at the project sites with Interstate 90 to the south. Barker Road and Pines Road are preferred freight routes to I-90 from north Idaho and Canada to avoid the congestion on U.S. Highway 95 through Coeur d'Alene, Idaho. The project promotes improved interstate freight movement from Canada and Idaho through Spokane County/Kootenai County by eliminating vehicle-train conflicts as envisioned in the 2004 Bridging the Valley Plan.

The project improves regional economic vitality by significantly improving reliability and accessibility to the City's largest undeveloped industrial area, home to close to 600 acres of prime industrially- zoned and 170 acres of mixed-use or commercially-zoned parcels. With the City expected to accommodate an additional 20,000 residents and 18,000 employees, the Barker/Pines/SR 290/BNSF/I-90 quadrant is a targeted locale for growth. This project contributes significantly to supporting and managing this economic growth by building transportation infrastructure necessary to attract, retain, and expand businesses.

[3] Washington Department of Transportation (WSDOT). Washington State Rail Plan. Technical Note 3a: Freight Rail Demand, Commodity Flows and Volumes. Dec. 2013.
[4] Ibid.

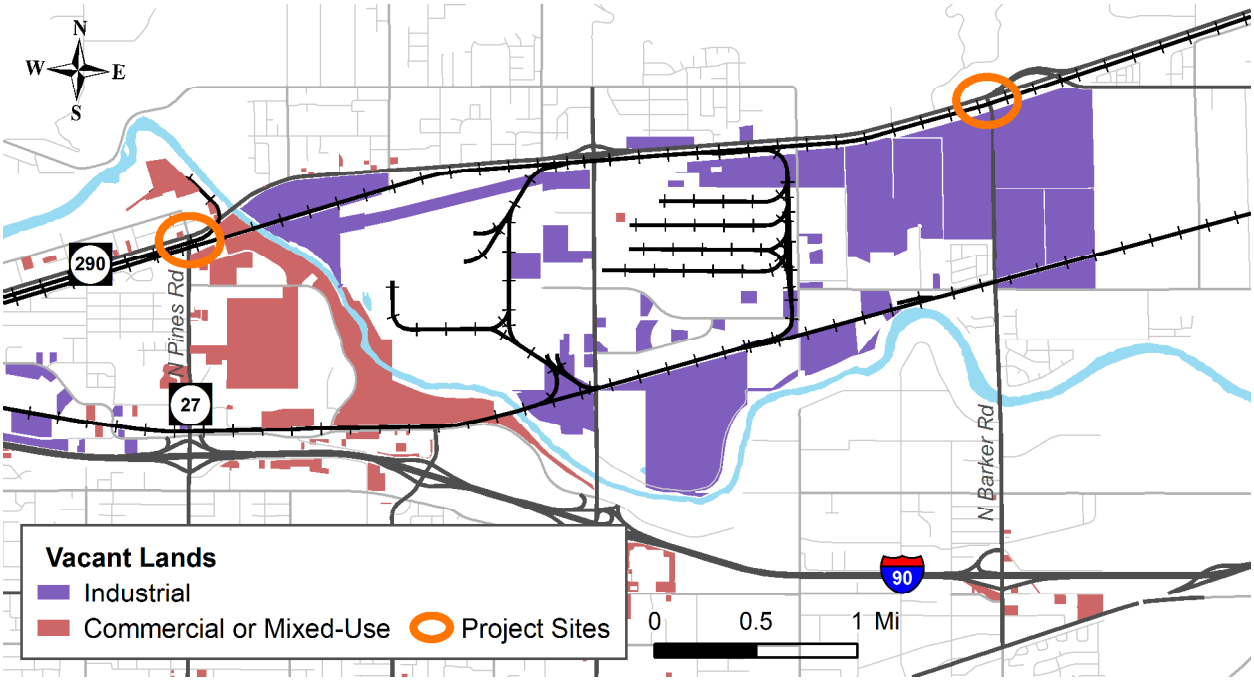


Figure 3. Vacant Industrial, Mixed-Use, and Commercial Parcels in Spokane Valley

Economic analysis estimates that this project will be a **significant generator of jobs and revenues**:

	Barker Rd/BNSF	Pines Rd/BNSF
State economic output:	$2 billion	$1.3 billion
New jobs in state (local share):	9,800 (3,300)	8,719 (4,312)
New City general fund taxes:	$12.3 million	$8.2 million
New State general fund taxes:	$50.8 million	$101.9 million

(See Appendix C for detailed fiscal and economic analysis)

6.2.2 Mobility Outcomes

The 21st century transportation system enhances the mobility needs of all users. The project design results in improved mobility for vehicles, trains, bicycles, and pedestrians. As previously noted, the community of Spokane Valley is growing and experiencing the transportation impacts associated with growth. The existing intersection at Barker Road and Trent Avenue (SR 290) currently operates at a Level of Service (LOS) 'F' and is forecasted to reach 50,050 vehicle hours of delay by 2030 without this project. The existing intersection at Pines Road (SR 27) and Trent Avenue (SR 290) operates at LOS 'E' and has a projected LOS of 'F' in future years due to high traffic volumes on both Pines Road and Trent Avenue. Add to the mix an average of 56 trains per day, up to 7,700 feet in length (nearly 1.5 miles in length), and the impact on traffic flow at these at-grade crossings is significant. The project improvements for Trent Avenue (SR 290) at Barker Road and Pines Road transforms LOS 'F' and LOS 'E' intersections to LOS 'A' and LOS 'D', respectively. This greatly

benefits travel time reliability for all modes, but significantly for emergency response vehicles where delay can have tragic outcomes; for school buses where delay means tardiness; and for commercial vehicles where delay has negative economic impact.

The positive outcome for freight and passenger rail travel by removing four at-grade crossings of the BNSF line is the continued implementation of the Bridging the Valley Plan that envisions a freight and passenger rail corridor unencumbered by at-grade crossings. The project will also accommodate the planned additional mainline tracks for the rail corridor.

The ability to safely walk or bike on Trent Avenue (SR 290) between the residential communities, schools, commercial centers, and employment areas is hampered by gaps in the pedestrian and bicycle networks on Barker Road and Pines Road. The project significantly enhances mobility for pedestrian and bicyclists by constructing Americans with Disabilities Act (ADA)-compliant sidewalks and bicycle lanes that connect the land uses to the north and south of the project area.

6.2.3 Safety Outcomes

The BNSF rail line and Trent Avenue (SR 290) are high volume train and vehicle corridors respectively. This creates the potential for significant safety hazards for vehicle, pedestrian, and bicyclist cross-traffic. The project eliminates four at-grade roadway-railway crossings. With an average 56 trains per day using the BNSF line currently **and the expectation that rail traffic will increase to 126 daily freight trains – that is five trains every hour** – the reduction in exposure to conflicts between modes is enormous. This is of particular concern to the community because the BNSF rail corridor is the route for commodity travel from the North American interior through Spokane Valley on its way to west coast terminals. To illustrate the magnitude of shipments, the **Washington State Department of Ecology estimates that 2.87 billion gallons per year of Bakken oil travels through Spokane Valley**[5]. This project eliminates the risk of fatalities, serious injuries, and road-related commodity spills that can happen at any roadway-railway at-grade crossing. This project eliminates four at-grade crossings, including two that are on well-traveled arterial routes.

In addition to the positive outcomes of the roadway-railway at-grade closures, the project offers additional safety benefits by improving the configuration of the intersections with Trent Avenue (SR 290). Barker Road northbound traffic has difficulty accessing SR 290 due to its high speeds and traffic volumes. Northbound Barker Road traffic faces additional challenges when making a left turn

[5] Maps of Oil Movement across Washington: http://www.ecy.wa.gov/programs/spills/OilMovement/Maps.html

onto SR 290 due to a relatively poor sightline and the need for drivers to watch for traffic heading east and two different traffic flows heading west (Wellesley Avenue and SR290/Trent Avenue). Traffic on SR 290 has a limited westerly field of vision, preventing drivers from seeing appropriate gaps in oncoming traffic. The Pines Road and SR 290 intersection will be realigned slightly and lowered to match the new grade resulting from the underpass. The result is highway intersection upgrades that address and resolve speed and sight distance issues.

The safety of pedestrians and bicyclists will be enhanced with the addition of ADA-accessible sidewalks and bicycle lanes on both the Barker Road overpass and the Pines Road underpass.

6.2.4 Community and Environmental Outcomes

The Barker Road and Pines Road BNSF Grade Separation project will substantially contribute to the improved livability for residents in the region by enhancing community connectivity while reducing the negative effects of train horn noise and decreasing transportation delays. The BNSF rail corridor bisects the community. The area north of SR 290 is largely residential interspersed with three schools and the Plantes Ferry Park and Sports Complex. South of the BNSF corridor and SR 290 lies the majority of the City's commercial, employment, and residential uses. This project will help knit together the northern and southern sectors of the community by eliminating barriers that impede mobility. The project delivers additional north-south grade separated connections that allow travelers to avoid the long waits for passing trains.

The project will complete key gaps in the City's pedestrian and bicycle networks that provide transportation and recreational options. Sidewalks and bicycle lanes are proposed for both Barker Road and Pines Road. SRTC's Horizon 2040 Plan shows the planned pedestrian and bicycle networks.

This project enhances the unique characteristics of Spokane Valley. Both Barker Road and Pines Road are gateways for access to the 37.5-mile paved, mixed-use Centennial Trail that runs along the Spokane River between Spokane, Washington and Coeur d'Alene, Idaho. Barker Road has an existing trailhead for the Centennial Trail 1.5 miles south of the project site with direct access to the Spokane River. During springtime, the Spokane River offers some of the most attractive river rafting and kayaking opportunities in the Inland Northwest. Many river users access the Spokane River at Barker Road because it is the midway point between unrestricted river use (i.e. no dams or diversions) between the crossing at the Idaho-Washington border and Plantes Ferry Park, providing access to over 12 miles of recreational river usage. Plantes Ferry Park and Sports Complex, located north of SR 290, is a 95-acre regional sports complex with sporting fields, trails, picnic areas, and playgrounds. This project significantly improves connections to these community amenities.

In addition to the community benefits, the dual grade separations of the BNSF rail line also generate environmental benefits in reduced noise and air pollution. Without safety measures, federal law

requires locomotives to sound their horns at 96 to 110 decibels as they approach at-grade crossings. The horns must continue blowing until the train clears the intersection. For Spokane Valley residents this represents a seemingly continuous sounding of horns along the BNSF corridor from Barker Road to Pines Road. With grade separations at Barker Road and Pines Road and the closure of the Flora Road and University Road at-grade crossings, the required sounding of the horn drops to just once (at Evergreen Road) in a four-mile stretch, resulting in a significant reduction in noise pollution.

Air quality and fuel efficiency also receive a boost from this project. Vehicles will no longer sit idling as 56 trains per day cross two key north-south routes. With trains nearly one and a half miles in length, crossings are closed for approximately three to five minutes for each train to pass and then vehicles are further delayed as the traffic clears. In that time, idling vehicles are consuming fuel and emitting harmful air pollutants. Spokane Valley and the rest of the region are identified by the U.S. Environmental Protection Agency (EPA) as maintenance areas for Particulate Matter (PM_{10}) and Carbon Monoxide (CO). With these grade separations, the combined fuel use from idling drops from an estimated 52,512 gallons/year to 0 (in Year 2022), providing a significant annual reduction in CO, particulate matter, and greenhouse gas as compared with the current configuration.[6]

6.3 Other Review Selection Criteria

This section shows how the project meets the other review selection criteria being considered by the U.S. DOT: partnership and innovation, as well as cost share.

6.3.1 Partnership and Innovation

This project demonstrates support from numerous public and private partners across the region. Two states, several regional public entities, multiple cities, and local business organization, as well as two Class I railroads actively participated in the Bridging the Valley Transportation Study completed in 2004 and subsequent workshops, stakeholder outreach, and funding initiatives to further this effort.

The significance of this project can be shown through the partnership Spokane Valley has with the Washington State Freight Mobility

Bridging the Valley Partners

State and Local Agencies

- Idaho Transportation Department
- Washington State Department of Transportation
- Washington Freight Mobility Strategic Investment Board
- Washington Utility and Transportation Commission
- State and Federal Legislators

Regional Agencies

- Spokane Regional Transportation Council
- Spokane Transit Authority
- Kootenai Metropolitan Planning Organization

Railroads

- BNSF Railway
- Union Pacific Railroad

Local Agencies and Districts

- Kootenai County
- Spokane County
- City of Athol
- Town of Millwood
- City of Rathdrum
- City of Spokane
- City of Spokane Valley
- Area Fire Districts/Emergency Response Systems
- Area School Districts

Chambers of Commerce

- Spokane Valley
- Spokane Regional

[6] Spokane Valley FASTLANE Appendix B: Benefit Cost Analysis Summary

and Strategic Investment Board (FMSIB). The FMSIB recognizes the need to improve the efficient movement of freight through the Spokane Region and has committed to funding 20% of construction costs for the Barker Road/BNSF grade separation project up to a total of $10 million. **This project also enjoys the benefit of a partnership with the BNSF Railroad, who plans to contribute several hundreds of thousands of dollars (per CFR 646.210) in additional matching funds.**

The City of Spokane Valley has a great working relationship with WSDOT and we collaborate on roughly 10 to 20 projects per year. WSDOT maintains and operates 26 miles of state roadways within Spokane Valley. The City and WSDOT are both members of the Spokane Regional Transportation Management Center (SRTMC) and work together to provide active regional transportation systems management and operations (e.g. incident management, traveler information). WSDOT and the City have delivered several intelligent transportation system (ITS) projects together, and WSDOT operates and maintains City traffic signals and ITS infrastructure on the state highways within the City through a long-standing Interlocal Agreement. The City and WSDOT collaboratively review traffic impact studies and permits for properties on Trent Avenue (SR 290) and Pines Road (SR 27). Other recent joint projects include planning efforts for three interchange justification reports (IJRs), paving projects, and bridge projects.

The City coordinates with BNSF Railway regarding the roadway crossings (at-grade and grade-separated) throughout the city. The two entities have worked together to complete several crossing diagnostic reviews in the past few years and coordinate all regularly scheduled and unplanned maintenance activities. In recent years, the City and BNSF have worked together to add an expansion joint to the Fancher Road overpass, enhance safety at the Vista Road at-grade crossing, and add barrier curb at the Park Road at-grade crossing.

With regard to innovation, the City of Spokane Valley will evaluate innovative bridge construction techniques to reduce the impact on the community and the exiting traffic. This may include constructing the structures off-site before staging for construction. The project will also take advantage of the Spokane Regional Transportation Management Center (SRTMC) ITS infrastructure to communicate traveler information about construction activities and expected delays throughout the project using SRTMC's website and 511 telephone system. Other ITS technologies, such as work zone queue management and speed management systems, will be evaluated for applicability during project engineering.

6.3.2 Cost Share

The community the size of Spokane Valley is greatly challenged to fund a project of this magnitude on its own. With many competing needs for city funds, the financial wherewithal to locally shoulder the entire burden of this project is inconceivable. With such geographically dispersed benefits generated by this project, federal assistance is not only a necessity, but also a wise investment for the broader multi-modal transportation system. Grade separation projects are commonly completed as

public-private partnerships. This is true for the Barker Road and Pines Road grade separations. BNSF is contributing funding to the project in partnership with the City of Spokane Valley and Washington State. The project also benefits from previous federal funding allocated for this project. The City of Spokane Valley is sufficiently positioned to financially deliver this project with the assistance of the FASTLANE funding.

7 Project Readiness

With the help of FASTLANE funding, the Barker Road and Pines Road (SR 27) BNSF Grade Separation Project is expected to begin construction well before the grant deadline and be fully constructed by September 2021. This project readiness section provides a summary of the technical feasibility, project schedule, required approvals needed, and mitigations for anticipated scope, schedule, and budget risks. Spokane Valley is moving ahead with the final design of the Barker Road/BNSF grade separation project this year. Up to $1 million of federal and city funds will be used to complete the design in 2017. Also, the City is committed to the acquisition of a parcel of land in 2016 for the Pines Road/BNSF grade separation project as a protective purchase so development does not occur such that it inhibits the construction of the project.

7.1 Technical Feasibility

The technical feasibility of the proposed improvements has been thoroughly established through previous planning and preliminary engineering efforts. This section describes the statement of work, design criteria and basis of design, basis of cost estimate and contingency levels, and scope/schedule/budget risk mitigation measures.

7.1.1 Statement of Work

This project will construct grade-separated crossings of Barker Road and Pines Road at the BNSF Railway and also closes at-grade crossings of the BNSF Railway at Flora Road and University Road. Figures 4 and 5 illustrate and list the key design features of the Barker Road/BNSF and Pines Road/BNSF projects, respectively. Table 5 provides the detailed project scope of work pertaining to how the design and construction will be achieved for the project.

7.1.2 Design Criteria and Basis of Design

The oversight of the project design and construction will be a joint effort by the City of Spokane Valley, WSDOT, and BNSF Railway. Project roles for each stakeholder are described in Section 3. Design criteria was identified in the Bridging the Valley preliminary engineering effort and includes national standards as well as City, WSDOT, and BNSF standards. The process will follow WSDOT's project development and delivery procedures and standards supplemented with City procedures and standards as applicable to the project. Procedures and design criteria from the *BNSF-UPRR Guidelines for Railroad Grade Separation Projects* will also guide the project.

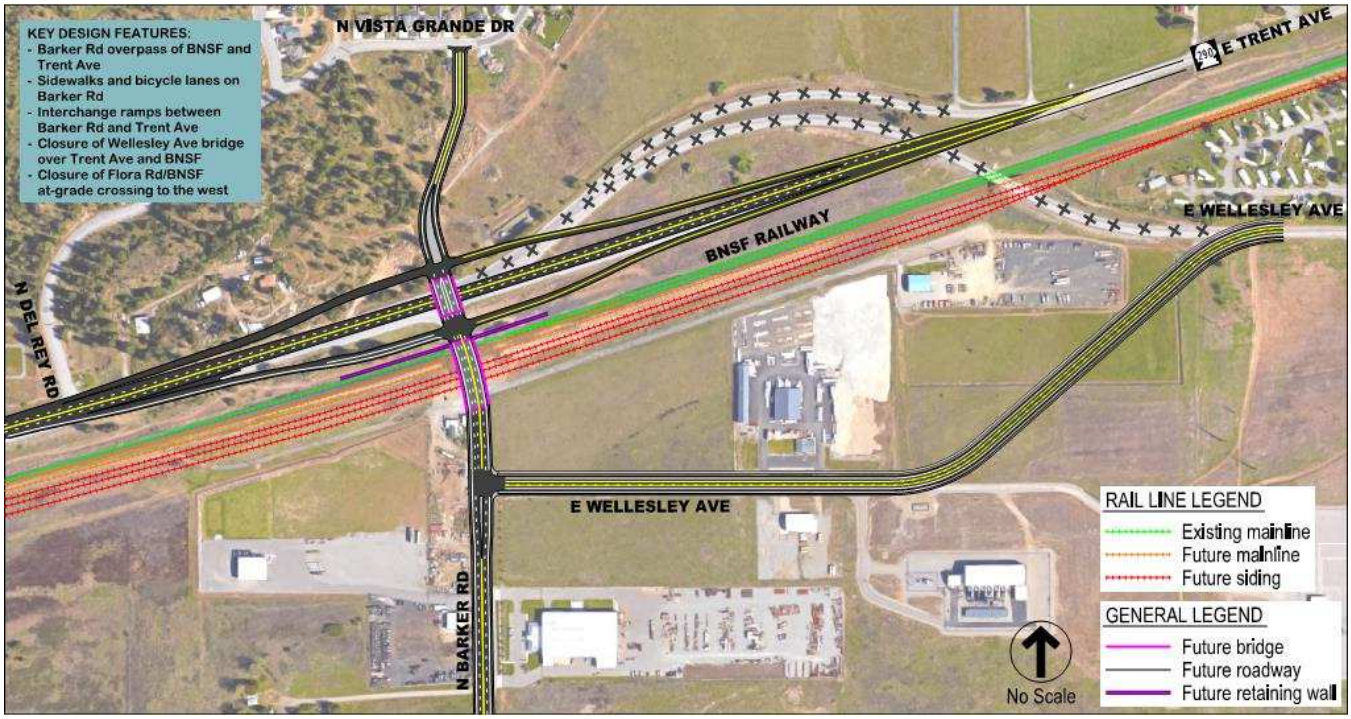


Figure 4. Barker Road/BNSF Grade Separation Conceptual Layout

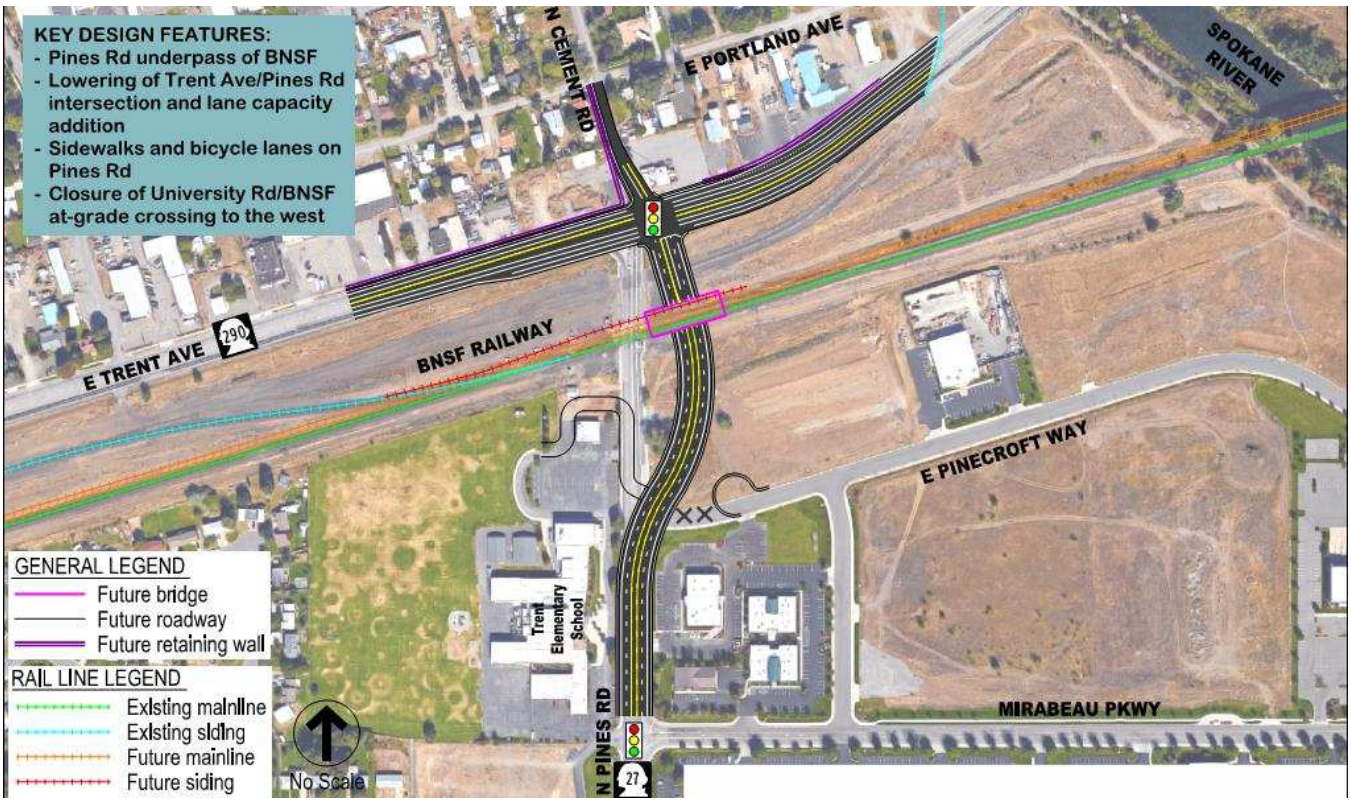


Figure 5. Pines Road/BNSF Grade Separation Conceptual Layout

Table 5. Project Scope of Work

Engineering	Bid Letting & Construction
• Procurement of Engineering Services • Task 1: Surveying & Mapping • Task 2: Utility Coordination • Task 3: 30% Plans and Estimate Update* • Task 4: 60% PS&E • Task 5: 90% PS&E • Task 6: Final PS&E • Task 7: Local Agency Permits • Task 8: Public Involvement • Task 9: Project Management • Task 10: Quality Management • Task 11: Project Team Meetings Tasks 1 through 6 will be completed in the order shown, while Tasks 7 through 11 will be ongoing throughout the course of the engineering.	• Final PS&E Review by FHWA, WSDOT, Spokane Valley, and BNSF • Advertisement and Bid Letting • Procurement of Contractor • Notice to Proceed • Shop Drawings and Submittal Reviews • Fabrication of Structural Supports • Mobilization and Erosion Control • Temporary Traffic Control • Utility Demarcation • Bridge Structure Construction • Roadway and Rail Construction • Site Visits and Inspection • Record ("As Constructed") Drawings • Meetings

* Although 30% plans and costs were developed in 2004, they will need to be updated to current standards (including all required railroad clearances) and to account for current conditions and unit prices. This update may include geotechnical updates if needed.

7.1.3 Basis of Cost Estimate and Contingency Levels

Cost estimates have been completed for the 30-percent design effort completed in 2004. The Barker Road/BNSF Grade Separation cost estimate was updated in 2014 as part of a previous funding request. Unit prices from that update were used in the Pines Road/BNSF Grade Separation cost estimate as part of this grant request. These estimates included inflation through the end of the construction period and a 30-percent contingency for construction costs. A detailed cost estimate is included in Appendix B.

7.1.4 Scope, Schedule, and Budget Risk Mitigation Measures

The scope, schedule, and budget risks for this project are low because the engineering is already 30-percent complete and the project details have been vetted through numerous planning and design efforts. Both the City of Spokane Valley and WSDOT have proven design standards and project delivery procedures in place.

7.2 Project Schedule

The project schedule shown in Figure 6includes the major project milestones for right-of-way acquisition, engineering, and construction and demonstrates that the project easily meets the funding obligation and construction deadlines required by the FASTLANE grant program. Environmental approval was already obtained through NEPA in 2006 as part of the Bridging the Valley environmental documentation process. Although portions of both projects are in the STIP, amendments must be made prior to starting the full engineering process. The schedule takes into account procurement and review timelines. With FASTLANE funding, the full project will be constructed by September 2021.

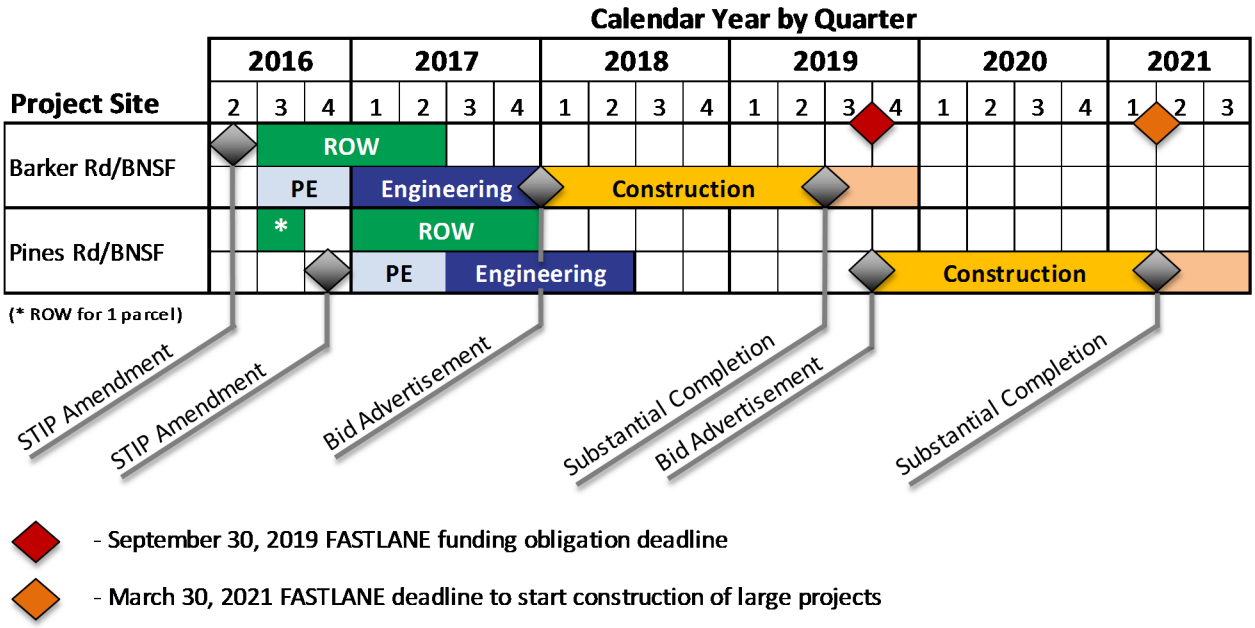


Figure 6. Project Schedule

7.3 Required Approvals

This section provides a summary of all required approvals related to environmental permits and reviews, state and local approvals, and state and local planning.

7.3.1 Environmental Permits and Reviews

The project has completed the environmental process as follows:

Environmental Process	Completed Efforts
National Environmental Protection Agency (NEPA) and State EPA (SEPA) Status	Project has **already received NEPA Class II Categorical Exclusion and SEPA Categorical Exemption** per WAC 197-11-800 on August 22, 2006. The approval documentation is posted on the City's website[7].
Reviews, Approvals, and Permits by other Agencies	The NEPA approval documentation provides a full list of all required permits and reviews. The Bridging the Valley stakeholders listed in Section 6.3.1 participated in reviews. This included reviews the City of Spokane Valley, WSDOT, and BNSF.
Environmental Studies and other Documents	Full environmental documentation in hard copy is on file at the Spokane Regional Transportation Council (SRTC). Copies are available upon request. The project was found to have no effect for most environmental components. Where there are small environmental impacts, mitigation measures have been identified and include procedures for hazmat disposal, erosion control, and stormwater treatment facilities.
DOT Discussions on NEPA Compliance	The project team coordinated with WSDOT to obtain SEPA approval concurrently with the NEPA approval.
Public Engagement	Extensive public engagement has been an on-going effort as part of the Bridging the Valley planning and engineering efforts. A Strategic Advisory Committee (SAC) was formed to oversee public engagement. Efforts included public open houses, alternatives workshops, site visits with neighborhoods at each crossing in Washington and Idaho, mailings, and outreach. Public support has been overwhelmingly positive. Public engagement will continue through the right-of-way, engineering, and construction of this project.

7.3.2 State and Local Approvals

Both the Barker Road/BNSF and Pines Road/BNSF Grade Separation projects are included in the STIP, Horizon 2040 Metropolitan Transportation Plan, and the Spokane Valley TIP. STIP amendments are needed before proceeding with the full engineering phase of the project and this is

[7] http://www.spokanevalley.org/filestorage/6836/6914/BTV-Local_Agency_Env_Classification_Summary.pdf

shown in the project schedule in Section 7.2. Additional right-of-way, engineering, and construction approvals will be obtained from the City, WSDOT, and BNSF at key milestones throughout the project.

7.3.3 State and Local Planning

Significant planning and preliminary engineering for this project have been completed. These efforts show that the proposed project is not only feasible but has the support of all project partners, the community, the region, and beyond:

Planning or Design Effort	Project Elements
Bridging the Valley Planning Study	• *Grade Separation Analysis:* development, evaluation, refinement, and documentation of grade separation alternatives to support transportation needs and BNSF operations • *Traffic Analysis:* evaluation of traffic impacts associated with each alternative for 2001 and 2020 • *Economic Analysis:* benefit-cost analysis of all alternatives
Bridging the Valley 30% Preliminary Engineering	• Right-of-Way needs were determined for the Barker and Pines projects • Design reports (including criteria), 30% plans, cost estimate, and environmental documentation were performed for these projects
Bridging the Valley 30% Preliminary Engineering	• Right-of-Way needs were determined for the Barker and Pines projects • Design reports (including criteria), 30% plans, cost estimate, and environmental documentation were performed for these projects
Inland Pacific Hub Transportation Investment and Project Priority Blueprint	• Lists the Bridging the Valley grade separation projects as priority rail improvement projects with significant project synergy economic benefits • Demonstrates support from local partners and identifies a midterm construction period of 2016-2021
Washington State Freight Mobility Plan 2014	• Identifies project for future implementation
Horizon 2040 Metropolitan Transportation Plan	• Identifies this project and other Bridging the Valley grade separation projects
Spokane Valley Comprehensive Plan (2014)	• Goal to support and encourage the continued viability of passenger and freight rail system in the region; Policy to support Bridging the Valley grade separation projects
City of Spokane Valley TIP	• Includes project funding for early pre-construction activities
Fiscal and Economic Analysis of Project	• Analysis of incremental development, tax revenue benefits, economic output, jobs, and wages showing the significant benefit of implementing this project (see Appendix C for full report)

7.4 Assessment of Project Risks and Mitigation Strategies

We have identified the following potential project risks and the associated mitigation measures:

Potential Risks	Mitigation Measures
Project Funding	The City has multiple options for meeting the project's remaining financing needs. The FMSIB funding for the Barker Road/BNSF Grade Separation is a match for 20% of the construction costs up to $10 million. Current estimates show only $7.2 million of this funding is needed, which leaves a surplus of $2.8 million if construction costs are higher than anticipated. The City plans to actively pursue other funding opportunities including TIGER, TIB, and STP. The City Council will consider providing additional funding, including selling bonds.
Environmental Issues	The project has already received NEPA approval for a categorical exclusion and minor mitigation measures (e.g. erosion control, stormwater treatment) have been identified.
Utility Conflicts	Potential utility issues were identified during the 30% preliminary engineering, which means utility coordination can start early.
Right-of-Way Acquisition	On-going engagement with the public has built positive support for development potential. These efforts will be continued.
Water Table at Pines Road	The Pines Road/BNSF Grade Separation project is near the Spokane River. Sometimes the water table is low near rivers. The nearby Argonne Road/BNSF Grade Separation project constructed an underpass of the rail line and did not run into any water table issues. Similar construction techniques will be used for excavation.

Appendix A.

Letters of Support

- Letters of support for this project are posted on the City's website:

  http://www.spokanevalley.org/content/6836/6914/9948.aspx

Appendix B.
Benefit-Cost Analysis (BCA) and Cost Estimate Summary

- Benefit-Cost Analysis (BCA)
- Cost Estimate Summary for Barker Road/BNSF Grade Separation Project
- Cost Estimate Summary for Pines Road/BNSF Grade Separation Project

Table of Contents

Table 1 General Inputs

Input #	Input Name	Units	Value
1	Real Discount Factor - Scenario 1	%	7%
2	Real Discount Factor - Scenario 2	%	3%
3	Base Year of Analysis	year	2015
4	Project Start Date	date	2018
5	Project End Date	date	2020
6	Benefits Start Date	date	2020
7	End Date of Analysis	date	2069
8	Number of Days Freight Trains Running per Year	days	365
9	Number of Days Passenger Trains Running per Year	days	365
10	Feet per Mile	feet	5,280
11	Grams per Short Ton	grams	907,185
12	Average Vehicle Speed Through Crossing	mph	45
13	Design Start Year	year	2017
14	Growth assumptions for Train Travel	%	3.40%

Table 2 Summary of the benefits of the infrastructure improvements

		Barker	Pines	Sum
1	**Travel Time Savings**	$25.67	$33.89	$59.57
2	**Safety**	$12.03	$14.03	$26.06
3	**Operating Costs**	$1.45	$1.84	$3.29
4	**Environment and Emissions**	$0.95	$1.37	$2.32

Table 3 Anticipated funding sources and project costs

Funding Source	Barker Rd	Pines Rd	Total	% of Total Cost		
TIGER	$10,440,000	$0	$10,440,000	18.71%	80%	Federal Funds
FASTLANE	$15,814,845	$17,665,155	$33,480,000	60.00%		
2009 Federal Earmark	$720,000	$0	$720,000	1.29%		
City of Spokane Valley	$1,420,735	$779,265	$2,200,000	3.94%	20.00%	Non-Federal Funds
Washington State FMSIB*	$7,207,000	$0	$7,207,000	12.92%		
BNSF**	$432,420	$237,180	$669,600	1.20%		
Others***	$0	$1,083,400	$1,083,400	1.94%		
Total	$36,035,000	$19,765,000	$55,800,000	100.00%	100.00%	

Table 4 Summary of Undiscounted Barker and Pines Benefits vs Costs per year

Year	Project Year	Barker Undiscounted Cost	Barker Undiscounted Benefit	Barker Undiscounted Benefit-Cost	Pines Undiscounted Cost	Pines Undiscounted Benefit	Pines Undiscounted Benefit-Cost	Total Undiscounted Cost	Total Undiscounted Benefit	Net of Cost and Benefit	Barker Benefit/Cost Ratio	Pines Benefit/Cost Ratio	Barker and Pines Benefit/Cost Ratio
2017	1	-$3,795,000	$0	-$3,795,000	-$3,164,500	$0	-$3,164,500	-$6,959,500	$0	-$6,959,500			
2018	2	-$11,480,000	$0	-$11,480,000	-$6,183,833	$0	-$6,183,833	-$17,663,833	$0	-$17,663,833			
2019	3	-$13,840,000	$0	-$13,840,000	-$6,944,444	$0	-$6,944,444	-$20,784,444	$0	-$20,784,444			
2020	4	-$6,920,000	$2,205,616	-$4,714,384	-$3,472,222	$2,153,984	-$1,318,238	-$10,392,222	$4,359,601	-$6,032,622			
2021	5	-$9,000	$2,276,442	$2,267,442	-$11,000	$2,251,063	$2,240,063	-$20,000	$4,527,504	$4,507,504			
2022	6	-$9,201	$2,350,748	$2,341,547	-$11,245	$2,354,148	$2,342,903	-$20,446	$4,704,896	$4,684,449			
2023	7	-$9,406	$2,428,090	$2,418,684	-$11,496	$2,462,660	$2,451,164	-$20,902	$4,890,751	$4,869,848			
2024	8	-$9,616	$2,508,261	$2,498,645	-$11,753	$2,576,696	$2,564,943	-$21,369	$5,084,957	$5,063,588			
2025	9	-$9,831	$2,592,063	$2,582,232	-$12,015	$2,697,453	$2,685,438	-$21,846	$5,289,516	$5,267,671			
2026	10	-$10,050	$2,678,869	$2,668,819	-$12,283	$2,824,304	$2,812,021	-$22,333	$5,503,173	$5,480,840			
2027	11	-$10,274	$2,769,304	$2,759,030	-$12,557	$2,958,187	$2,945,630	-$22,831	$5,727,491	$5,704,660			
2028	12	-$10,503	$2,863,473	$2,852,969	-$12,837	$3,099,442	$3,086,605	-$23,341	$5,962,915	$5,939,574			
2029	13	-$10,738	$2,961,887	$2,951,149	-$13,124	$3,248,814	$3,235,690	-$23,862	$6,210,701	$6,186,839			
2030	14	-$10,977	$3,064,168	$3,053,190	-$13,417	$3,406,274	$3,392,857	-$24,394	$6,470,441	$6,446,047			
2031	15	-$11,222	$3,171,346	$3,160,124	-$13,716	$3,573,195	$3,559,479	-$24,938	$6,744,540	$6,719,602			
2032	16	-$11,473	$3,283,813	$3,272,340	-$14,022	$3,750,362	$3,736,340	-$25,495	$7,034,175	$7,008,680			
2033	17	-$11,729	$3,400,929	$3,389,200	-$14,335	$3,937,420	$3,923,085	-$26,064	$7,338,349	$7,312,285			
2034	18	-$11,990	$3,523,478	$3,511,488	-$14,655	$4,135,477	$4,120,822	-$26,645	$7,658,955	$7,632,310			
2035	19	-$12,258	$3,647,524	$3,635,266	-$14,982	$4,339,948	$4,324,967	-$27,240	$7,987,472	$7,960,232			
2036	20	-$12,531	$3,779,729	$3,767,198	-$15,316	$4,559,394	$4,544,078	-$27,847	$8,339,123	$8,311,276			
2037	21	-$12,811	$3,917,715	$3,904,904	-$15,658	$4,791,322	$4,775,664	-$28,469	$8,709,038	$8,680,569			
2038	22	-$13,097	$4,062,654	$4,049,557	-$16,007	$5,037,762	$5,021,755	-$29,104	$9,100,416	$9,071,312			
2039	23	-$13,389	$4,214,880	$4,201,491	-$16,364	$5,299,539	$5,283,175	-$29,753	$9,514,419	$9,484,666			
2040	24	-$13,688	$4,374,015	$4,360,327	-$16,729	$5,576,564	$5,559,834	-$30,417	$9,950,579	$9,920,162			
2041	25	-$13,993	$4,537,977	$4,523,984	-$17,103	$5,866,271	$5,849,169	-$31,096	$10,404,249	$10,373,153			
2042	26	-$14,305	$4,709,314	$4,695,008	-$17,484	$6,172,618	$6,155,134	-$31,790	$10,881,932	$10,850,142			
2043	27	-$14,625	$4,889,123	$4,874,499	-$17,874	$6,497,674	$6,479,800	-$32,499	$11,386,797	$11,354,298			
2044	28	-$14,951	$5,077,439	$5,062,488	-$18,273	$6,841,990	$6,823,717	-$33,224	$11,919,429	$11,886,205			
2045	29	-$15,284	$5,274,683	$5,259,399	-$18,681	$7,206,711	$7,188,030	-$33,966	$12,481,394	$12,447,429			
2046	30	-$15,626	$5,481,309	$5,465,683	-$19,098	$7,593,056	$7,573,958	-$34,723	$13,074,365	$13,039,641			
2047	31	-$15,974	$5,697,797	$5,681,823	-$19,524	$8,002,327	$7,982,803	-$35,498	$13,700,124	$13,664,626			

Year	Project Year	Barker Undiscounted Cost	Barker Undiscounted Benefit	Barker Undiscounted Benefit-Cost	Pines Undiscounted Cost	Pines Undiscounted Benefit	Pines Undiscounted Benefit-Cost	Total Undiscounted Cost	Total Undiscounted Benefit	Net of Cost and Benefit	Barker Benefit/Cost Ratio	Pines Benefit/Cost Ratio	Barker and Pines Benefit/Cost Ratio
2048	32	-$16,331	$5,925,112	$5,908,781	-$19,960	$8,436,635	$8,416,676	-$36,290	$14,361,747	$14,325,457			
2049	33	-$16,695	$6,162,916	$6,146,221	-$20,405	$8,896,039	$8,875,634	-$37,100	$15,058,955	$15,021,855			
2050	34	-$17,067	$6,412,234	$6,395,166	-$20,860	$9,382,812	$9,361,952	-$37,928	$15,795,045	$15,757,118			
2051	35	-$17,448	$6,673,683	$6,656,235	-$21,326	$9,898,625	$9,877,299	-$38,774	$16,572,308	$16,533,534			
2052	36	-$17,838	$6,947,921	$6,930,084	-$21,802	$10,445,258	$10,423,457	-$39,639	$17,393,180	$17,353,540			
2053	37	-$18,236	$7,235,646	$7,217,410	-$22,288	$11,024,604	$11,002,316	-$40,524	$18,260,250	$18,219,726			
2054	38	-$18,642	$7,537,598	$7,518,955	-$22,785	$11,638,673	$11,615,888	-$41,428	$19,176,271	$19,134,843			
2055	39	-$19,058	$7,854,562	$7,835,504	-$23,294	$12,289,607	$12,266,313	-$42,352	$20,144,169	$20,101,817			
2056	40	-$19,484	$8,187,372	$8,167,888	-$23,813	$12,979,680	$12,955,866	-$43,297	$21,167,052	$21,123,755			
2057	41	-$19,918	$8,536,911	$8,516,993	-$24,345	$13,711,311	$13,686,966	-$44,263	$22,248,222	$22,203,959			
2058	42	-$20,363	$8,904,117	$8,883,755	-$24,888	$14,487,072	$14,462,184	-$45,251	$23,391,189	$23,345,938			
2059	43	-$20,817	$9,289,985	$9,269,168	-$25,443	$15,309,696	$15,284,253	-$46,260	$24,599,681	$24,553,421			
2060	44	-$21,282	$9,695,568	$9,674,286	-$26,011	$16,182,092	$16,156,081	-$47,293	$25,877,659	$25,830,367			
2061	45	-$21,757	$10,121,984	$10,100,228	-$26,591	$17,107,348	$17,080,756	-$48,348	$27,229,332	$27,180,984			
2062	46	-$22,242	$10,570,421	$10,548,179	-$27,185	$18,088,749	$18,061,564	-$49,427	$28,659,170	$28,609,743			
2063	47	-$22,738	$11,042,136	$11,019,397	-$27,791	$19,129,786	$19,101,995	-$50,529	$30,171,922	$30,121,393			
2064	48	-$23,246	$11,538,463	$11,515,218	-$28,411	$20,234,173	$20,205,762	-$51,657	$31,772,636	$31,720,979			
2065	49	-$23,764	$12,060,819	$12,037,054	-$29,045	$21,405,855	$21,376,810	-$52,809	$33,466,673	$33,413,864			
2066	50	-$24,294	$12,610,704	$12,586,409	-$29,693	$22,649,026	$22,619,333	-$53,988	$35,259,730	$35,205,742			
2067	51	-$24,837	$13,189,712	$13,164,876	-$30,356	$23,968,146	$23,937,791	-$55,192	$37,157,859	$37,102,666			
2068	52	-$25,391	$13,799,533	$13,774,143	-$31,033	$25,367,956	$25,336,923	-$56,424	$39,167,490	$39,111,066			
2069	53	-$25,957	$14,441,961	$14,416,004	-$31,726	$26,853,495	$26,821,770	-$57,683	$41,295,456	$41,237,774			
Sum		-$36,820,946	$310,482,003	$273,661,057	-$20,725,601	$472,701,295	$451,975,694	-$57,546,547	$783,183,298	$725,636,751	8.4	22.8	13.6

Table 5 Summary of 7% discounted Barker and Pines Benefits vs Costs per year

Year	Project Year	Barker 7% Discounted Cost	Barker 7% Discounted Benefit	Barker Net 7% Discounted Benefit	Pines 7% Discounted Cost	Pines 7% Discounted Benefit	Pines Net 7% Discounted Benefit	Total Undiscounted Cost	Total 7% Discounted Benefit	Pines 7% discounted Net Benefit	Barker Benefit/Cost Ratio	Pines Benefit/Cost Ratio	Barker and Pines Benefit/Cost Ratio
2017	1	-$3,314,700	$0	-$3,314,700	-$2,763,997	$0	-$2,763,997	-$6,078,697	$0	-$6,078,697			
2018	2	-$9,371,100	$0	-$9,371,100	-$5,047,850	$0	-$5,047,850	-$14,418,950	$0	-$14,418,950			
2019	3	-$10,558,470	$0	-$10,558,470	-$5,297,883	$0	-$5,297,883	-$15,856,353	$0	-$15,856,353			
2020	4	-$4,933,864	$1,574,008	-$3,359,856	-$2,475,646	$1,537,119	-$938,527	-$7,409,511	$3,111,127	-$4,298,384			
2021	5	-$5,997	$1,518,570	$1,512,573	-$7,330	$1,501,607	$1,494,277	-$13,327	$3,020,177	$3,006,850			
2022	6	-$5,730	$1,465,885	$1,460,155	-$7,003	$1,467,985	$1,460,982	-$12,733	$2,933,870	$2,921,137			
2023	7	-$5,474	$1,415,449	$1,409,975	-$6,691	$1,435,599	$1,428,908	-$12,165	$2,851,048	$2,838,882			
2024	8	-$5,230	$1,366,885	$1,361,654	-$6,393	$1,404,200	$1,397,807	-$11,623	$2,771,084	$2,759,461			
2025	9	-$4,997	$1,320,508	$1,315,510	-$6,108	$1,374,248	$1,368,140	-$11,105	$2,694,755	$2,683,650			
2026	10	-$4,775	$1,275,821	$1,271,047	-$5,836	$1,345,169	$1,339,333	-$10,610	$2,620,990	$2,610,380			
2027	11	-$4,562	$1,232,989	$1,228,427	-$5,576	$1,317,208	$1,311,632	-$10,137	$2,550,197	$2,540,060			
2028	12	-$4,359	$1,191,898	$1,187,539	-$5,327	$1,290,283	$1,284,956	-$9,686	$2,482,181	$2,472,495			
2029	13	-$4,164	$1,152,531	$1,148,367	-$5,090	$1,264,390	$1,259,300	-$9,254	$2,416,921	$2,407,667			
2030	14	-$3,979	$1,114,724	$1,110,745	-$4,863	$1,239,440	$1,234,577	-$8,842	$2,354,164	$2,345,322			
2031	15	-$3,801	$1,078,717	$1,074,916	-$4,646	$1,215,725	$1,211,079	-$8,447	$2,294,442	$2,285,995			
2032	16	-$3,632	$1,044,313	$1,040,681	-$4,439	$1,193,066	$1,188,627	-$8,071	$2,237,380	$2,229,309			
2033	17	-$3,470	$1,011,223	$1,007,753	-$4,241	$1,171,188	$1,166,947	-$7,711	$2,182,412	$2,174,701			
2034	18	-$3,315	$979,551	$976,236	-$4,052	$1,150,205	$1,146,153	-$7,368	$2,129,756	$2,122,388			
2035	19	-$3,168	$948,138	$944,970	-$3,872	$1,128,713	$1,124,841	-$7,039	$2,076,850	$2,069,811			
2036	20	-$3,026	$918,670	$915,644	-$3,699	$1,108,831	$1,105,132	-$6,726	$2,027,501	$2,020,776			
2037	21	-$2,892	$890,364	$887,473	-$3,534	$1,089,646	$1,086,112	-$6,426	$1,980,010	$1,973,584			
2038	22	-$2,763	$863,357	$860,594	-$3,377	$1,071,399	$1,068,022	-$6,139	$1,934,756	$1,928,616			
2039	23	-$2,640	$837,671	$835,031	-$3,226	$1,054,157	$1,050,931	-$5,866	$1,891,827	$1,885,962			
2040	24	-$2,522	$812,902	$810,380	-$3,082	$1,037,400	$1,034,318	-$5,604	$1,850,302	$1,844,697			
2041	25	-$2,410	$788,684	$786,275	-$2,945	$1,020,635	$1,017,690	-$5,355	$1,809,319	$1,803,965			
2042	26	-$2,302	$765,302	$763,000	-$2,814	$1,004,275	$1,001,461	-$5,116	$1,769,577	$1,764,461			
2043	27	-$2,200	$743,037	$740,838	-$2,688	$988,769	$986,080	-$4,888	$1,731,806	$1,726,918			
2044	28	-$2,102	$721,674	$719,573	-$2,569	$973,840	$971,271	-$4,670	$1,695,514	$1,690,844			
2045	29	-$2,008	$701,170	$699,162	-$2,454	$959,457	$957,003	-$4,462	$1,660,627	$1,656,165			
2046	30	-$1,918	$681,482	$679,564	-$2,345	$945,593	$943,248	-$4,263	$1,627,075	$1,622,812			
2047	31	-$1,833	$662,575	$660,742	-$2,240	$932,221	$929,980	-$4,073	$1,594,796	$1,590,723			

Year	Project Year	Barker 7% Discounted Cost	Barker 7% Discounted Benefit	Barker Net 7% Discounted Benefit	Pines 7% Discounted Cost	Pines 7% Discounted Benefit	Pines Net 7% Discounted Benefit	Total Undiscounted Cost	Total 7% Discounted Benefit	Pines 7% discounted Net Benefit	Barker Benefit/Cost Ratio	Pines Benefit/Cost Ratio	Barker and Pines Benefit/Cost Ratio
2048	32	-$1,751	$644,582	$642,831	-$2,140	$919,591	$917,451	-$3,892	$1,564,174	$1,560,282			
2049	33	-$1,673	$627,132	$625,459	-$2,045	$907,141	$905,096	-$3,718	$1,534,274	$1,530,555			
2050	34	-$1,599	$610,366	$608,768	-$1,954	$895,122	$893,168	-$3,552	$1,505,488	$1,501,936			
2051	35	-$1,527	$594,254	$592,727	-$1,867	$883,516	$881,649	-$3,394	$1,477,771	$1,474,376			
2052	36	-$1,459	$578,770	$577,310	-$1,784	$872,306	$870,523	-$3,243	$1,451,076	$1,447,833			
2053	37	-$1,394	$563,886	$562,492	-$1,704	$861,477	$859,773	-$3,098	$1,425,363	$1,422,265			
2054	38	-$1,332	$549,578	$548,246	-$1,628	$851,014	$849,385	-$2,960	$1,400,592	$1,397,632			
2055	39	-$1,273	$535,824	$534,551	-$1,556	$840,902	$839,346	-$2,828	$1,376,726	$1,373,897			
2056	40	-$1,216	$522,600	$521,384	-$1,486	$831,128	$829,642	-$2,702	$1,353,729	$1,351,026			
2057	41	-$1,162	$509,886	$508,724	-$1,420	$821,682	$820,262	-$2,582	$1,331,567	$1,328,985			
2058	42	-$1,110	$497,660	$496,550	-$1,357	$812,550	$811,193	-$2,467	$1,310,210	$1,307,743			
2059	43	-$1,061	$485,905	$484,845	-$1,296	$803,722	$802,425	-$2,357	$1,289,627	$1,287,270			
2060	44	-$1,013	$474,601	$473,588	-$1,238	$795,187	$793,949	-$2,252	$1,269,788	$1,267,537			
2061	45	-$968	$463,731	$462,763	-$1,183	$786,937	$785,753	-$2,151	$1,250,668	$1,248,516			
2062	46	-$925	$453,278	$452,353	-$1,131	$778,961	$777,830	-$2,056	$1,232,239	$1,230,183			
2063	47	-$884	$443,226	$442,342	-$1,080	$771,251	$770,171	-$1,964	$1,214,477	$1,212,513			
2064	48	-$844	$433,559	$432,715	-$1,032	$763,799	$762,767	-$1,876	$1,197,358	$1,195,482			
2065	49	-$807	$424,264	$423,457	-$986	$756,596	$755,610	-$1,793	$1,180,860	$1,179,067			
2066	50	-$771	$415,325	$414,554	-$942	$749,637	$748,695	-$1,713	$1,164,962	$1,163,249			
2067	51	-$736	$406,729	$405,993	-$900	$742,913	$742,013	-$1,637	$1,149,642	$1,148,006			
2068	52	-$704	$398,464	$397,761	-$860	$736,418	$735,558	-$1,564	$1,134,882	$1,133,319			
2069	53	-$672	$390,518	$389,845	-$822	$730,146	$729,324	-$1,494	$1,120,664	$1,119,170			
Sum		-$28,298,283	$40,102,238	$11,803,955	-$15,732,226	$51,134,360	$35,402,134	-$44,030,509	$91,236,598	$47,206,089	1.4	3.3	2.1

Table 6 Summary of 3% discounted Barker and Pines Benefits vs Costs per year

Year	Project Year	Barker 3% Discounted Cost	Barker 3% Discounted Benefit	Barker Net 3% Discounted Benefit	Pines 3% Discounted Cost	Pines 3% Discounted Benefit	Pines Net 3% Discounted Benefit	Total Undiscounted Cost	Total 3% Discounted Benefit	Pines 3% Discounted Net Benefit	Barker Benefit/Cost Ratio	Pines Benefit/Cost Ratio	Barker and Pines Benefit/Cost Ratio
2017	1	-$3,577,151	$0	-$3,577,151	-$2,982,845	$0	-$2,982,845	-$6,559,996	$0	-$6,559,996			
2018	2	-$10,821,001	$0	-$10,821,001	-$5,659,083	$0	-$5,659,083	-$16,480,085	$0	-$16,480,085			
2019	3	-$13,045,527	$0	-$13,045,527	-$6,170,049	$0	-$6,170,049	-$19,215,576	$0	-$19,215,576			
2020	4	-$6,522,764	$1,902,584	-$4,620,180	-$2,995,169	$1,858,046	-$1,137,124	-$9,517,933	$3,760,630	-$5,757,303			
2021	5	-$8,483	$1,885,547	$1,877,064	-$9,212	$1,885,230	$1,876,017	-$17,696	$3,770,777	$3,753,081			
2022	6	-$8,673	$1,887,446	$1,878,773	-$9,144	$1,914,138	$1,904,994	-$17,816	$3,801,584	$3,783,768			
2023	7	-$8,866	$1,889,989	$1,881,123	-$9,075	$1,944,047	$1,934,971	-$17,941	$3,834,036	$3,816,095			
2024	8	-$9,064	$1,892,856	$1,883,792	-$9,008	$1,974,823	$1,965,815	-$18,072	$3,867,679	$3,849,607			
2025	9	-$9,266	$1,896,540	$1,887,274	-$8,940	$2,007,159	$1,998,218	-$18,207	$3,903,699	$3,885,493			
2026	10	-$9,473	$1,900,457	$1,890,984	-$8,874	$2,040,337	$2,031,464	-$18,347	$3,940,794	$3,922,448			
2027	11	-$9,684	$1,904,990	$1,895,306	-$8,807	$2,074,813	$2,066,005	-$18,492	$3,979,803	$3,961,311			
2028	12	-$9,900	$1,910,093	$1,900,193	-$8,742	$2,110,569	$2,101,828	-$18,642	$4,020,663	$4,002,020			
2029	13	-$10,121	$1,915,956	$1,905,835	-$8,676	$2,147,849	$2,139,172	-$18,798	$4,063,805	$4,045,007			
2030	14	-$10,347	$1,922,273	$1,911,925	-$8,612	$2,186,357	$2,177,746	-$18,959	$4,108,630	$4,089,671			
2031	15	-$10,578	$1,929,411	$1,918,833	-$8,547	$2,226,697	$2,218,149	-$19,125	$4,156,108	$4,136,983			
2032	16	-$10,814	$1,937,445	$1,926,631	-$8,484	$2,269,031	$2,260,547	-$19,298	$4,206,475	$4,187,178			
2033	17	-$11,055	$1,946,005	$1,934,950	-$8,420	$2,312,819	$2,304,399	-$19,476	$4,258,825	$4,239,349			
2034	18	-$11,302	$1,955,343	$1,944,041	-$8,357	$2,358,405	$2,350,047	-$19,659	$4,313,748	$4,294,088			
2035	19	-$11,554	$1,963,211	$1,951,657	-$8,295	$2,402,924	$2,394,629	-$19,849	$4,366,135	$4,346,286			
2036	20	-$11,812	$1,973,121	$1,961,309	-$8,233	$2,450,899	$2,442,666	-$20,045	$4,424,019	$4,403,974			
2037	21	-$12,076	$1,983,651	$1,971,575	-$8,172	$2,500,555	$2,492,383	-$20,247	$4,484,206	$4,463,959			
2038	22	-$12,345	$1,995,146	$1,982,801	-$8,111	$2,552,592	$2,544,482	-$20,456	$4,547,738	$4,527,282			
2039	23	-$12,620	$2,007,702	$1,995,082	-$8,050	$2,607,022	$2,598,972	-$20,671	$4,614,725	$4,594,054			
2040	24	-$12,902	$2,020,961	$2,008,059	-$7,990	$2,663,398	$2,655,408	-$20,892	$4,684,358	$4,663,466			
2041	25	-$13,190	$2,034,852	$2,021,662	-$7,930	$2,720,159	$2,712,229	-$21,120	$4,755,011	$4,733,891			
2042	26	-$13,484	$2,049,447	$2,035,963	-$7,871	$2,778,845	$2,770,974	-$21,355	$4,828,292	$4,806,937			
2043	27	-$13,785	$2,065,072	$2,051,287	-$7,813	$2,839,982	$2,832,170	-$21,598	$4,905,054	$4,883,457			
2044	28	-$14,093	$2,081,558	$2,067,465	-$7,754	$2,903,374	$2,895,619	-$21,847	$4,984,932	$4,963,085			
2045	29	-$14,407	$2,098,907	$2,084,500	-$7,696	$2,969,069	$2,961,373	-$22,103	$5,067,977	$5,045,873			
2046	30	-$14,729	$2,117,126	$2,102,398	-$7,639	$3,037,125	$3,029,486	-$22,367	$5,154,251	$5,131,883			
2047	31	-$15,057	$2,136,224	$2,121,167	-$7,582	$3,107,600	$3,100,018	-$22,639	$5,243,824	$5,221,185			

Year	Project Year	Barker 3% Discounted Cost	Barker 3% Discounted Benefit	Barker Net 3% Discounted Benefit	Pines 3% Discounted Cost	Pines 3% Discounted Benefit	Pines Net 3% Discounted Benefit	Total Undiscounted Cost	Total 3% Discounted Benefit	Pines 3% Discounted Net Benefit	Barker Benefit/Cost Ratio	Pines Benefit/Cost Ratio	Barker and Pines Benefit/Cost Ratio
2048	32	-$15,393	$2,156,383	$2,140,990	-$7,525	$3,180,833	$3,173,308	-$22,918	$5,337,216	$5,314,297			
2049	33	-$15,737	$2,177,279	$2,161,543	-$7,469	$3,256,350	$3,248,881	-$23,206	$5,433,629	$5,410,423			
2050	34	-$16,088	$2,199,102	$2,183,014	-$7,413	$3,334,496	$3,327,082	-$23,501	$5,533,598	$5,510,097			
2051	35	-$16,447	$2,221,871	$2,205,424	-$7,358	$3,415,347	$3,407,989	-$23,805	$5,637,218	$5,613,413			
2052	36	-$16,814	$2,245,607	$2,228,794	-$7,303	$3,498,983	$3,491,680	-$24,117	$5,744,591	$5,720,474			
2053	37	-$17,189	$2,270,334	$2,253,146	-$7,249	$3,585,489	$3,578,241	-$24,437	$5,855,824	$5,831,386			
2054	38	-$17,572	$2,296,078	$2,278,505	-$7,195	$3,674,952	$3,667,758	-$24,767	$5,971,030	$5,946,263			
2055	39	-$17,964	$2,322,863	$2,304,899	-$7,141	$3,767,463	$3,760,322	-$25,105	$6,090,326	$6,065,221			
2056	40	-$18,365	$2,350,720	$2,332,355	-$7,088	$3,863,116	$3,856,029	-$25,453	$6,213,836	$6,188,383			
2057	41	-$18,775	$2,379,677	$2,360,902	-$7,035	$3,962,010	$3,954,975	-$25,810	$6,341,687	$6,315,877			
2058	42	-$19,194	$2,409,766	$2,390,572	-$6,982	$4,064,246	$4,057,263	-$26,176	$6,474,012	$6,447,836			
2059	43	-$19,622	$2,441,020	$2,421,398	-$6,930	$4,169,929	$4,162,999	-$26,552	$6,610,949	$6,584,397			
2060	44	-$20,060	$2,473,472	$2,453,412	-$6,878	$4,279,170	$4,272,292	-$26,938	$6,752,643	$6,725,704			
2061	45	-$20,508	$2,507,159	$2,486,652	-$6,827	$4,392,081	$4,385,254	-$27,335	$6,899,241	$6,871,906			
2062	46	-$20,965	$2,542,118	$2,521,153	-$6,776	$4,508,779	$4,502,003	-$27,741	$7,050,897	$7,023,156			
2063	47	-$21,433	$2,578,387	$2,556,954	-$6,725	$4,629,385	$4,622,660	-$28,158	$7,207,772	$7,179,614			
2064	48	-$21,911	$2,616,006	$2,594,095	-$6,675	$4,754,025	$4,747,350	-$28,586	$7,370,031	$7,341,444			
2065	49	-$22,400	$2,655,017	$2,632,617	-$6,625	$4,882,827	$4,876,202	-$29,025	$7,537,844	$7,508,818			
2066	50	-$22,900	$2,695,462	$2,672,562	-$6,576	$5,015,925	$5,009,349	-$29,476	$7,711,388	$7,681,912			
2067	51	-$23,411	$2,737,388	$2,713,977	-$6,527	$5,153,458	$5,146,931	-$29,938	$7,890,846	$7,860,908			
2068	52	-$23,933	$2,780,839	$2,756,906	-$6,478	$5,295,568	$5,289,090	-$30,411	$8,076,407	$8,045,996			
2069	53	-$24,467	$2,825,864	$2,801,396	-$6,430	$5,442,403	$5,435,973	-$30,897	$8,268,267	$8,237,370			
Sum		-$34,707,273	$109,086,327	$74,379,053	-$18,186,387	$158,970,700	$140,784,313	-$52,893,660	$268,057,026	$215,163,366	3.1	8.7	5.1

Table 7 Summary of Undiscounted Barker and Pines Benefits per year

Year	Travel Time Saving at Barker Road	Travel Time Saving at Pines Road	Barker Safety Benefit	Pines Safety Benefit	Barker Operating Cost	Pines Operating Cost	Barker Emissions	Pines Emissions	Barker Undiscounted Benefit	Pines Undiscounted Benefit	Barker + Pines Undiscounted Benefit
2020	1,267,768	1,095,663	806,283	940,533	$71,873	$61,251	$59,693	$56,537	2,205,616	2,153,984	4,359,601
2021	1,316,995	1,165,394	826,237	963,823	$74,925	$65,377	$58,285	$56,469	2,276,442	2,251,063	4,527,504
2022	1,368,581	1,239,947	846,686	987,691	$78,004	$69,561	$57,476	$56,949	2,350,748	2,354,148	4,704,896
2023	1,422,392	1,318,856	867,642	1,012,151	$81,122	$73,975	$56,935	$57,678	2,428,090	2,462,660	4,890,751
2024	1,478,671	1,402,789	889,118	1,037,218	$84,447	$78,675	$56,025	$58,014	2,508,261	2,576,696	5,084,957
2025	1,537,550	1,492,063	911,126	1,062,907	$88,012	$83,886	$55,375	$58,597	2,592,063	2,697,453	5,289,516
2026	1,599,165	1,587,019	933,681	1,089,234	$91,810	$89,441	$54,213	$58,610	2,678,869	2,824,304	5,503,173
2027	1,663,661	1,688,020	956,796	1,116,214	$95,765	$95,338	$53,083	$58,615	2,769,304	2,958,187	5,727,491
2028	1,731,192	1,795,449	980,483	1,143,863	$99,885	$101,597	$51,912	$58,533	2,863,473	3,099,442	5,962,915
2029	1,801,921	1,909,716	1,004,759	1,172,198	$104,269	$108,266	$50,939	$58,633	2,961,887	3,248,814	6,210,701
2030	1,876,019	2,031,256	1,029,637	1,201,237	$108,743	$115,314	$49,769	$58,466	3,064,168	3,406,274	6,470,441
2031	1,953,668	2,160,533	1,055,132	1,230,996	$113,732	$123,156	$48,814	$58,510	3,171,346	3,573,195	6,744,540
2032	2,035,061	2,298,038	1,081,259	1,261,494	$119,269	$131,871	$48,223	$58,959	3,283,813	3,750,362	7,034,175
2033	2,120,403	2,444,295	1,108,035	1,292,749	$124,955	$141,107	$47,537	$59,269	3,400,929	3,937,420	7,338,349
2034	2,209,908	2,599,862	1,135,475	1,324,779	$130,993	$150,965	$47,102	$59,871	3,523,478	4,135,477	7,658,955
2035	2,303,805	2,765,332	1,163,596	1,357,604	$137,201	$161,408	$42,921	$55,604	3,647,524	4,339,948	7,987,472
2036	2,402,337	2,941,334	1,192,415	1,391,244	$143,897	$172,588	$41,080	$54,227	3,779,729	4,559,394	8,339,123
2037	2,505,760	3,128,539	1,221,949	1,425,719	$150,894	$184,473	$39,111	$52,591	3,917,715	4,791,322	8,709,038
2038	2,614,347	3,327,661	1,252,216	1,461,049	$158,495	$197,570	$37,596	$51,482	4,062,654	5,037,762	9,100,416
2039	2,728,383	3,539,457	1,283,234	1,497,257	$166,449	$211,503	$36,813	$51,322	4,214,880	5,299,539	9,514,419
2040	2,848,176	3,764,735	1,315,022	1,534,363	$174,775	$226,323	$36,043	$51,143	4,374,015	5,576,564	9,950,579
2041	2,974,047	4,004,353	1,347,598	1,572,390	$180,758	$238,167	$35,573	$51,361	4,537,977	5,866,271	10,404,249
2042	3,106,341	4,259,224	1,380,983	1,611,361	$186,993	$250,633	$34,997	$51,400	4,709,314	6,172,618	10,881,932
2043	3,245,419	4,530,319	1,415,197	1,651,299	$193,489	$263,752	$35,019	$52,304	4,889,123	6,497,674	11,386,797
2044	3,391,666	4,818,671	1,450,259	1,692,229	$200,260	$277,559	$35,253	$53,532	5,077,439	6,841,990	11,919,429
2045	3,545,492	5,125,378	1,486,192	1,734,175	$207,320	$292,090	$35,680	$55,068	5,274,683	7,206,711	12,481,394
2046	3,707,328	5,451,609	1,523,017	1,777,162	$214,680	$307,384	$36,284	$56,902	5,481,309	7,593,056	13,074,365
2047	3,877,633	5,798,606	1,560,755	1,821,215	$222,357	$323,480	$37,052	$59,026	5,697,797	8,002,327	13,700,124
2048	4,056,894	6,167,693	1,599,430	1,866,363	$230,365	$340,420	$38,422	$62,160	5,925,112	8,436,635	14,361,747
2049	4,245,628	6,560,274	1,639,065	1,912,631	$238,720	$358,249	$39,504	$64,885	6,162,916	8,896,039	15,058,955
2050	4,444,380	6,977,846	1,679,684	1,960,048	$247,438	$377,015	$40,731	$67,903	6,412,234	9,382,812	15,795,045
2051	4,653,732	7,422,000	1,721,311	2,008,642	$256,539	$396,765	$42,101	$71,219	6,673,683	9,898,625	16,572,308

Year	Travel Time Saving at Barker Road	Travel Time Saving at Pines Road	Barker Safety Benefit	Pines Safety Benefit	Barker Operating Cost	Pines Operating Cost	Barker Emissions	Pines Emissions	Barker Undiscounted Benefit	Pines Undiscounted Benefit	Barker + Pines Undiscounted Benefit
2052	4,874,300	7,894,428	1,763,971	2,058,442	$266,039	$417,551	$43,611	$74,837	6,947,921	10,445,258	17,393,180
2053	5,106,737	8,396,930	1,807,690	2,109,479	$275,958	$439,429	$45,261	$78,766	7,235,646	11,024,604	18,260,250
2054	5,351,737	8,931,420	1,852,494	2,161,782	$286,317	$462,456	$47,050	$83,015	7,537,598	11,638,673	19,176,271
2055	5,610,035	9,499,935	1,898,410	2,215,384	$297,137	$486,691	$48,980	$87,596	7,854,562	12,289,607	20,144,169
2056	5,882,411	10,104,642	1,945,466	2,270,317	$308,441	$512,200	$51,053	$92,521	8,187,372	12,979,680	21,167,052
2057	6,169,695	10,747,844	1,993,691	2,326,614	$320,253	$539,048	$53,273	$97,805	8,536,911	13,711,311	22,248,222
2058	6,472,764	11,431,992	2,043,112	2,384,308	$332,596	$567,306	$55,645	$103,465	8,904,117	14,487,072	23,391,189
2059	6,792,554	12,159,693	2,093,760	2,443,434	$345,499	$597,049	$58,173	$109,520	9,289,985	15,309,696	24,599,681
2060	7,130,053	12,933,719	2,145,665	2,504,029	$358,987	$628,355	$60,862	$115,989	9,695,568	16,182,092	25,877,659
2061	7,486,314	13,757,021	2,198,859	2,566,128	$373,090	$661,305	$63,721	$122,894	10,121,984	17,107,348	27,229,332
2062	7,862,453	14,632,734	2,253,373	2,629,769	$387,839	$695,987	$66,756	$130,259	10,570,421	18,088,749	28,659,170
2063	8,259,655	15,564,196	2,309,241	2,694,990	$403,265	$732,491	$69,975	$138,109	11,042,136	19,129,786	30,171,922
2064	8,679,178	16,554,956	2,366,495	2,761,830	$419,402	$770,915	$73,388	$146,472	11,538,463	20,234,173	31,772,636
2065	9,122,358	17,608,789	2,425,171	2,830,330	$436,286	$811,358	$77,004	$155,378	12,060,819	21,405,855	33,466,673
2066	9,590,613	18,729,711	2,485,303	2,900,531	$453,953	$853,927	$80,834	$164,857	12,610,704	22,649,026	35,259,730
2067	10,085,451	19,921,993	2,546,929	2,972,475	$472,443	$898,735	$84,889	$174,944	13,189,712	23,968,146	37,157,859
2068	10,608,471	21,190,179	2,610,084	3,046,205	$491,797	$945,898	$89,181	$185,674	13,799,533	25,367,956	39,167,490
2069	11,161,371	22,539,100	2,674,808	3,121,765	$512,058	$995,543	$93,724	$197,087	14,441,961	26,853,495	41,295,456
Sum	218,280,471	359,411,212	78,078,794	91,109,651	$11,519,797	$18,085,402	$2,602,941	$4,095,029	310,482,003	472,701,295	783,183,298

Table 8 Summary of 7% discounted Barker and Pines Benefits per year

Year	Travel Time Saving at Barker Road	Travel Time Saving at Pines Road	Barker Safety Benefit	Pines Safety Benefit	Barker Operating Cost	Pines Safety Benefit	Barker Emissions	Pines Safety Benefit	Barker 7% Discounted Benefit	Pines 7% Discounted Benefit	Barker+ Pines 7% Discounted Benefit
2020	903,901	781,192	574,868	670,587	$51,244	$43,671	$43,994	$41,669	1,574,008	1,537,119	3,111,127
2021	877,569	776,551	550,556	642,236	$49,926	$43,563	$40,519	$39,256	1,518,570	1,501,607	3,020,177
2022	852,284	772,177	527,273	615,084	$48,577	$43,319	$37,751	$37,405	1,465,885	1,467,985	2,933,870
2023	827,845	767,586	504,975	589,081	$47,214	$43,054	$35,415	$35,877	1,415,449	1,435,599	2,851,048
2024	804,299	763,024	483,621	564,178	$45,933	$42,794	$33,031	$34,204	1,366,885	1,404,200	2,771,084
2025	781,612	758,489	463,171	540,328	$44,741	$42,643	$30,984	$32,787	1,320,508	1,374,248	2,694,755
2026	759,752	753,981	443,585	517,487	$43,618	$42,493	$28,866	$31,207	1,275,821	1,345,169	2,620,990
2027	738,685	749,501	424,829	495,612	$42,521	$42,331	$26,954	$29,763	1,232,989	1,317,208	2,550,197
2028	718,383	745,047	406,866	474,662	$41,449	$42,159	$25,200	$28,414	1,191,898	1,290,283	2,482,181
2029	698,816	740,621	389,663	454,599	$40,437	$41,988	$23,615	$27,183	1,152,531	1,264,390	2,416,921
2030	679,956	736,221	373,188	435,384	$39,414	$41,795	$22,167	$26,041	1,114,724	1,239,440	2,354,164
2031	661,775	731,847	357,410	416,981	$38,525	$41,717	$21,008	$25,180	1,078,717	1,215,725	2,294,442
2032	644,248	727,500	342,299	399,357	$37,758	$41,747	$20,008	$24,463	1,044,313	1,193,066	2,237,380
2033	627,351	723,179	327,828	382,478	$36,970	$41,749	$19,076	$23,783	1,011,223	1,171,188	2,182,412
2034	611,058	718,884	313,968	366,312	$36,221	$41,743	$18,304	$23,266	979,551	1,150,205	2,129,756
2035	595,347	714,614	300,695	350,831	$35,455	$41,711	$16,640	$21,557	948,138	1,128,713	2,076,850
2036	580,196	710,371	287,984	336,004	$34,753	$41,682	$15,738	$20,774	918,670	1,108,831	2,027,501
2037	565,583	706,152	275,810	321,804	$34,059	$41,638	$14,912	$20,052	890,364	1,089,646	1,980,010
2038	551,488	701,960	264,151	308,204	$33,434	$41,677	$14,283	$19,559	863,357	1,071,399	1,934,756
2039	537,892	697,792	252,985	295,179	$32,815	$41,697	$13,979	$19,488	837,671	1,054,157	1,891,827
2040	524,774	693,649	242,292	282,705	$32,202	$41,700	$13,634	$19,346	812,902	1,037,400	1,850,302
2041	512,118	689,532	232,050	270,758	$31,126	$41,011	$13,391	$19,334	788,684	1,020,635	1,809,319
2042	499,905	685,439	222,242	259,317	$30,093	$40,334	$13,063	$19,185	765,302	1,004,275	1,769,577
2043	488,118	681,370	212,849	248,359	$29,101	$39,669	$12,969	$19,371	743,037	988,769	1,731,806
2044	476,742	677,326	203,853	237,864	$28,149	$39,014	$12,930	$19,635	721,674	973,840	1,695,514
2045	465,761	673,306	195,237	227,814	$27,235	$38,371	$12,937	$19,966	701,170	959,457	1,660,627
2046	455,160	669,310	186,985	218,187	$26,357	$37,738	$12,980	$20,356	681,482	945,593	1,627,075
2047	444,924	665,339	179,083	208,968	$25,513	$37,116	$13,055	$20,797	662,575	932,221	1,594,796
2048	435,040	661,391	171,514	200,139	$24,703	$36,505	$13,325	$21,557	644,582	919,591	1,564,174
2049	425,494	657,466	164,266	191,683	$23,924	$35,904	$13,448	$22,088	627,132	907,141	1,534,274
2050	416,274	653,566	157,324	183,584	$23,176	$35,312	$13,593	$22,660	610,366	895,122	1,505,488

Year	Travel Time Saving at Barker Road	Travel Time Saving at Pines Road	Barker Safety Benefit	Pines Safety Benefit	Barker Operating Cost	Pines Safety Benefit	Barker Emissions	Pines Safety Benefit	Barker 7% Discounted Benefit	Pines 7% Discounted Benefit	Barker+ Pines 7% Discounted Benefit
2051	407,367	649,688	150,676	175,827	$22,456	$34,731	$13,756	$23,270	594,254	883,516	1,477,771
2052	398,761	645,834	144,308	168,399	$21,764	$34,159	$13,936	$23,914	578,770	872,306	1,451,076
2053	390,445	642,003	138,210	161,284	$21,099	$33,597	$14,132	$24,593	563,886	861,477	1,425,363
2054	382,408	638,195	132,370	154,470	$20,459	$33,045	$14,341	$25,304	549,578	851,014	1,400,592
2055	374,640	634,409	126,777	147,944	$19,843	$32,501	$14,564	$26,047	535,824	840,902	1,376,726
2056	367,131	630,647	121,420	141,694	$19,250	$31,967	$14,800	$26,821	522,600	831,128	1,353,729
2057	359,869	626,906	116,289	135,708	$18,680	$31,442	$15,047	$27,625	509,886	821,682	1,331,567
2058	352,848	623,189	111,376	129,975	$18,131	$30,925	$15,306	$28,461	497,660	812,550	1,310,210
2059	346,056	619,493	106,670	124,484	$17,602	$30,418	$15,577	$29,327	485,905	803,722	1,289,627
2060	339,487	615,819	102,163	119,226	$17,093	$29,918	$15,859	$30,224	474,601	795,187	1,269,788
2061	333,130	612,168	97,846	114,189	$16,602	$29,427	$16,153	$31,152	463,731	786,937	1,250,668
2062	326,979	608,538	93,712	109,365	$16,129	$28,944	$16,457	$32,113	453,278	778,961	1,232,239
2063	321,026	604,930	89,753	104,746	$15,674	$28,470	$16,773	$33,105	443,226	771,251	1,214,477
2064	315,263	601,344	85,961	100,321	$15,234	$28,003	$17,101	$34,131	433,559	763,799	1,197,358
2065	309,684	597,779	82,329	96,083	$14,811	$27,544	$17,440	$35,190	424,264	756,596	1,180,860
2066	304,280	594,235	78,851	92,025	$14,403	$27,092	$17,791	$36,284	415,325	749,637	1,164,962
2067	299,047	590,713	75,520	88,138	$14,009	$26,649	$18,154	$37,414	406,729	742,913	1,149,642
2068	293,976	587,211	72,329	84,415	$13,628	$26,212	$18,530	$38,580	398,464	736,418	1,134,882
2069	289,064	583,731	69,274	80,849	$13,262	$25,783	$18,919	$39,783	390,518	730,146	1,120,664
Sum	25,673,810	33,891,215	12,029,252	14,034,909	1,446,770	1,838,675	952,405	1,369,560	40,102,238	51,134,360	91,236,598

Table 9 Summary of 3% discounted Barker and Pines Benefits per year

Year	Travel Time Saving at Barker Road	Travel Time Saving at Pines Road	Barker Safety Benefit	Pines Safety Benefit	Barker Operating Cost	Pines Safety Benefit	Barker Emissions	Pines Emissions	Barker 3% Discounted Benefit	Pines 3% Discounted Benefit	Barker+ Pines 3% Discounted Benefit
2020	1,093,588	945,128	695,507	811,312	$61,998	$52,836	$51,492	$48,770	1,902,584	1,858,046	3,760,630
2021	1,102,963	975,999	691,960	807,187	$41,812	$54,752	$48,813	$47,292	1,885,547	1,885,230	3,770,777
2022	1,112,782	1,008,190	688,433	803,083	$39,498	$56,559	$46,734	$46,305	1,887,446	1,914,138	3,801,584
2023	1,122,849	1,041,117	684,924	799,001	$37,271	$58,396	$44,945	$45,532	1,889,989	1,944,047	3,834,036
2024	1,133,278	1,075,121	681,435	794,941	$35,204	$60,298	$42,939	$44,463	1,892,856	1,974,823	3,867,679
2025	1,144,081	1,110,235	677,964	790,903	$33,291	$62,419	$41,204	$43,602	1,896,540	2,007,159	3,903,699
2026	1,155,270	1,146,497	674,511	786,886	$31,511	$64,614	$39,164	$42,341	1,900,457	2,040,337	3,940,794
2027	1,166,858	1,183,943	671,077	782,890	$29,823	$66,869	$37,231	$41,111	1,904,990	2,074,813	3,979,803
2028	1,178,858	1,222,613	667,661	778,915	$28,225	$69,183	$35,350	$39,858	1,910,093	2,110,569	4,020,663
2029	1,191,282	1,262,547	664,264	774,961	$26,734	$71,577	$33,676	$38,763	1,915,956	2,147,849	4,063,805
2030	1,204,145	1,303,786	660,885	771,028	$25,298	$74,016	$31,945	$37,527	1,922,273	2,186,357	4,108,630
2031	1,217,461	1,346,373	657,523	767,116	$24,007	$76,747	$30,420	$36,461	1,929,411	2,226,697	4,156,108
2032	1,231,246	1,390,351	654,180	763,225	$22,844	$79,784	$29,176	$35,671	1,937,445	2,269,031	4,206,475
2033	1,245,513	1,435,766	650,854	759,354	$21,716	$82,886	$27,923	$34,814	1,946,005	2,312,819	4,258,825
2034	1,260,279	1,482,665	647,546	755,503	$20,656	$86,093	$26,862	$34,144	1,955,343	2,358,405	4,313,748
2035	1,275,561	1,531,097	644,255	751,673	$19,631	$89,368	$23,764	$30,787	1,963,211	2,402,924	4,366,135
2036	1,291,375	1,581,112	640,982	747,862	$18,681	$92,775	$22,083	$29,150	1,973,121	2,450,899	4,424,019
2037	1,307,738	1,632,761	637,726	744,072	$17,775	$96,275	$20,412	$27,447	1,983,651	2,500,555	4,484,206
2038	1,324,668	1,686,098	634,488	740,302	$16,941	$100,107	$19,049	$26,085	1,995,146	2,552,592	4,547,738
2039	1,342,184	1,741,178	631,266	736,551	$16,143	$104,046	$18,110	$25,247	2,007,702	2,607,022	4,614,725
2040	1,360,305	1,798,058	628,062	732,820	$15,380	$108,093	$17,214	$24,426	2,020,961	2,663,398	4,684,358
2041	1,379,050	1,856,797	624,874	729,109	$14,433	$110,437	$16,495	$23,816	2,034,852	2,720,159	4,755,011
2042	1,398,441	1,917,456	621,704	725,417	$13,547	$112,832	$15,755	$23,140	2,049,447	2,778,845	4,828,292
2043	1,418,497	1,980,097	618,550	721,745	$12,719	$115,280	$15,306	$22,861	2,065,072	2,839,982	4,905,054
2044	1,439,241	2,044,785	615,412	718,091	$11,945	$117,781	$14,959	$22,716	2,081,558	2,903,374	4,984,932
2045	1,460,696	2,111,588	612,291	714,457	$11,220	$120,337	$14,700	$22,687	2,098,907	2,969,069	5,067,977
2046	1,482,883	2,180,573	609,187	710,842	$10,542	$122,950	$14,513	$22,760	2,117,126	3,037,125	5,154,251
2047	1,505,829	2,251,814	606,099	707,245	$9,908	$125,619	$14,389	$22,922	2,136,224	3,107,600	5,243,824
2048	1,529,556	2,325,382	603,027	703,668	$9,314	$128,347	$14,486	$23,436	2,156,383	3,180,833	5,337,216
2049	1,554,090	2,401,355	599,971	700,109	$8,757	$131,135	$14,460	$23,751	2,177,279	3,256,350	5,433,629
2050	1,579,459	2,479,811	596,932	696,569	$8,236	$133,985	$14,475	$24,132	2,199,102	3,334,496	5,533,598

Year	Travel Time Saving at Barker Road	Travel Time Saving at Pines Road	Barker Safety Benefit	Pines Safety Benefit	Barker Operating Cost	Pines Safety Benefit	Barker Emissions	Pines Emissions	Barker 3% Discounted Benefit	Pines 3% Discounted Benefit	Barker+ Pines 3% Discounted Benefit
2051	1,605,689	2,560,831	593,908	693,047	$7,748	$136,897	$14,526	$24,573	2,221,871	3,415,347	5,637,218
2052	1,632,807	2,644,499	590,900	689,543	$7,291	$139,873	$14,609	$25,069	2,245,607	3,498,983	5,744,591
2053	1,660,845	2,730,901	587,908	686,058	$6,862	$142,914	$14,720	$25,617	2,270,334	3,585,489	5,855,824
2054	1,689,830	2,820,128	584,932	682,590	$6,460	$146,022	$14,856	$26,212	2,296,078	3,674,952	5,971,030
2055	1,719,795	2,912,270	581,971	679,141	$6,083	$149,199	$15,015	$26,853	2,322,863	3,767,463	6,090,326
2056	1,750,770	3,007,424	579,025	675,710	$5,729	$152,445	$15,195	$27,537	2,350,720	3,863,116	6,213,836
2057	1,782,790	3,105,689	576,095	672,296	$5,398	$155,763	$15,394	$28,262	2,379,677	3,962,010	6,341,687
2058	1,815,888	3,207,165	573,181	668,901	$5,086	$159,154	$15,611	$29,026	2,409,766	4,064,246	6,474,012
2059	1,850,100	3,311,957	570,281	665,523	$4,794	$162,619	$15,845	$29,830	2,441,020	4,169,929	6,610,949
2060	1,885,461	3,420,175	567,397	662,162	$4,520	$166,161	$16,094	$30,672	2,473,472	4,279,170	6,752,643
2061	1,922,010	3,531,930	564,527	658,819	$4,262	$169,781	$16,360	$31,551	2,507,159	4,392,081	6,899,241
2062	1,959,785	3,647,337	561,673	655,493	$4,020	$173,481	$16,639	$32,468	2,542,118	4,508,779	7,050,897
2063	1,998,827	3,766,517	558,833	652,184	$3,793	$177,262	$16,934	$33,422	2,578,387	4,629,385	7,207,772
2064	2,039,175	3,889,592	556,009	648,893	$3,579	$181,127	$17,243	$34,414	2,616,006	4,754,025	7,370,031
2065	2,080,874	4,016,689	553,199	645,618	$3,378	$185,076	$17,565	$35,443	2,655,017	4,882,827	7,537,844
2066	2,123,968	4,147,942	550,403	642,361	$3,190	$189,113	$17,902	$36,510	2,695,462	5,015,925	7,711,388
2067	2,168,501	4,283,484	547,622	639,120	$3,012	$193,239	$18,252	$37,615	2,737,388	5,153,458	7,890,846
2068	2,214,521	4,423,456	544,856	635,896	$2,845	$197,457	$18,617	$38,760	2,780,839	5,295,568	8,076,407
2069	2,262,077	4,568,004	542,104	632,689	$2,688	$201,767	$18,995	$39,944	2,825,864	5,442,403	8,268,267
Sum	76,373,739	115,446,282	30,778,373	35,912,880	785,801	6,005,743	1,148,414	1,605,795	109,086,327	158,970,700	268,057,026

Table 10 Barker Costs per Year

	Barker				
	Maintenance	P.E.+R/W+ Construction	Total - Undiscounted	Total - Discounted 7%	Total - Discounted 3%
2017	$0	-$3,795,000	-$3,795,000	-$3,314,700	-$3,577,151
2018	$0	-$11,480,000	-$11,480,000	-$9,371,100	-$10,821,001
2019	$0	-$13,840,000	-$13,840,000	-$10,558,470	-$13,045,527
2020	$0	-$6,920,000	-$6,920,000	-$4,933,864	-$6,522,764
2021	-$9,000	$0	-$9,000	-$5,997	-$8,483
2022	-$9,201	$0	-$9,201	-$5,730	-$8,673
2023	-$9,406	$0	-$9,406	-$5,474	-$8,866
2024	-$9,616	$0	-$9,616	-$5,230	-$9,064
2025	-$9,831	$0	-$9,831	-$4,997	-$9,266
2026	-$10,050	$0	-$10,050	-$4,775	-$9,473
2027	-$10,274	$0	-$10,274	-$4,562	-$9,684
2028	-$10,503	$0	-$10,503	-$4,359	-$9,900
2029	-$10,738	$0	-$10,738	-$4,164	-$10,121
2030	-$10,977	$0	-$10,977	-$3,979	-$10,347
2031	-$11,222	$0	-$11,222	-$3,801	-$10,578
2032	-$11,473	$0	-$11,473	-$3,632	-$10,814
2033	-$11,729	$0	-$11,729	-$3,470	-$11,055
2034	-$11,990	$0	-$11,990	-$3,315	-$11,302
2035	-$12,258	$0	-$12,258	-$3,168	-$11,554
2036	-$12,531	$0	-$12,531	-$3,026	-$11,812
2037	-$12,811	$0	-$12,811	-$2,892	-$12,076
2038	-$13,097	$0	-$13,097	-$2,763	-$12,345
2039	-$13,389	$0	-$13,389	-$2,640	-$12,620
2040	-$13,688	$0	-$13,688	-$2,522	-$12,902
2041	-$13,993	$0	-$13,993	-$2,410	-$13,190
2042	-$14,305	$0	-$14,305	-$2,302	-$13,484
2043	-$14,625	$0	-$14,625	-$2,200	-$13,785
2044	-$14,951	$0	-$14,951	-$2,102	-$14,093
2045	-$15,284	$0	-$15,284	-$2,008	-$14,407
2046	-$15,626	$0	-$15,626	-$1,918	-$14,729
2047	-$15,974	$0	-$15,974	-$1,833	-$15,057

	Barker				
	Maintenance	P.E.+R/W+ Construction	Total - Undiscounted	Total - Discounted 7%	Total - Discounted 3%
2048	-$16,331	$0	-$16,331	-$1,751	-$15,393
2049	-$16,695	$0	-$16,695	-$1,673	-$15,737
2050	-$17,067	$0	-$17,067	-$1,599	-$16,088
2051	-$17,448	$0	-$17,448	-$1,527	-$16,447
2052	-$17,838	$0	-$17,838	-$1,459	-$16,814
2053	-$18,236	$0	-$18,236	-$1,394	-$17,189
2054	-$18,642	$0	-$18,642	-$1,332	-$17,572
2055	-$19,058	$0	-$19,058	-$1,273	-$17,964
2056	-$19,484	$0	-$19,484	-$1,216	-$18,365
2057	-$19,918	$0	-$19,918	-$1,162	-$18,775
2058	-$20,363	$0	-$20,363	-$1,110	-$19,194
2059	-$20,817	$0	-$20,817	-$1,061	-$19,622
2060	-$21,282	$0	-$21,282	-$1,013	-$20,060
2061	-$21,757	$0	-$21,757	-$968	-$20,508
2062	-$22,242	$0	-$22,242	-$925	-$20,965
2063	-$22,738	$0	-$22,738	-$884	-$21,433
2064	-$23,246	$0	-$23,246	-$844	-$21,911
2065	-$23,764	$0	-$23,764	-$807	-$22,400
2066	-$24,294	$0	-$24,294	-$771	-$22,900
2067	-$24,837	$0	-$24,837	-$736	-$23,411
2068	-$25,391	$0	-$25,391	-$704	-$23,933
2069	-$25,957	$0	-$25,957	-$672	-$24,467

Table 11 Pines Cost per Year

	Pines				
	Maintenance	P.E.+R/W+ Construction	Total - Undiscounted	Total - Discounted 7%	Total - Discounted 3%
2017	$0	-$3,164,500	-$3,164,500	-$2,763,997	-$2,982,845
2018	$0	-$6,183,833	-$6,183,833	-$5,047,850	-$5,659,083
2019	$0	-$6,944,444	-$6,944,444	-$5,297,883	-$6,170,049
2020	$0	-$3,472,222	-$3,472,222	-$2,475,646	-$2,995,169
2021	-$11,000	$0	-$11,000	-$7,330	-$9,212
2022	-$11,245	$0	-$11,245	-$7,003	-$9,144
2023	-$11,496	$0	-$11,496	-$6,691	-$9,075
2024	-$11,753	$0	-$11,753	-$6,393	-$9,008
2025	-$12,015	$0	-$12,015	-$6,108	-$8,940
2026	-$12,283	$0	-$12,283	-$5,836	-$8,874
2027	-$12,557	$0	-$12,557	-$5,576	-$8,807
2028	-$12,837	$0	-$12,837	-$5,327	-$8,742
2029	-$13,124	$0	-$13,124	-$5,090	-$8,676
2030	-$13,417	$0	-$13,417	-$4,863	-$8,612
2031	-$13,716	$0	-$13,716	-$4,646	-$8,547
2032	-$14,022	$0	-$14,022	-$4,439	-$8,484
2033	-$14,335	$0	-$14,335	-$4,241	-$8,420
2034	-$14,655	$0	-$14,655	-$4,052	-$8,357
2035	-$14,982	$0	-$14,982	-$3,872	-$8,295
2036	-$15,316	$0	-$15,316	-$3,699	-$8,233
2037	-$15,658	$0	-$15,658	-$3,534	-$8,172
2038	-$16,007	$0	-$16,007	-$3,377	-$8,111
2039	-$16,364	$0	-$16,364	-$3,226	-$8,050
2040	-$16,729	$0	-$16,729	-$3,082	-$7,990
2041	-$17,103	$0	-$17,103	-$2,945	-$7,930
2042	-$17,484	$0	-$17,484	-$2,814	-$7,871
2043	-$17,874	$0	-$17,874	-$2,688	-$7,813
2044	-$18,273	$0	-$18,273	-$2,569	-$7,754
2045	-$18,681	$0	-$18,681	-$2,454	-$7,696
2046	-$19,098	$0	-$19,098	-$2,345	-$7,639
2047	-$19,524	$0	-$19,524	-$2,240	-$7,582
2048	-$19,960	$0	-$19,960	-$2,140	-$7,525
2049	-$20,405	$0	-$20,405	-$2,045	-$7,469

	Pines				
	Maintenance	P.E.+R/W+ Construction	Total - Undiscounted	Total - Discounted 7%	Total - Discounted 3%
2050	-$20,860	$0	-$20,860	-$1,954	-$7,413
2051	-$21,326	$0	-$21,326	-$1,867	-$7,358
2052	-$21,802	$0	-$21,802	-$1,784	-$7,303
2053	-$22,288	$0	-$22,288	-$1,704	-$7,249
2054	-$22,785	$0	-$22,785	-$1,628	-$7,195
2055	-$23,294	$0	-$23,294	-$1,556	-$7,141
2056	-$23,813	$0	-$23,813	-$1,486	-$7,088
2057	-$24,345	$0	-$24,345	-$1,420	-$7,035
2058	-$24,888	$0	-$24,888	-$1,357	-$6,982
2059	-$25,443	$0	-$25,443	-$1,296	-$6,930
2060	-$26,011	$0	-$26,011	-$1,238	-$6,878
2061	-$26,591	$0	-$26,591	-$1,183	-$6,827
2062	-$27,185	$0	-$27,185	-$1,131	-$6,776
2063	-$27,791	$0	-$27,791	-$1,080	-$6,725
2064	-$28,411	$0	-$28,411	-$1,032	-$6,675
2065	-$29,045	$0	-$29,045	-$986	-$6,625
2066	-$29,693	$0	-$29,693	-$942	-$6,576
2067	-$30,356	$0	-$30,356	-$900	-$6,527
2068	-$31,033	$0	-$31,033	-$860	-$6,478
2069	-$31,726	$0	-$31,726	-$822	-$6,430

Table 12 Inputs and Assumptions for Barker Vehicle Delay

Input #	Input Name	Units	Value	Source/Comment
1	2016 - No. of Freight Trains Passing the Crossing/ Day	trains/day	56	http://goo.gl/UlvLS0 | http://goo.gl/1j9AKd | http://goo.gl/j6CsrA | http://goo.gl/SPthLH
2	2069 No. of Freight Trains Passing the Crossing/ Day	trains/day	288	http://goo.gl/SPthLH
3	2016 No. of Passenger Trains Passing the Crossing/ Day	trains/day	2	http://goo.gl/UlvLS0
4	Expected Passenger Annual Traffic Growth	%	2.00%	Estimate from DKS
5	Avg. Speed of Freight Train	mph	25	Speed Regulations in the BNSF Spokane area | http://goo.gl/2pXWk1
6	Avg. Speed of Passenger Train	mph	30	Speed Regulations in the BNSF Spokane area | http://goo.gl/2pXWk1
7	Avg. Freight Train Length	feet	6,500	http://goo.gl/go220P | http://goo.gl/mlLOIp
8	Avg. Passenger Train Length	feet	1,000	
9	Barker/ Trent Intersection Annual Veh. Growth	%	1.40%	
10	N Del Rey Residential Area Annual Veh. Growth	%	5.50%	
11	Time of Lead/ Lag	minutes	0.6	
12	2016 Avg. Daily Traffic (ADT) at the Grade Crossing	vehicles	5,500	http://goo.gl/UlvLS0 | then filter for Washington State, Spokane
13	2069 Avg. Daily Traffic (ADT) at the Grade Crossing	vehicles	8,150	
14	Year of ADT	year	2016	
15	Automobile Driver and Passenger Value of Time	$/hour	$12.50	https://goo.gl/VAR0hX
16	Bus Passenger Value of Time	$/hour	$15.00	
17	Truck Driver Value of Time	$/hour	$25.80	
18	Bus Driver Value of Time	$/hour	$26.70	
19	Value of Time Annual Growth Rate	%	1.45%	
20	2016 Avg. Daily Traffic (ADT) to N Del Rey Residential Area	vehicles	1,500	
21	Base Case Distance from Grade Crossing to N Del Rey Residential Area	miles	0.6	Google Earth Measurement | https://goo.gl/8cw97c
22	Alt Case Distance from Grade Crossing to N Del Rey Residential Area	miles	0.2	Google Earth Measurement | https://goo.gl/8cw97c
23	Base Case Avg. Veh. Speed	mph	12	Two one minute stops at Trent/Barker, and Trent/N DelRay Dr | https://goo.gl/8cw97c
24	Alt Case Avg. Veh. Speed	mph	30	Estimate from DKS
25	% of Automobiles of Total Traffic	%	87.00%	Estimate from DKS
26	% of Buses of Total Traffic	%	1.00%	Estimate from DKS
27	% of Trucks of Total Traffic	%	12.00%	Estimate from DKS
28	Avg. No. of Persons/ Automobile	persons	1.6	http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/CAFE_2012-2016_FRIA_04012010.pdf
29	Avg. No. of Passenger/ Bus	passengers	60	http://goo.gl/RwTDcH

Table 13 Inputs and Assumptions for Pines Vehicle Delay

Input #	Input Name	Units	Value	Source/Comment
1	2016 - No. of Freight Trains Passing the Crossing/ Day	trains/day	56	http://goo.gl/UlvLS0 | http://goo.gl/1j9AKd | http://goo.gl/j6CsrA | http://goo.gl/SPthLH
2	2069 No. of Freight Trains Passing the Crossing/ Day	trains/day	288	http://goo.gl/SPthLH
3	2016 No. of Passenger Trains Passing the Crossing/ Day	trains/day	2	http://goo.gl/UlvLS0 | Crossing # 066244T
4	Expected Passenger Annual Traffic Growth	%	2.00%	Estimate from DKS
5	Avg. Speed of Freight Train	mph	25	Speed Regulations in the BNSF Spokane area | http://goo.gl/2pXWk1
6	Avg. Speed of Passenger Train	mph	30	Speed Regulations in the BNSF Spokane area | http://goo.gl/2pXWk1
7	Avg. Freight Train Length	feet	6,500	http://goo.gl/go220P | http://goo.gl/mlLOIp
8	Avg. Passenger Train Length	feet	1,000	
9	Pines/ Trent Intersection Annual Veh. Growth	%	1.40%	
10	N Del Rey Residential Area Annual Veh. Growth	%	5.50%	
11	Time of Lead/ Lag	minutes	0.6	
12	2016 Avg. Daily Traffic (ADT) at the Grade Crossing	vehicles	16,400	http://goo.gl/UlvLS0 | then filter for Washington State, Spokane
13	2069 Avg. Daily Traffic (ADT) at the Grade Crossing	vehicles	31,600	
14	Year of ADT	year	2016	
15	Automobile Driver and Passenger Value of Time	$/hour	$12.50	https://goo.gl/VAR0hX
16	Bus Passenger Value of Time	$/hour	$15.00	
17	Truck Driver Value of Time	$/hour	$25.80	
18	Bus Driver Value of Time	$/hour	$26.70	
19	Value of Time Annual Growth Rate	%	1.45%	
20	2016 Avg. Daily Traffic (ADT) to N Del Rey Residential Area	vehicles	1,500	
21	Base Case Distance from Grade Crossing	miles	0	Google Earth Measurement | https://goo.gl/BecMWb
22	Alt Case Distance from Grade Crossing	miles	0	Google Earth Measurement | https://goo.gl/BecMWb
23	Base Case Avg. Veh. Speed	mph	12	Two one minute stops at Trent/Pines | https://goo.gl/8cw97c
24	Alt Case Avg. Veh. Speed	mph	30	Estimate from DKS
25	% of Automobiles of Total Traffic	%	87.00%	Estimate from DKS
26	% of Buses of Total Traffic	%	1.00%	Estimate from DKS
27	% of Trucks of Total Traffic	%	12.00%	Estimate from DKS
28	Avg. No. of Persons/ Automobile	persons	1.6	http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/CAFE_2012-2016_FRIA_04012010.pdf
29	Avg. No. of Passenger/ Bus	passengers	60	http://goo.gl/RwTDcH

Table 14 Barker Safety Inputs and Assumptions

Name of the Input	Units	Value	Input specific to grade crossing, from Database Input sheet		
Rail Grade Crossing Expected Accident Rate per Year - Base Case	accidents/year	0.1290	http://goo.gl/rIz9y3	http://goo.gl/gaelTM	http://goo.gl/a6BNaK
Rail Grade Crossing Expected Accident Rate per Year - Alt. Case	accidents/year	0			
Fatalities as Share of Total Accidents	%	31%	http://goo.gl/lE6oZU	Calculations below	Avg. of 1991-2014 (No of fatalities)/(total no of crossing accidents)
Injuries as Share of Total Accidents	%	69%	http://goo.gl/lE6oZU	Calculations below	Avg. of 1991-2014 (No of fatalities)/(total no of crossing accidents)
Road Intersection Expected Injuries per Year - Base Case	injuries/year	1.25	Provided from the City of Spokane Valley		
Road Intersection Expected Fatalities per Year - Base Case	fatalities/year	0.047304	Conversion of a two-way stop to a diamond interchange		
Road Intersection Expected PDO per Year - Base Case	PDO/year	1.81332			
Road Intersection Expected Injuries per Year - Alt Case	injuries/year	0.21024			

Name of the Input	Units	Value	Input specific to grade crossing, from Database Input sheet
Road Intersection Expected Fatalities per Year - Alt Case	fatalities/year	0.024528	
Road Intersection Expected PDO per Year - Alt Case	PDO/year	0.36792	
Value of a Statistical Life	2,014$	$9,400,000	https://goo.gl/1LY0U3
Average Cost per Accident Injury	2,013$	$166,778	US DOT, Based on MAIS Injury Severity Scale and KACBO-AIS Conversion if Injury Unknown. Department of Transportation Analyses. 2013.
Cost of a Property Damage Only (PDO) Accident	2,013$	$3,927	https://goo.gl/Mf9sZd
Growth of the Cost of Accidents	%	1.07%	Adjusted for growth in real income (source: US DOT)

Table 15 Pines Safety Inputs and Assumptions

Name of the Input	Units	Value	Input specific to grade crossing, from Database Input sheet		
Rail Grade Crossing Expected Accident Rate per Year - Base Case	accidents/year	0.1718	http://goo.gl/rIz9y3	http://goo.gl/gaelTM	http://goo.gl/a6BNaK
Rail Grade Crossing Expected Accident Rate per Year - Alt. Case	accidents/year	0			
Fatalities as Share of Total Accidents	%	31%	http://goo.gl/lE6oZU	Calculations below	Avg. of 1991-2014 (No of fatalities)/(total no of crossing accidents)
Injuries as Share of Total Accidents	%	69%	http://goo.gl/lE6oZU	Calculations below	Avg. of 1991-2014 (No of fatalities)/(total no of crossing accidents)
Road Intersection Expected Injuries per year - Base Case	injuries/year	1.25	Provided from the City of Spokane Valley		
Road Intersection Expected Fatalities per year - Base Case	fatalities/year	0.047304	Conversion of a two-way stop to a diamond interchange		
Road Intersection Expected PDO per year - Base Case	PDO/year	1.81332			
Road Intersection Expected Injuries per year - Alt Case	injuries/year	0.21024			

Name of the Input	Units	Value	Input specific to grade crossing, from Database Input sheet
Road Intersection Expected Fatalities per year - Alt Case	fatalities/year	0.024528	
Road Intersection Expected PDO per year - Alt Case	PDO/year	0.36792	
Value of a Statistical Life	2,014$	$9,400,000	https://goo.gl/1LY0U3
Average Cost per Accident Injury	2,013$	$166,778	US DOT, Based on MAIS Injury Severity Scale and KACBO-AIS Conversion if injury Unknown. Department of Transportation Analyses. 2013.
Cost of a Property Damage Only (PDO) Accident	2,013$	$3,927	https://goo.gl/Mf9sZd
Growth of the Cost of Accidents	%	1.07%	Adjusted for growth in real income (source: US DOT)

Table 16 Operating Costs Inputs and Assumptions

Description	Value	Unit	Source
Fuel consumption at idle (auto)	0.44	gal/hr	Argonne National Laboratory Idling Worksheet - Average of Gas Passenger Cars (http://www.anl.gov/sites/anl.gov/files/idling_worksheet.pdf)
Fuel consumption at idle (bus)	0.97	gal/hr	Argonne National Laboratory Idling Worksheet - Transit Bus (http://www.anl.gov/sites/anl.gov/files/idling_worksheet.pdf)
Fuel consumption at idle (truck)	1.1	gal/hr	Argonne National Laboratory Idling Worksheet - Delivery Truck with Load (http://www.anl.gov/sites/anl.gov/files/idling_worksheet.pdf)
Fuel economy (auto)	23.41	mi/gal	Dept of Energy AFDC Avg Fuel Economy of Major Vehicle Categories updated 2015 - Car (http://www.afdc.energy.gov/data/10310)
Fuel economy (bus)	6.64	mi/gal	Dept of Energy AFDC Avg Fuel Economy of Major Vehicle Categories updated 2015 - Delivery Truck (http://www.afdc.energy.gov/data/10310)
Fuel economy (truck)	6.30	mi/gal	Dept of Energy AFDC Avg Fuel Economy of Major Vehicle Categories updated 2015 - School Bus (http://www.afdc.energy.gov/data/10310)

Table 17 Emissions Inputs and Assumptions

Description	Value	Unit	Source
Fuel consumption at idle (auto)	0.44	gal/hr	Argonne National Laboratory Idling Worksheet - Average of Gas Passenger Cars (http://www.anl.gov/sites/anl.gov/files/idling_worksheet.pdf)
Fuel consumption at idle (bus)	0.97	gal/hr	Argonne National Laboratory Idling Worksheet - Transit Bus (http://www.anl.gov/sites/anl.gov/files/idling_worksheet.pdf)
Fuel consumption at idle (truck)	1.10	gal/hr	Argonne National Laboratory Idling Worksheet - Delivery Truck with Load (http://www.anl.gov/sites/anl.gov/files/idling_worksheet.pdf)
Fuel economy (auto)	23.41	mi/gal	Dept of Energy AFDC Avg Fuel Economy of Major Vehicle Categories updated 2015 - Car (http://www.afdc.energy.gov/data/10310)
Fuel economy (bus)	6.64	mi/gal	Dept of Energy AFDC Avg Fuel Economy of Major Vehicle Categories updated 2015 - Delivery Truck (http://www.afdc.energy.gov/data/10310)
Fuel economy (truck)	6.30	mi/gal	Dept of Energy AFDC Avg Fuel Economy of Major Vehicle Categories updated 2015 - School Bus (http://www.afdc.energy.gov/data/10310)
Monetized value of VOCs	$1,844	2015$/short ton	Corporate Average Fuel Economy for MY2017-MY2025 Passenger Cars and Light Trucks (August 2012), page 922, Table VIII-16, "Economic Values Used for Benefits Computations (2010 dollars)" http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FRIA_2017-2025.pdf
Monetized value of NOx	$7,266	2015$/short ton	
Monetized value of PM	$332,405	2015$/short ton	
CO2 per gallon of fuel burned	8,887	gram/gal	US DOT. NHTSA. Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards. 75 FR 25324, May 7, 2010.
Grams per short ton	907,185	grams	

Table 18 Barker Road Cost Estimates

Bridging The Valley				
City of Spokane Valley				
Cost Estimate				
4/7/2016				
Alternative:		**General Description:**		
Consolidated Corridor		Barker Road 4-lane overcrossing of 6-track transload yard and over 4-lane SR 290.		
Project Name:	Bridge #	Extend Barker Rd (2 lanes only) north of SR 290 to Del Rey Drive		
Barker/Wellesley - BNSF		EB on/off ramps on MSE walls between RR and highway		
Location:	RR Milepost:	Barker approaches on fill. Some cut required north of SR290.		
Barker Rd/BNSF & SR290	58.93	Build new embankments using mat'l from existing Wellesley roadbed		
Project Type:		Build new Wellesley Ave south of and parallel to RR tracks		
Overcrossing / Interchange				
Project Information:	**Comments:**		**Cost (2016 Dollars)**	
Roadway	Proposed:	Existing:		$9,570,297
Crossing road	Barker			
Classification	Urban Principal Arterial			
No. of Through lanes	4	2		
No. of Turn lanes	0	0		
Intersecting road	SR 290 (Trent Ave.), Hwy Milepost 12.5			
Classification	Principal Arterial (P-6)			
Bicycle lanes	1 bicycle lane on each side of bridge	0		
No. of Through lanes	4	4		
No. of Turn lanes	4 ramps	1 right-turn (EB-SB)		
Railroad Tracks				$0
No. of Mainline	3	1		
No. of Siding	2	0		
No. of Yard	1	0		
Crossing Removal	1			
Bridge				$5,851,878
Hwy Bridge				
Configuration	3-span over transload yard, spill-thru abutment south, retaining abutment north			
Structure Type	precast concrete W58G girders. Include crash walls at Pier 3			
Hwy Bridge				

Configuration	Single-span, retaining abutments				
Structure Type	precast concrete WF74G girders				
Ancillary Facilities				$1,629,219	
Frontage roads	New	New Wellesley Ave, 2900-ft of 3-lane			
Retaining Walls	Yes	MSE walls for EB on/off ramps at Trent			
Pump station	No				
Traffic Signal	Yes				
Utilities	Yes	water, power, tel			
Temporary Facilities				$237,998	
Road detour	No				
Shoring	No				
Bridge structure	No				
Traffic Control	Yes				
	Construction Subtotal			$17,289,392	
	Contingency		30%	$5,186,818	
	Mobilization		10%	$2,247,621	
	Total Construction Cost				$24,723,831
	Design Engineering		10%	$2,472,383	
	Construction Engr and Insp		16.5%	$4,079,432	
	Total Project Development Cost				$6,551,815
	Sales Tax	% of Total Construction Cost	8.7%		$2,150,973
Other Direct Costs				$189,922	
Railroad Flagging	Yes	9 Months			
Shoofly Track	No				
Remove RR Crossing	Yes				
Temporary RR Signals	Yes				
Temporary RR Crossing	No				$189,922
Project Estimate- subtotal					$33,616,541
		Cost/Unit	SF		
Project ROW Costs		$4.00	604610		$2,418,440
Project Total Estimate					$36,034,981
Indirect Project Costs (Paid by others, not included in the estimate above)					$47,481

BARKER OVERCROSSING / INTERCHANGE					
Work Item	**L x W x D**	**Qty**	**Unit**	**Unit Cost**	**Cost**
Demo Wellesley & WB Trent (Ramp B)	5500 + 6200	12,000	SY	$5.35	$64,259
Remv Exist Wellesley Embankments	As req'd for new embankmn	90,000	CY	$9.52	$856,793
Rock Excav WB On-Ramp		15,000	CY	$23.80	$356,997
Fill Barker North Approach	860 x 63 x 7ave	14,000	CY	$14.28	$199,918
Added 10' of additional width of new bridge	860 x 10 x 7 avg	2,230	CY	$20.00	$44,600
Fill Barker South Approach	1200 x 136 x 25 ave	151,000	CY	$14.28	$2,156,262
Added 10' of additional width of new bridge	1200 x 10 x 25	11,111	CY	$20.00	$222,220
Fill for New Wellesley		83,000	CY	$14.28	$1,185,230
Fill for EB ramps (use avail fill mat'l)	2x(1000x82x20 ave)	122,000	CY	$2.38	$290,358
Fill for WB Ramps		28,000	CY	$14.28	$399,837
New Barker Road (N of Trent)	634 x 2-lane ave	634	LF	$188.02	$119,204
New Bafker Road (S of Trent)	869 x 6-lane ave	869	LF	$415.31	$360,901
New Barker Road (S of Trent)	1050 x 4-lane ave	1,050	LF	$307.02	$322,368
New Wellesley (4-lane)	1305 x 4-lane ave	1,305	LF	$293.93	$383,575
New Wellesley (3-lane)	1595 x 3-lane ave	1,595	LF	$258.23	$411,873
New WB Trent	2560 x 1-lane	2,560	LF	$173.74	$444,771
New on/off ramps	3x2000' + 1150'	7,150	LF	$173.74	$1,242,231
WB on/off ramp (2-lane)	850 2-lane ave	850	LF	$224.91	$191,172
Connector Road (McMillan Rd)	500 x 2-lane Rural	500	LF	$188.02	$94,009
Guardrail (Barker + Ramps + Wellesley)	250+6000+650	6,900	LF	$23.80	$164,219
Driveways & cul-de-sacs		5	EA	$11,900.00	$59,500
Hwy Bridge over RR	269.3 x 78.63	21,175	SF	$139.60	$2,955,935
Added 10' of additional width of new bridge	269.3 X 10	2,693	SF	$200.00	$538,600
Hwy Bridge over Hwy	141 x 90.63	12,779	SF	$149.74	$1,913,504
Added 10' of additional width of new bridge	141 x 10	1,410	SF	$200.00	$282,000
Demo existing Wellesley bridges	2 ea	1	LS	$161,839.00	$161,839
MSE Wall (Barker SW)	280 x 16ave	4,500	SF	$41.65	$187,423
MSE Walls (EB On-Ramp)	340 x 5ave	1,700	SF	$41.65	$70,804
MSE Walls (EB Off-Ramp)	480 x 10ave	4,800	SF	$41.65	$199,918
Conc Barrier Rail (Barker + Wellesley)	2100 + 600	2,700	LF	$42.00	$113,400

Traffic Signal		3	INT	$300,000.00	$900,000
Lighting (Overhead)		3	INT	$29,749.67	$89,249
Relocate 8-inch water line		550	LF	$59.50	$32,725
Relocate tel-com lines		1,000	LF	$35.70	$35,700
Traffic Control		1	LS	$237,998.00	$237,998
Construction Subtotal					$17,289,392
Other Direct Costs					
Railroad Flagging	9 months x 21 days/mo	189	DAYS	$951.99	$179,926
Crossing Removal		1	LS	$4,760.00	$4,760
C&S Work		1	LS	$5,236.00	$5,236
ODC Subtotal					$189,922
Indirect Project Costs (Paid by Others)					
Relocate power poles	(Avista's cost $30k)	2	EA	$17,850.00	$35,700
Relocate gas line		550	LF	$21.42	$11,781
IPC Subtotal					$47,481

Assumptions:

This estimate was only reviewed with the City to provide our assistance in suggesting updates to the Engineers estimate. The previous estimate was only updated where highlighted.

This estimate does not account for a revision in the bridge standards or RR crossing width/height revisions.

1. Increased construction management costs from 15% to 16.5% to account for management costs that will be extended over 3 years.
2. Increased contingency costs up to 30% to account for a budget estimate based on a 30% design.
3. Increased cost for traffic signal ($300,000 + $100,000 for a temporary signal with multiple phases due to the lowering and reconfiguration of the signalized intersection.
4. Increased MSE wall to match Barker MSE at $41.65. Previously listed at $35 per SF
5. Contingency does not cover if bridge standards require additional height or width for the bridge crossings.
6. Increased the width of Barker Road to accommodate an additional 10' of structure width. This would likely be tapered down on each side but I left the estimate accommodating the additional width for the approaches (since they will be wall structures)

Items Missing (contingency):

1. Clearing and Grubbing
2. Removal of structure and obstructions
3. Erosion Water Pollution Control
4. Bridge transverse joint seal
5. Waterproofing membrane

6. Landscaping
7. Elements associated with roadway (assumed included in unit price for new road) Signing, striping, curb and gutter

Table 19 Pines Road Cost Estimates

Bridging The Valley				
City of Spokane Valley				
Cost Estimate				
4/7/2016				
Alternative:		**General Description:**		
Consolidated Corridor		Construct New Railroad Overhead grade separation structure		
Project Name:	Bridge #	Realign Pines Road to the east of right-angle crossing of track and better approach to Trent		
Pines - BNSF		Allows construction on new alignment while maintaining traffic on old alignment		
Location:	RR Milepost:	Construct bridge in phases: 1st phase constructs the north 2/3		
Pines Rd near Trent	62.95	of the bridge. Single mainline traffic is sifted to the north side utilizing the planned turnouts		
Project Type:		to maintain the control point, while the south third of the structure is constructed		
Road Underpass				
Project Information:	**Comments:**		**Cost (2016 Dollars)**	
Roadway	Proposed:	Existing:		$2,653,908
Crossing road	Pines (SR 27)			
Classification	Principal Arterial (P-6)			
Bicycle lanes	1 bicycle lane on each side of bridge	0		
No. of Through lanes	4 1300 ft. on new alignment to cross the right angle			
No. of Turn lanes	2	4 thru + 0 turn lanes		
Intersecting road	Trent (SR 290). Highway Milepost 8.4 +/-			
Classification	Principal Arterial (P-6)			
No. of Through lanes	4 1500 ft. on lowered alignment to match Pines Rd grade	4		
No. of Turn lanes	3	4 thru + 2 turn		
Railroad Tracks				$0
No. of Mainline	3	Existing Main + 2 new main track		
No. of Siding	1	spur track to cement transload facility north of Trent		
No. of Yard	0			
Crossing Removal	2	one for existing mainline and one for spur track		

Bridge				$2,903,760	
RR Bridge					
Configuration	4 spans, 40-44-44-40 with concrete piers in center median, spill through abutments				
Structure Type	precast, prestressed concrete box girder spans on concrete pile supported substr.				
Ancillary Facilities					
Frontage roads	No				
Retaining Walls	Yes				
Pump station	Yes				
Traffic Signal	Yes	Plus streetlights			
Utilities	Yes	Sewer, water, power, gas, petro, telephone			
Temporary Facilities				$940,000	
Road detour	Yes	Lane Shift			
Shoring	Yes				
Bridge structure	No				
Traffic Control	Yes				
	Construction Subtotal			$8,311,827	
	Contingency		30%	$2,493,548	
	Mobilization		10%	$1,080,538	
	Total Construction Cost				$11,885,913
	Design Engineering		10%	$1,188,591	
	Construction Engr and Insp		16.5%	$1,961,176	
	Total Project Development Cost				$3,149,767
	Sales Tax	% of Total Construction Cost	8.4%		$998,417
Other Direct Costs				$779,350	
Railroad Flagging	Yes	9 Months			
Shoofly Track	Yes	2621 TF, turnouts in permeant triple track estimate			
Remove RR Crossing	Yes	2621 TF, turnouts in permeant triple crossing estimate			
Temporary RR Signals	Yes				
Temporary RR Crossing	Yes	2			$779,350

Project Estimate - subtotal		$16,813,446

Project ROW Costs	$2,950,000
Project Total Estimate	$19,763,446
Indirect Project Costs (Paid by others, not included in the estimate above)	$789,625

PINES UNDERCROSSING					
Work Item	**L x W x D**	**Qty**	**Unit**	**Unit Cost**	**Cost**
Pines Road cut	1262x138avex11 .5ave	74,000	CY	$8	$592,000
Additional 8' of width added	1262x8x11.5	4,300	CY	$12	$51,600
Pines Road realignment	1245x5 lane	1,245	LF	$400	$498,000
Pines Road Realignment with 8' addl width	8' additional width	1,245	LF	$52	$64,740
Removal of Structures and Obstructions (boulders in the cut area)		1	FA	$35,000	$35,000
Cement Road cut	334x40x8ave	4,000	CY	$8	$32,000
Cement Road realignment	334x2 lane Residential	334	LF	$167	$55,778
Trent road cut	1600x128x7ave	53,000	CY	$8	$424,000
New Trent	300 x 5-lane	300	LF	$396	$118,800
New Trent	1300 x 7-lane	1,300	LF	$554	$720,200
New School Driveways & Pinecroft Way	370 x 2-lane	370	LF	$167	$61,790
RR Bridge over Highway	168x61	1	LS	$2,552,000	$2,552,000
Additional 8' of width for	13% added to project	1	LS	$331,760	$331,760
Under bridge lighting	168 LF	1	LS	$20,000	$20,000
Additional 8' of width for	13% added to project	1	LS	$2,600	$2,600
MSE walls Cement Rd	(180x8ave)	1,440	SF	$42	$59,976
MSE walls Trent (North side)	(340x8ave)+(520x10ave)	7,920	SF	$42	$329,868
Pump station		1	EA	$500,000	$500,000
Communication (ITS- fiber line)	1245	1,245	LF	$7	$8,715
Traffic Signal		1	EA	$400,000	$400,000
Lights	Pines I Trent intersection	1	INT	$25,000	$25,000
Utility Relocation: Qwest Buried Telephone	Trent . Pines. Cement	2000	LF	$200	$400,000
Utility Relocation: Water Mains	in Trent & Pines	1760	LF	$50	$88,000
Shoring for Staged Bridge Construction	168 LF	1	LS	$50,000	$50,000
ACP overlay on Pines for RR shoo-Oy Xing	200x50	10000	SF	$1	$10,000
Shoring for Staged Trent Construction	1000x6 ave	6000	SF	$30	$180,000

Traffic Control		1	LS	$100,000	$100,000
Construction Phasing Impacts	6 phases	6	EA	$100,000	$600,000
Construction Subtotal					$8,311,827
Other Direct Costs					
Remove Existing RR Xing Signals	2 crossings	1	LS	$9,000	$9,000
Remove Existing RR Xing	2 crossings	1	LS	$6,000	$6,000
Install Temporary Two Track Crossing		1	LS	$20,000	$20,000
Install temporary Control Point (Signal Costs)		1	LS	$200,000	$200,000
Railroad Flagging	9 months x 21 daysfmo	189	Days	$800	$151,200
Railroad Shoofly (turnouts in Track Costs)		2621	TF	$150	$393,150
ODC Subtotal					$779,350
Indirect Project Costs (Paid by Others)					
Utility Relocation: Yellowstone Pipeline	south of tracks	570	LF	$200	$114,000
Utility Relocation: Century Link		1245	LF	$125	$155,625
Utility Relocation: Avista 12-inch Gas Main	south side of Trent	1450	LF	$200	$290,000
Utility Relocation: Avista 2-inch Gas Main	north side of Trent	1150	LF	$200	$230,000
IPC Subtotal					$789,625

Assumptions:

This estimate was only reviewed with the City to provide our assistance in suggesting updates to the Engineers estimate. The previous estimate was only updated where highlighted.

This estimate does not account for a revision in the bridge standards or RR crossing width/height revisions.

1. Increased construction management costs from 15% to 16.5% to account for management costs that will be extended over 3 years.
2. Increased contingency costs up to 30% to account for a budget estimate based on a 30% design.
3. Increased cost for traffic signal ($300,000 + $100,000 for a temporary signal with multiple phases due to the lowering and reconfiguration of the signalized intersection.
4. Increased MSE wall to match Barker MSE at $41.65. Previously listed at $35 per SF
5. Contingency does not cover if bridge standards require additional height or width for the bridge crossings.

6. Added 8' additional width to Pines to accommodate bicycle lanes on both sides of the bridge undercrossing. This would account for additional cut, pavement, and structure under the RR.

Items Missing (contingency):

1. Clearing and Grubbing
2. Erosion Water Pollution Control
3. Bridge transverse joint seal
4. Waterproofing membrane
5. Landscaping
6. Elements associated with roadway (assumed included in unit price for new road) Signing, striping, curb and gutter
7. Not sure how or if there will be dewatering required during construction but if this is a factor, the costs may exceed this contingency.
8. ITS fiber on Pines that runs up to Trent. Fairly good size fiber line. Century link on the east side of Pines that is on the project.
9. BNSF is working on their RR pre-emption and its part of a project that they are working on. Not sure if they will implement this before the project or after it.

Appendix C.

Fiscal and Economic Benefits of the Project

- Report for Fiscal and Economic Benefits of the Barker Road/BNSF Grade Separation Project
- Report for Fiscal and Economic Benefits of the Pines Road/BNSF Grade Separation Project

ECONorthwest
ECONOMICS • FINANCE • PLANNING

DATE: March 26, 2015
TO: Mike Basinger and Gloria Mantz, City of Spokane Valley
FROM: Morgan Shook and Austin Rempel, ECONorthwest
SUBJECT: FISCAL AND ECONOMIC BENEFITS OF THE BARKER ROAD PROJECT

Background and Purpose

The City of Spokane Valley (City) is currently contemplating investments in infrastructure to support industrial zoned lands within the City. The City is currently assembling a funding package that potentially includes federal, state, and local sources. As part of the planning, the City would like to better understand both the tax benefits and economic impact of the project to support decision-making. This memorandum summarizes preliminary results of analyses that estimate the ability of targeted infrastructure to support a higher a level of development intensities. Specifically, the analyses include estimates of:

- Potential incremental development estimates stemming from the infrastructure projects
- Potential tax revenue benefits accruing to the City of Spokane Valley and State of Washington from the incremental development.
- Potential direct and indirect economic effects (e.g. economic output, jobs, and wages) to Washington State.

Analytic Framework

The infrastructure projects provide benefits to development in the form of better access, travel-time savings, and operational savings. Utility improvements allow for development to host greater levels of economic uses. Those increased development benefits improve the economy through increases in regional productivity and the benefits of urbanization and agglomeration; enhanced employment accessibility; and, eventually, impacts on land rents and property values.

In this analysis, it is assumed that less intense development of the land is possible without the improvements and that septic and well-supported development will still allow productive use of the land but at lower land development intensities. However, transportation improvements and water/sewer service would allow full site development and greater land development intensities. Figure 1 illustrates how development under either of these scenarios would materialize.

Figure 1: Examples of Site Development Intensities

Lower Intensity Development

Higher Intensity Development

Description of the Proposed Project

The Barker Road Grade Separation Project replaces an at grade crossing with an overpass over BNSF's tracks and SR290, supplemented with other roadway access improvements. The Barker Road crossing is one of 57 high-priority crossings targeted for improvement since the mid-2000s as part of "Bridging the Valley," an important initiative for eastern Washington and north Idaho. BNSF's tracks currently carry approximately 55 scheduled trains a day, a figure that will increase substantially to serve a projected expansion in agricultural production, natural resources and other sectors. In 2014, the project cost was estimated at 29.2 million dollars. These costs are beyond the financial ability of Spokane Valley to bear on its own.

The existing intersection at Barker Road and SR290/Trent Ave has a Level of Service (LOS) of "F" due to high traffic volumes on SR290 and proximity to the at-grade crossing. This failing level of service rating prohibits 500 acres of nearby industrial-zoned land and 75 acres of residential-zoned land from being developed at planned intensities (shown in Figure 2). Without improvement, the crossing will experience continued increases in troublesome vehicle and rail conflicts, eroding the quality of life in nearby residential areas and hampering economic growth.

Figure 2: Project Context Map

Supporting Competitive Development Sites

The City is home to many industrial and manufacturing businesses. It has a keen interest in creating a well-positioned portfolio of industrial lands ready for development. Currently, the City has a limited supply of vacant industrial lands well served by transportation and sewer infrastructure. The City and state compete with land markets in Idaho and Oregon for industrial businesses. These improvements will allow the City and state to be more competitive to industrial businesses seeking locations. Specifically, there are over 500 acres of vacant industrial land that would be positively impacted by these projects (Figure 2).

Summary of Findings

The ability to attract businesses will positively affect economic growth in the area. The investment in infrastructure will allow for the land to support economic development at a much higher intensity. The economic and tax impacts of that higher level of development are estimated as follows stemming from the construction and occupation of industrial developments.

- $2 billion in total economic output in the state ($980 million in direct impacts)
- 9,800 new jobs supported in the state (3,300 direct job impacts)
- $12.3 million in new general fund taxes to the city (25 year present value at 4%)
- $50.8 million in new general fund taxes to Washington State (25 year present value at 4%)

Estimate of Higher Land Intensity Development

Currently, industrial land development has been developed at much lower intensity in the range of 0.05 FAR. FAR stands for floor area ratio and is a broad measure for how intense the land is developed. Higher intensity industrial land development typically is seen at the 0.20 FAR, where available transportation and other infrastructure allow for greater economically productive uses to take place.

In the case of the study area, development of the 500 acres of industrial land would translate into:

- Lower intensity 0.05 FAR: approximately 1,100,000 square feet of industrial development
- Higher intensity 0.20 FAR: approximately 4,300,000 square feet of industrial development

The increment of new industrial development that new infrastructure would be able to support would amount to 3,200,000 square feet of industrial development.

Fiscal Impacts

The action studied in this fiscal analysis is the development and operation of industrial businesses based on the increment of higher intensity development enabled by the infrastructure project. For the analysis, it is assumed that construction and occupation of the development would take place in 2015 in order to provide a range of magnitude estimate of the incremental effects. The analysis uses current City and state tax policy to estimate revenues to the jurisdictions.

The tax revenue benefits of the projects are as follows. Because little is known about the exact facilities and economic activities that might be housed on the site, average cost and productivity assumptions are used to account for typical construction types for industrial buildings.

Figure 3 summarizes the tax impacts. In summary, about $12.3 million in new general fund taxes to the City would be produced on the increment of new development. That same increment of higher intensity industrial development would generate about $50.9 million in new general fund taxes to Washington State.[1] While a full buildout of the area in a single year is not entirely likely, it does illustrate the potential opportunity cost of not supporting higher intensity industrial development in the area. However, full use of the area in small amount of time could be likely given that industrial users typically look for sites in the 20-100 acre range.

[1] Both analyses assume a 2015 buildout over tax benefits over a 25-year time frame and discounted back to 2015-dollar values at a discount rate of 4%.

Figure 3: Total Incremental Revenues Resulting From Development By Jurisdiction & Source (Figures in thousands)

Total Incremental Revenues Resulting From Development By J

Revenue Source	City	State
Property Taxes	$9,680	$15,580
Sales Tax on Construction	$2,550	$19,510
Ongoing Sales Tax	$120	$900
B&O on Construction	-	$4,500
Ongoing B&O Tax	-	$10,390
Total Incremental Revenues	**$12,350**	**$50,880**

Economic Impacts

The potential location of the industrial businesses in Spokane Valley in the study area will create economic impacts to both the City and broader region. The action studied in this analysis is the construction and operation of industrial facilities in this area in Spokane Valley. For the analysis, it is assumed that construction and occupation of the building would take place in 2015.

The economic impacts are separated into two types: one-time impacts from construction and annual recurring impacts resulting from on-going operation of the business at steady state. Economic impacts can be measured in several ways. Two most common measures of reporting impacts are:

- **Jobs** represent the number of people working full- or part-time jobs.
- **Output** represents the value of goods and services produced. This is the largest, most encompassing measure of economic activity and includes personal income.

ECONorthwest used the 2007 Washington State I/O model developed by the Office of Financial Management. The analysis uses Washington State level data to trace the ripple effects of direct expenditure that occurs within the economy. The model is used to track how an economic action, such as money spent at a jobs created by the industrial activity, will ripple through the local economy creating different levels of business revenue, jobs, and income in many different economic sectors.

One-Time Effects: Construction of Industrial Buildings

Assumed construction costs are based on comparable figures of other industrial buildings that might house the industrial businesses. These direct construction expenditures will go towards the construction industry. However, the project might also use architecture, planning, and engineering industries' services in the area – these impacts are not counted in this analysis.

Figure 4: Summary of Construction Impacts

	Incremental Intensity	
	Output (millions)	Jobs
Direct	$306	1,109
Indirect/Ind	$391	2,399
Total	$697	3,508

- **Job Impacts.** The incremental construction estimates of facilities would support about 1,109 direct jobs in the local construction industry over the entire project. It would also create an additional 2,399 jobs resulting from indirect and induced economic activity from the construction. The total job impact would be 3,508 jobs from construction.
- **Economic Output.** The $306 million construction investment would also create an additional $391 million in multiplier incremental economic activity from indirect and induced economic activity from the construction. The total impact would be about $697 million.

On-Going Impacts: Annual Operation of the Industrial Businesses

The following analysis uses assumptions on the number of jobs that might be supported in the area once buildings are occupied by businesses. The direct impacts estimates use industrial lands employment densities commonly found in industrial buildings to estimate the incremental employment growth that might be the result of higher land intensity development.

Figure 5: Summary of Business Operations Impacts

	Incremental Intensity	
	Output (millions)	Jobs
Direct	$673	2,268
Indirect/Ind	$685	4,036
Total	$1,358	6,305

- **Job Impacts.** In addition to the 2,268 direct jobs at the businesses, the business activity would create an additional 4,036 jobs resulting from indirect and induced economic activity. Total job impacts would be 6,305 jobs.
- **Economic Output.** Under the employment assumptions above, the business would generate $673 million in business income/output on a annual basis. The business would then create an additional $685 million in multiplier impacts from indirect and induced economic activity. A total impact of $1,358 million to the state economy.

Background and Methodology on Fiscal and Economic Impact Analysis

Fiscal Impacts

A public revenue model was used to allow for estimation of likely net tax revenue impacts resulting from new development in the study area .The analysis used a cash flow revenue model that will build up from the development assumptions, including phasing and timing of development, to estimate changes in affected tax bases, which in turn is used to estimate revenues for all affected jurisdictions. Current tax rates are applied to the incremental tax bases to estimate potential public revenues. Revenues are organized according to the legislative or policy limits on their use and whether they are one-time or ongoing revenues. The revenue model includes:

- Property Tax
- Sales Tax (both on construction and ongoing from business operations)

- B&O Taxes (both on construction and ongoing from business operations)

Economic Impacts

In general terms, economic impacts models work by tracing how spending associated with an industry circulates through an economy or study area. That is, changes in one sector or multiple sectors trigger changes in demand and supply throughout the economy. Initial changes in the demand spread through the economy, altering the quantities of inputs and outputs and associated jobs, income, and value-added. These *multiplier effects* continue until the initial change in final demand leaks out of the economy in the form of savings, taxes, and imports. Here, the final demand reflects the total amount of output created by the initial investment.

Input-output models enable the user to follow expenditures from a company as they ripple through the economy. These impacts are called the *multiplier* effects, and they measure the full scope of economic impacts. Economic impact analysis employs specific terminology to identify different types of economic impacts. *Direct* impacts are those associated with payroll and employment. They also include the direct output of activities in a specific geography, which is estimated using labor and non-labor operating expenses.

For this analysis, the 2007 Washington State Input-Output Model, developed by the Office of Financial Management is used to estimate economic impacts. It use state-level data to trace the ripple effects of an expenditure that occurs within the economy. The Washington State Input-Output model represents a 2007 estimate of the structure of the Washington economy (latest available model year). The model was a result of new data and industry information from a survey of businesses. The Washington I/O model has the advantage of being developed specifically to reflect Washington State's unique industry linkages (and being accepted by OFM).

The Washington Input-Output model estimates *indirect* impacts using purchases of goods and services from other businesses. These businesses, in turn, purchase a wide array of intermediate goods and services they need to operate. Because these purchases represent interactions among businesses, indirect effects are often referred to as "supply-chain" impacts. The resulting direct and indirect increases in employment and income enhance overall economic purchasing power, thereby *inducing* further consumption and investment-driven stimulus. These induced effects are often referred to as "consumption-driven" impacts.

ECONorthwest
ECONOMICS • FINANCE • PLANNING

DATE: April 8, 2016
TO: Gloria Mantz, Chaz Bates, and Mike Basinger, City of Spokane Valley
FROM: Morgan Shook and Austin Rempel, ECONorthwest
SUBJECT: FISCAL AND ECONOMIC BENEFITS OF THE PINES ROAD UNDERPASS PROJECT

Background and Purpose

The City of Spokane Valley (City) is currently contemplating investments in infrastructure to support better mobility and safety within the City. The City is currently assembling a funding application to construct the Pines Road Underpass.

As part of the planning, the City would like to better understand both the tax benefits and economic effects of the project to support decision-making. This memorandum summarizes preliminary results of analyses that estimate the ability of targeted infrastructure to support development in the immediate vicinity of the project. Specifically, the analyses include estimates of:

- Potential affected development estimates stemming from the infrastructure project
- Potential tax revenue benefits accruing to the City of Spokane Valley and State of Washington from the affected development.
- Potential direct and indirect economic effects of development and construction activities (e.g. economic output, jobs, and wages) to Spokane County of both land development and the infrastructure project.

Analytic Framework

The infrastructure projects provide benefits to development in the form of better access, travel-time savings, safety improvements, and operational savings. These types of improvements allow for land development to host greater levels of economic uses. Those increased development benefits improve the economy through increases in regional productivity and the benefits of urbanization and agglomeration; enhanced employment accessibility; and, eventually, impacts on land rents and property values.

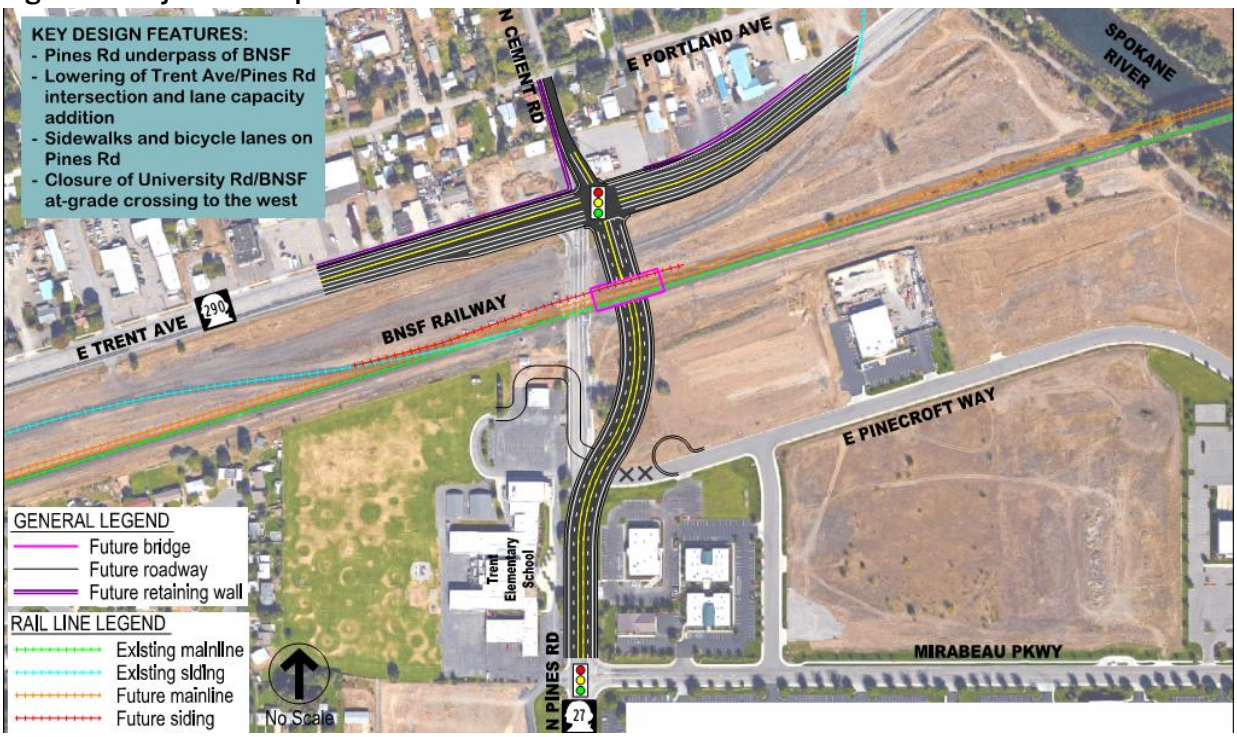
In this analysis, it is assumed that the underpass project will aid in the relative attractiveness of development on land parcels. As Spokane Valley builds out its vacant residential and commercial lands, positioning its remaining vacant lands for highest and best economic uses will help both the city, region, and state create robust economy in eastern Washington. Maximizing vacant land development makes the most of initial development before infill development becomes the norm. Taking advantage of these types of opportunities helps position communities for better long-run economic future. While not all the tax and job impacts estimated in this analysis are directly attributed to the underpass project, completing the project will incrementally help land developers either build earlier or larger projects on the affected area.

Description of the Proposed Project

This project proposes to reconstruct Pines Road to pass under existing BNSF tracks. To accommodate this, Trent Avenue will also be lowered, similar to the Argonne Road underpass. This project will allow the City of Spokane Valley to request closure of the University Road railroad crossing one mile to the west. The closure would further improve public safety by reducing the possibility of rail-vehicle collisions at this intersection. BNSF's tracks currently carry approximately 55 scheduled trains a day, a figure that will increase substantially to serve a projected expansion in agricultural production, natural resources and other sectors. In 2016, the project cost was estimated at 18 million dollars. These costs are beyond the financial ability of Spokane Valley to bear on its own.

This project is critical because of the projected increase in vehicular traffic in the area through 2040 and because of its location, which is approximately half way between the two nearest crossings of the BNSF track (Argonne Rd to the West and Sullivan Rd to the East). The separation of Pines Road and the BNSF tracks will provide a vital transportation link to the businesses and residences north of Trent (SR-290), south along Pines (SR-27), I-90 and further south to the Palouse. This project eliminates rail-crossing crashes at both the Pines (SR-27) and University BNSF crossing. It would also greatly reduce delay along Pines Road and along Trent (SR-290) when accessing Pines (SR-27). The new grade separation project will address the current extremely poor Level of Service (LOS) at the Pines Road/SR-290 intersection. The project is shown below.

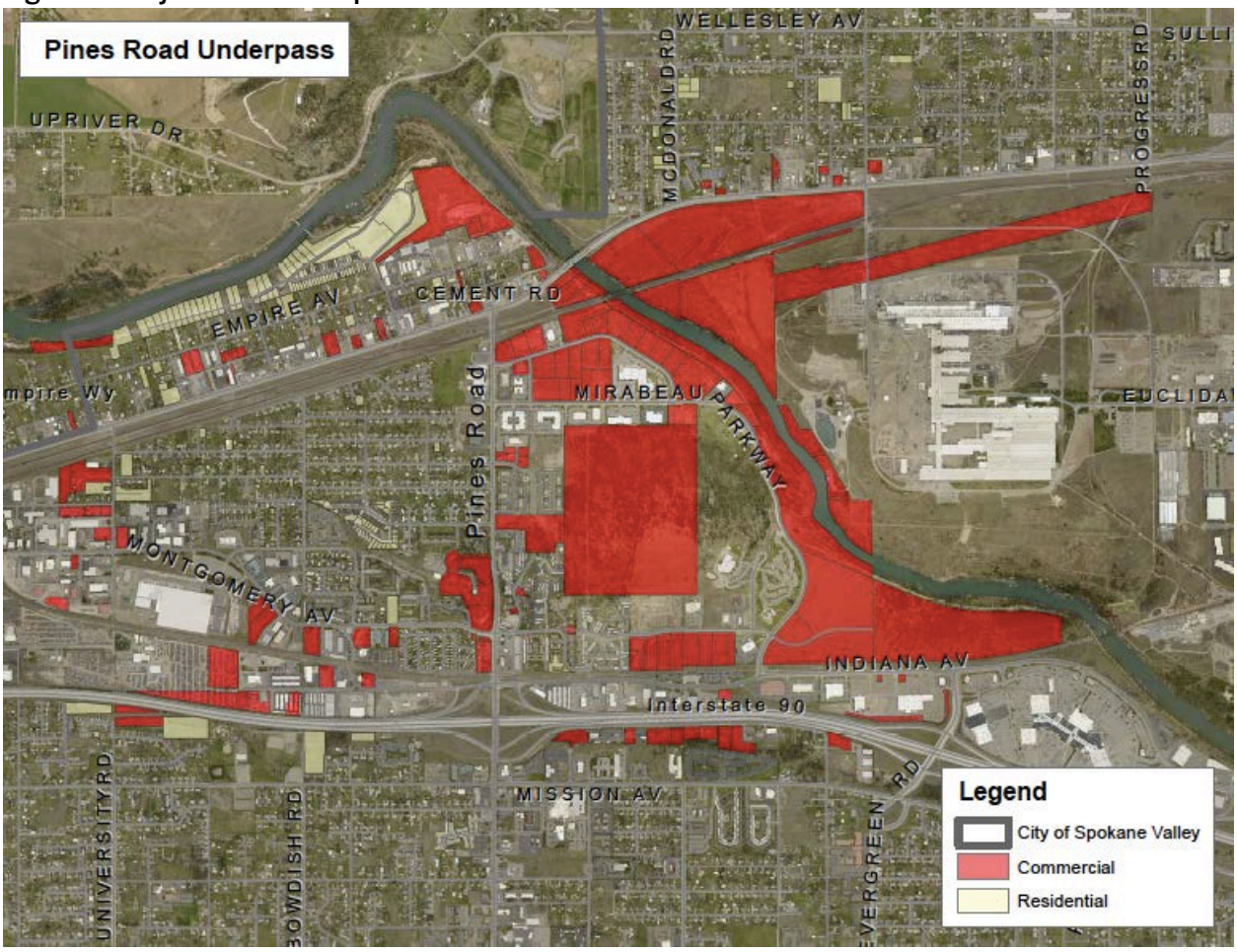
Figure 1: Project Description



There are over 226 acres of nearby undeveloped residential, commercial, and industrial-zoned land that are likely to be directly influenced by the underpass project (649 acres are shown in

Figure 2 – 226 acres represent those parcels that are most likely to benefit from the project). Without improvement, the crossing will experience continued increases in poor LOS or failure, vehicle and rail conflicts that erode the quality of life in nearby residential areas and hamper economic growth.

Figure 2: Project Context Map



Summary of Findings

The ability to attract businesses will positively affect economic growth in the area. The investment in infrastructure will allow for the land to support economic development at a much higher intensity and/or sooner. The economic and tax impacts of that higher level of development are estimated as follows stemming from the construction and occupation of residential, commercial, and industrial developments.

- $1.3 billion in total economic output in Spokane County ($686 million in direct spending)
- 8,719 new jobs supported in the county (4,312 direct jobs)
- $8.2 million in new general fund taxes to the city (25 year present value at 4%)
- $101.9 million in new general fund taxes to Washington State (25 year present value at

4%)

Projected Land Development Program

Several developers have proposed some land use in anticipation of the underpass project covering 149 of the 226 acres of the affected area. A rough breakdown of the tenant uses is shown below:

- 1,044 units of housing
- 63,890 square feet of retail development
- 577,570 square feet of office development
- 150 room hotel

The remaining 77 acres consist of 56 acres of industrial land and 21 acres mixed use commercial. A rough breakdown of the tenant uses is shown below:

- 365,904 square feet of heavy industrial development
- 320,166 square feet of office development

Fiscal Impacts

The action studied in this fiscal analysis is the development and operation of residential, commercial, and industrial businesses enabled by the infrastructure project. For the analysis, it is assumed that construction and occupation of the development would take place in 2016. Build out is assumed to take over 15 years. The analysis uses current City and state tax policy to estimate revenues to the jurisdictions. Because little is known about the exact facilities and economic activities that might be housed on the site, average cost and productivity assumptions are used to account for typical construction types for industrial buildings.

Figure 3 summarizes the tax impacts. In summary, about $8.2 million in new general fund taxes to the City would be produced on the increment of new development. That same increment of higher intensity industrial development would generate about $101.9 million in new general fund taxes to Washington State.[1]

[1] Both analyses assume a 2016 buildout over 15 years and over tax benefits over a 25-year time frame and discounted back to 2015-dollar values at a discount rate of 4%.

Figure 3: Total Incremental Revenues Resulting From Development By Jurisdiction & Source (Figures in thousands)

Total Incremental Revenues Resulting From Development By Jurisdiction & Source (in thousands - 2016$)		
Revenue Source	**City**	**State**
Property Taxes	$3,100	$5,000
Sales Tax on Construction	$2,700	$20,600
Ongoing Sales Tax	$2,400	$18,400
B&O on Construction	-	$4,800
Ongoing B&O Tax	-	$53,100
Total Incremental Revenues	**$8,200**	**$101,900**

Economic Impacts

The economic impacts are separated into two types: one-time impacts from construction and annual recurring impacts resulting from on-going operation of the business at steady state. Economic impacts can be measured in several ways. Three most common measures of reporting impacts are:

- Output is the broadest measure of economic activity and represents the value of production (or roughly sales). Output includes wages, business income, and other income (described immediately below, so the impact measures are not additive).
- Income includes wages, business income, and other income.
    - Wages represent wages and salaries, as well as other payroll benefits such as health and life insurance, retirement payments, and non-cash compensation.
    - Business income (also called proprietor's income) represents the payments received by small-business owners or self-employed workers (doctors, accountants, lawyers, etc.).
    - Other kinds of income include payments to individuals in the form of rents received on properties, royalties from contracts, dividends paid by corporations and profits earned by corporations.
- Job impacts are reported as full- and part-time jobs. This is consistent with covered employment statistics gathered and reported by state employment agencies in the United States. Job impacts have also been converted to full-time equivalents (FTEs) using detailed bridge tables provided by the Bureau of Economic Analysis (BEA).

One-Time Effects: Construction of the Pines Road Underpass

Construction spending associated with the Pines Road underpass project will generate short-term impacts for workers and business owners in Spokane County and elsewhere in the state of Washington. Results for Spokane County are listed below. The estimated construction cost of the project is 18 million dollars of which $14.9 million is slated for right-of-way and construction.

Figure 4: Summary of Underpass Construction Impacts

Economic Output	
Direct Output	$14,868,678
Indirect Output	$6,737,385
Induced Output	$6,197,771
Total Output	$27,803,833

Income	
Direct Labor Income	$5,316,891
Indirect Labor Income	$2,147,959
Induced Labor Income	$2,015,970
Total Labor Income	$9,480,819

Jobs	
Direct Jobs	99
Indirect Jobs	45
Induced Jobs	49
Total Jobs	193

- **Job Impacts.** The incremental construction estimates of the project would support about 99 direct jobs in the local construction industry over the entire project. It would also create an additional 94 jobs resulting from indirect and induced economic activity from the construction. The total job impact would be 193 jobs from construction.
- **Economic Output.** The $14.9 million construction investment would also create an additional $12.9 million in multiplier incremental economic activity from indirect and induced economic activity from the construction. The total impact would be about $27.8 million.

One-Time Effects: Construction of Residential, Commercial, and Industrial Buildings

Assumed construction costs are based on comparable figures of residential, commercial, and industrial buildings. These direct construction expenditures will go towards the construction industry. However, the project might also use architecture, planning, and engineering industries' services in the area – these impacts are not counted in this analysis.

Figure 5: Summary of Building Construction Impacts

Economic Output	
Direct Output	$365,005,120
Indirect Output	$166,175,881
Induced Output	$131,657,347
Total Output	$662,838,348

Income	
Direct Labor Income	$103,034,375
Indirect Labor Income	$55,362,152
Induced Labor Income	$42,828,971
Total Labor Income	$201,225,498

Jobs	
Direct Jobs	1,959
Indirect Jobs	1,265
Induced Jobs	1,038
Total Jobs	4,263

- **Job Impacts.** The incremental construction estimates of facilities would support about 1,959 direct jobs in the local construction industry over the entire project. It would also create an additional 1,303 jobs resulting from indirect and induced economic activity from the construction. The total job impact would be 4,263 jobs from construction.
- **Economic Output.** The $365 million construction investment would also create an additional $298 million in multiplier incremental economic activity from indirect and induced economic activity from the construction. The total impact would be about $663 million.

On-Going Impacts: Annual Operation of the Commercial and Industrial Businesses

The following analysis uses assumptions on the number of jobs that might be supported in the area once all the buildings are constructed and occupied by businesses. The direct impacts estimates use commercial and industrial lands employment densities commonly found in their respective buildings to estimate the incremental employment growth.

Figure 6: Summary of Business Operations Impacts

Economic Output	
Direct Output	$305,835,538
Indirect Output	$86,299,521
Induced Output	$168,801,597
Total Output	$560,936,656

Income	
Direct Labor Income	$175,180,841
Indirect Labor Income	$28,904,013
Induced Labor Income	$54,888,102
Total Labor Income	$258,972,956

Jobs	
Direct Jobs	2,254
Indirect Jobs	680
Induced Jobs	1,329
Total Jobs	4,263

- **Job Impacts.** In addition to the 2,254 direct jobs at the businesses, the business activity would create an additional 2,009 jobs resulting from indirect and induced economic activity. Total job impacts would be 4,263 jobs.
- **Economic Output.** Under the employment assumptions above, the business would generate $306 million in business income/output on a annual basis. The business would then create an additional $255 million in multiplier impacts from indirect and induced economic activity. A total impact of $561 million to the county economy.

Background and Methodology on Fiscal and Economic Impact Analysis

Fiscal Impacts

A public revenue model was used to allow for estimation of likely net tax revenue impacts resulting from new development in the study area .The analysis used a cash flow revenue model that will build up from the development assumptions, including phasing and timing of development, to estimate changes in affected tax bases, which in turn is used to estimate revenues for all affected jurisdictions. Current tax rates are applied to the incremental tax bases to estimate potential public revenues. Revenues are organized according to the legislative or policy limits on their use and whether they are one-time or ongoing revenues. The revenue model includes:

- Property Tax
- Sales Tax (both on construction and ongoing from business operations)
- B&O Taxes (both on construction and ongoing from business operations)[2]

Economic Impacts

In general terms, economic impacts models work by tracing how spending associated with an industry circulates through an economy or study area. That is, changes in one sector or multiple sectors trigger changes in demand and supply throughout the economy. Initial changes in the demand spread through the economy, altering the quantities of inputs and outputs and associated jobs, income, and value-added. These *multiplier effects* continue until the initial change in final demand leaks out of the economy in the form of savings, taxes, and imports. Here, the final demand reflects the total amount of output created by the initial investment.

Input-output models enable the user to follow expenditures from a company as they ripple through the economy. These impacts are called the *multiplier* effects, and they measure the full scope of economic impacts. Economic impact analysis employs specific terminology to identify different types of economic impacts. The three major types of impacts are discussed below within the context of this analysis.

- Direct economic effects. Construction spending associated with the project represent the initial change in final demand. The direct economic impacts are then determined by this spending and the availability of goods and services locally—as estimated by the regional purchase coefficients (RPCs) for each of the 440 industry sectors in the IMPLAN model for Spokane County.
- Indirect economic effects. The project indirectly affects the local and state economies because the firms that provide direct services to project must also purchase materials and supplies. For instance, a local contractor hired to install bridge railings will have to purchase welding supplies or lease portable lighting when operating at night. The

[2] The city of Spokane Valley does not collect a business and occupation tax. Only the state tax is modeled.

welding supply wholesaler will also have to purchase goods and services necessary to operate. These types of spending generate indirect impacts.

- Induced economic effects. The direct and indirect effects on employment and income affect overall purchasing power within the economy, thereby inducing further consumption spending. For instance, construction workers who use their income to buy groceries or take their families to the movies generate economic impacts for workers and businesses in those sectors. These individuals will, in turn, spend their incomes much like construction workers. This cycle continues until the spending eventually leaks out of the economy as a result of taxes, savings, or purchases of non-locally produced goods and services (imports).

The most commonly used input-output modeling software and the one ECONorthwest used in this analysis is called IMPLAN (for IMpact Analysis for PLANning).[3] IMPLAN has been developed and distributed by the Minnesota IMPLAN Group, Inc., since 1993. Currently there are over 1,500 public and private users of the IMPLAN modeling software. In addition, the United States Department of Agriculture (USDA) recently recognized the IMPLAN modeling framework as "*one of the most credible regional impact models used for regional economic impact analysis"* and, following a review by experts from seven USDA agencies, selected IMPLAN as its analysis framework for monitoring job creation associated with many federal investment activities. The model is used to track how an economic action, such as money spent at a jobs created by the industrial activity, will ripple through the local economy creating different levels of business revenue, jobs, and income in many different economic sectors.

[3] IMPLAN was originally developed by the Forest Service of the U.S. Department of Agriculture in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management of the U.S. Department of the Interior to assist federal agencies in their land and resource management planning. Applications of IMPLAN by the U.S. government, public agencies, and private firms span a wide range of projects. Examples include new factories, resource extraction facilities, and public infrastructure projects. IMPLAN can also be applied to a variety of policy issues. Predicting the effects of a tourism marketing campaign or measuring the importance of an existing industry on a local community are common examples.