State Street Premium Corridor Infrastructure Project

2022 RAISE Grant Technical Memos

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Memo

Date:	Saturday, March 26, 2022
Project:	VRT RAISE Grant
To:	Stephen Hunt, Valley Regional Transit
From:	Lewis Kelley, HDR
Subject:	**State Street Crash History and Crash Modification Factor (CMF) Results**

1.0 Purpose

The purpose of this memo is to present findings for a crash history and future crash modification factor (CMF) analysis along the State Street corridor in Boise, Idaho. Both the existing roadway conditions and the planned future improvements packaged together for the 2022 Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant program are rated. A few intersections covered in this memo will not be part of the RAISE Grant as of the latest scoping information. These intersections are still present in the analysis but are highlighted as being a part of the State Street Transit Operations Analysis (TOA) or other future project.

2.0 Existing Crash History

The Community Planning Association of Southwest Idaho (COMPASS) provided crash statistics between 2016 and 2020 for the corridor between Bogart Lane in northwest Boise and 7th Street in downtown Boise. The analyzed corridor encompasses just over 6 miles and includes analysis of 16 individual intersections identified as part of the RAISE Grant application.

Crashes are categorized depending on the mode involved, including general purpose vehicles, buses, pedestrians, and bicycles. Crashes are also categorized by the severity of the crash involved and include the following identifiers:

- O – Property Damage Only. No evident injuries reported.
- C – Possible Injury. Any injury that does not fall into the more severe categories. These may include momentary unconsciousness, limping, complaints of pain, or nausea.
- B – Non-incapacitating injury (may be visible). Any injury, other than fatal or incapacitating, which are visible to observers on the scene of the collision.
- A – Incapacitating. Any injury, other than fatal, which prevents the injured person from walking, driving, or continuing normal activities.
- K – Fatal. Any death of an involved person within 30 days of the collision.

Table A summarizes the crashes that occurred during the 5-year period analyzed, including crash rates. The crash rates are calculated per million entering vehicles (MEV) so that a crash rate of 1 would relate to one expected crash for every million vehicles travelling through the intersection.

A total of 371 crashes occurred at the project intersections with most, 258 or 70 percent, being O crashes. A total of 64 crashes were C crashes, 39 were B crashes, and 10 were A crashes. None of the crashes during the 5-year period involved a fatal crash. Further, a total of three crashes involved a pedestrian being struck by a vehicle and one crash involved a bus.

Table A: 2016-2020 Intersection Crash History*

Intersection	Crash Rate [Crash/MEV]	Total Crash	K	A	B	C	O	Bike	Ped	Bus
State & 7th St	0.06	1	0	0	0	0	1	0	0	0
State St & 15th St	0.64	33	0	1	3	4	25	0	1	0
State St & 18th St	0.51	21	0	0	5	4	12	0	0	0
State St & 23rd St	0.21	9	0	0	2	0	7	0	0	0
State St & 27th St	0.40	21	0	2	3	2	14	0	0	0
State St & Whitewater Park Blvd	0.34	21	0	2	2	4	13	0	1	0
State & Clover Dr	0.44	25	0	0	3	7	15	0	0	0
State & Arthur St.	0.15	12	0	0	1	3	8	0	0	0
State & Willow Ln	0.50	33	0	0	2	5	26	0	0	0
State St & Collister Dr	0.50	35	0	0	2	5	28	0	0	1
State St & Marketplace Ln	0.17	11	0	0	1	2	8	0	0	0
State St & Pierce Park Ln	0.61	42	0	1	6	5	30	0	0	0
Northgate/Plantation Shopping Entrance	0.34	22	0	1	4	4	13	0	0	0
Gary & Bunch	0.31	7	0	1	1	1	4	0	1	0
State & Saxton Dr	0.90	54	0	1	3	15	35	0	0	0
State & Bogart Ln**	0.40	24	0	1	1	3	19	0	0	0
Totals	***0.00***	***371***	***0***	***10***	***39***	***64***	***258***	***0***	***3***	***1***

**Highlighted rows are intersections with geometric changes or countermeasures that are not part of the final RAISE Grant application and reflective of the State Street Transit Operations Analysis (TOA). **State and Bogart is design only in the RAISE grant and the benefits were not included in the Cost Benefit Analysis.*

The pedestrian crashes occurred at the intersections of 15th/State, Whitewater/State and Gary/Bunch and /State with the former involving an incapacitating injury while the latter involved possible and non-capacitating injuries.

The intersections of Saxton/State and Pierce Park/State feature the highest number of crashes with 54 and 42, respectively. Pierce Park/State also featured the most injury related crashes with six non-capacitating injuries and one incapacitating injury. Crash rates are also reported for each intersection analyzed with the highest crash rates occurring at Saxton/State (.9), 15th/State (.64), and Pierce Park/State (.61).

3.0 Future Expected Crashes

This section presents analysis to predict future crashes at the project intersections. For this analysis, a No-Build and Build set of assumptions were applied to the future year 2035. The No-Build assumes that the existing intersection geometries remain the same while the Build applies the RAISE Grant project improvements. In both cases, traffic volumes are grown to the 2035 year at a rate of between 1.5 or 2.5 percent per year depending on the location. The growth factor is consistent with traffic growth factors used by COMPASS in their regional travel demand model.

3.1 Crash Modification Factors Defined

CMFs are used to compute the expected number of future crashes after implementing countermeasures or geometric changes along a road or at an intersection. The factors used in the analysis are taken from the CMF Clearinghouse, which functions as a central repository of peer reviewed transportation research for use in crash analysis.

CMF values are presented as factors that are applied to the existing conditions and crash expectations. A factor below 1.0 can be expected to reduce future crashes, while a factor above 1.0 can be expected to raise crashes in the future. For example, CMF ID 175 (Install raised median with marked crosswalk) with a factor of .54 can be expected to reduce crashes involving pedestrians and vehicles by approximately half.

Table B summarizes the CMFs applied for the roadway and intersection geometric changes that are being proposed as part of the RAISE Grant package of investments. The most applicable CMF for each treatment was selected. In the case of multiple treatments at a single location, the most conservative estimate of benefits is provided.

Table B: Applied Crash Modification Factors

CMF ID	Crash Modification Factor	Value	Note
9664	Implement transit signal priority	0.873	
2080	Presence of far-side transit stop location	0.55	Transit-related crashes
175	Install raised median with marked crosswalk (uncontrolled)	0.54	Ped/Vehicle
8800	Install raised median with/without marked crosswalk (uncontrolled)	0.742	
9120	Median treatment for ped/bike safety	0.86	
9024	Install RRFB	0.526	Ped/Vehicle
9901	Modify signal phasing (implement a leading ped interval)	0.9	
4123	Install high visibility crosswalk	0.6	Ped/Vehicle
4124	Install high visibility crosswalk	0.81	Angle, head-on, left turn, rear end, right turn, sideswipe
3092	Install bicycle boulevard	0.37	Bike/Vehicle
10743	Install bike lanes	0.649	
3258	Install colored bike lanes at signalized intersections	0.61	Bike/Vehicle

3.2 Expected Future Crashes

Table C presents the results of the predictive analysis applying the CMFs. Where investments in geometric changes, improved pedestrian crossings, bicycle lanes, and other improvements are planned, the expected crashes will be significantly reduced. The largest reduction is expected at 23rd/State where protected bicycle facilities are planned, which are predicted to reduce total crashes by 50 percent. Other significant reductions include the following:

- 27th/State, 44 percent reduction in total crashes
- Bogart/State, 44 percent reduction in total crashes
- Collister/State, 35 percent reduction in total crashes
- Marketplace/State, 35 percent reduction in total crashes
- Plantation/State, 31 percent reduction in total crashes
- Saxton/State, 18 percent reduction in total crashes
- Gary/Bunch, 14 percent reduction in total crashes

Table C: Predicted 2035 Crashes*

Intersection	2035 No Build Crashes						2035 Build Crashes						2035 Crash Reduction					
	Total	K	A	B	C	O	Total	K	A	B	C	O	Total	K	A	B	C	O
State & 7th St	0.25	0	0	0	0	0.25	0.25	0	0	0	0	0.25	0	0	0	0	0	0
State St & 15th St	8.37	0	0.25	0.76	1.01	6.34	8.37	0	0.25	0.76	1.01	6.34	0	0	0	0	0	0
State St & 18th St	5.34	0	0	1.27	1.02	3.05	5.34	0	0.00	1.27	1.02	3.05	0	0	0	0	0	0
State St & 23rd St	2.29	0	0	0.51	0	1.78	1.11	0	0	0.26	0	0.86	1.17	0.00	0.00	0.25	0.00	0.92
State St & 27th St	5.33	0	0.51	0.76	0.51	3.56	2.96	0	0.27	0.43	0.27	1.99	2.37	0.00	0.24	0.33	0.24	1.56
State St & Whitewater Park Blvd	5.73	0	0.55	0.55	1.09	3.54	5.73	0	0.55	0.55	1.09	3.54	0	0	0	0	0	0
State & Clover Dr	7.42	0	0	0.89	2.08	4.45	7.42	0	0	0.89	2.08	4.45	0	0	0	0	0	0
State & Arthur St.	2.97	0	0	0.25	0.74	1.98	2.97	0	0	0.25	0.74	1.98	0	0	0	0	0	0
State & Willow Ln	9.80	0	0	0.59	1.48	7.72	9.80	0	0	0.59	1.48	7.72	0	0	0	0	0	0
State St & Collister Dr	10.40	0	0	0.59	1.49	8.32	6.75	0	0	0.39	0.96	5.40	3.65	0	0	0.21	0.52	2.92
State St & Marketplace Ln	3.27	0	0	0.30	0.59	2.38	2.12	0	0	0.19	0.39	1.54	1.15	0	0	0.10	0.21	0.83
State St & Pierce Park Ln	12.48	0	0	1.78	1.49	8.91	12.48	0	0.30	1.78	1.49	8.91	0	0	0	0	0	0
Northgate/Plantation Shopping Entrance	6.54	0	0.30	1.19	1.19	3.86	4.48	0	0.21	0.81	0.80	2.66	2.06	0	0.09	0.38	0.39	1.20
Gary & Bunch	1.78	0	0.25	0.25	0.25	1.02	1.54	0	0.25	0.21	0.25	0.82	0.24	0	0	0.05	0	0.19
SH 44 & Saxton Dr	13.71	0	0.25	0.76	3.81	8.89	11.25	0	0.21	0.67	3.13	7.25	2.46	0	0.05	0.10	0.68	1.64
SH 44 & Bogart Ln	6.09	0	0.25	0.25	0.76	4.82	3.39	0	0.13	0.13	0.40	2.72	2.70	0	0.12	0.12	0.36	2.10

**Highlighted rows are intersection with geometric changes or countermeasures that are not part of the final RAISE Grant application and reflective of the State Street Transit Operations Analysis (TOA). **State and Bogart is design only in the RAISE grant and the benefits were not included in the Cost Benefit Analysis.*

Memo

Date:	Monday, April 04, 2022
Project:	VRT RAISE Grant
To:	Stephen Hunt, Valley Regional Transit
From:	Lewis Kelley, HDR
Subject:	**State Street Transit Demand Analysis**

1.0 Introduction

Valley Regional Transit, the Community Planning Association of Southwest Idaho (COMPASS) and the land use and transportation agencies along the State Street corridor are seeking to improve the Route 9 State Street bus service along State Street, which will make transit faster, quieter, and easier to use for commute trips into the downtown. The improvements to the bus service, will make it more desirable and attract new riders from other transit services and provide an opportunity for commuters using auto to switch modes. This purpose of this memo is to document the assumptions, methodology, and results of the analysis that was used to quantify the benefits of these improvements.

2.0 Assumptions

Travel demand is a function of the transit supply and the demand which is linked to population and households. The analysis incorporated data and guidance from several local sources to better understand and the travel demand and benefits associated with supply and demand components of the analysis. National Research and data from the local MPO supported the methodology The assumptions were developed for a 2019 pre-pandemic scenario and an existing condition of 2022, two build alternatives in the current condition, a horizon year of 2035 without improvements, and finally two build alternatives. The two build conditions included the following components.

Build A for 2022 and 2035

- Stop consolidation for five station that improved travel time
  - Three outbound stations were consolidated
    - State St @ 21st
    - State St @ Collister St
    - State St @ Northgate Shopping
  - Two inbound stations were consolidated
    - State St @ 21st
    - State St @ 29th
- Transit Signal and roadway improvements which resulted in travel time improvements

- Collectively this improvement improved travel time by over three minutes end-to-end, or 1.6 minutes for the average user.

Build B for 2022 and 2035

- Stop consolidation for five station that improved travel time
    - Three outbound stations were consolidated
        - State St @ 21st
        - State St @ Collister St
        - State St @ Northgate Shopping
    - Two inbound stations were consolidated
        - State St @ 21st
        - State St @ 29th
- Transit Signal and roadway improvements which resulted in travel time improvements
- Collectively this improvement improved travel time by over three minutes end-to-end, or 1.8 minutes for the average user.
- Headway improvements included reducing AM and PM peak period headway from 15 minutes to 10 minutes.

The transit service data for 2022 and for 2035 consisted of accessing the data described below which was obtained from Valley Transit, COMPASS MPO, and the project team.

- Verifying its alignment
- Matching stop locations with adjacent land use
- Checking location and capacity of park-and-ride lots
- Researching the competing/connecting bus service in the area
- Examining the travel time between stations (including dwell) and in-vehicle travel time into the downtown by time and direction
- Establishing the headways by time-period

The supply side included socio-economic data, demographic forecasts, counts, and surveys.

- Transit Counts
- 2021 COMPASS Onboard Survey
- Demographic data from COMPASS
- COMPASS Travel Model Outputs
- Valley Regional Transit, usage data reported to the FTA National Transit Database

The methodology utilized research on elasticities of demand for travel time and elasticities produced by:

- Victoria Transportation Policy Institute
- American Planning Association Transportation Planning Handbook
- Transit Cooperative Research Program. TCRP_RRD_61, Travelers Response to Transportation System Changes

3.0 Methodology

The analysis examined the changes to existing 2022 and future 2035 service plan and ridership without travel time or headway improvements. The existing condition for the Route 9 was built entirely on existing ridership data and published service schedules. Mode of access to the stations was considered, focusing on walk access markets, on a park-and-ride lot, and connecting/competing bus service for the inner and outer stations. An average weekday was used as the starting point for the analysis for the near-term build alternatives. The 2022 demand is lower that pre-pandemic 2019 ridership that was reported by Valley Regional Transit, but it represented the best data set available for the near-term.

All the stations have a strong walk access market, with the terminal stop which also has a small park-and-ride lot that isn't expected to be expanded in the future. Some of the connecting/competing bus markets in this corridor include Routes 10 and 12. It was assumed that even though stops were being consolidated, the catchment area around the remaining stops was sufficient and overlapping with the removed stops to minimize any possible reduction in ridership from losing stops.

The future 2035 was developed by examining the land use changes that are expected to occur in this corridor as referenced by CAMPO and the Valley Transit Bus Rapid Transit Alternative Analysis. This corridor is anticipating significant growth, an increase in households from 1,541 to 3,157 between 2019 and 2035. Employment and jobs are also growing from 3,829 in 2019 to over 12,595 by 2035. To create an estimate of 2035 demand and to account for the eventual return to pre-pandemic transit use, the 2019 ridership for the Route 9 was grown instead of the 2022 ridership data. This increase in households and employment create a need for travel options that the 2035 demand analysis shows exist in the future and the Route 9 helps serve.

Using research data on elasticities of demand nationally and implied from several CAMPO travel demand model tests, the relationships between travel time changes and headway changes for the peak and off-peak periods were calculated to produce weekday ridership changes by station due to the proposed improvements. The ridership demand for the Route 9 unlinked transit boardings was factored by 269 to get an annual estimate. The 269 was derived from the ratio of the 2019 Valley Regional Transit NTD submission for annual and weekday unlinked transit trips in the region.

The elasticity calculation was used to develop the demand for the Route 9 service with the improvements, but a mode-shift analysis was used to identify how many autos could be diverted to transit based on an appraisal of competing and connecting service. Since there was not a lot of other bus service in this corridor, a conservative estimate of 60% of the new Route 9 ridership was assumed to be auto diversions. A one-way travel distance of 7 miles was assumed for the route which was then used to calculate the one-way vehicle miles traveled. Multiplying the auto diversions by the trip length helped produce the estimate vehicle miles travelled reduction. The vehicle hours travelled reductions was backed into from travel speed data along this corridor for the peak periods.

4.0 Results

The analysis examined three years and two build alternatives, 2019, 2022, and one for 2035.The Route 9 commuter bus is approximately 6 miles in length with travelling from its terminus at Gary & Bunch to downtown Boise. It operates at 15-minute headways in the peaks between 5:15 AM and 9:39 PM on weekdays. The travel times varies slightly depending on direction and time-period, but generally ranges from 20 minutes to 25 minutes. There are 22 outbound stops and 20 inbound stops.

The 2019 pre-pandemic scenario had approximately 810 boardings daily, with a little more than half going outbound when compared to the inbound direction. Many of the bus stops attract between 20 to 30 boardings daily with three attracting more than 40 boardings daily. The pandemic has surpassed ridership due to a variety of reasons which include shifting of trips to telecommuting, changes in workforce, and transit attractiveness has been reduced to being in a confined space with other passengers. The 2021 daily boardings were 530 and the 2022 daily boardings were 470. These numbers are likely to improve with time, but it may take another couple of years to get back to 2019 pre-pandemic levels. The change in demand associated with the pandemic are shown in Table 1 and Table 2. Changes associated with the auto mode are reported in Table 3.

The Route 9 travel time improvements associated with the near-term 2022 findings resulted in 2.6 to 3.4 minutes of improvement in-vehicle travel time for the entire route depending on direction and time-period. This translates into approximately between 1.3 and 1.6 minutes of travel time benefit for the average rider. This travel time improvement in scenario a resulted in a 6.9% increase in daily boardings on the route. When the peak period headway was improved in scenario b from 15-minutes to 10-minutes on top of the travel time improvement, boardings increased by 14.5%. Annually these improvements lead to an increase in Route 9 ridership of 8,800 for travel time improvements to 18,500 for both travel time and headway improvements. Of these new transit riders to the Route 9 service, between 5,300 and 11,100 were auto diversions which resulted in an annual reduction of between 37,000 and 77,500 vehicle miles travelled (VMT).

The Route 9 travel time improvements associated with the near-term 2035 findings resulted in 2.6 to 3.7 minutes of improvement in-vehicle travel time for the entire route depending on direction and time-period. This translates into approximately between 1.3 and 1.8 minutes of travel time benefit for the average rider. This travel time improvement in scenario b resulted in a 6.5% increase in daily boardings on the route. When the peak period headway was improved from 15 minutes to 10 minutes on top of the travel time improvement, boardings increased by 13.4%. Annually these improvements could lead to an increase in Route 9 ridership of 39,700 for travel time improvements to 82,000 for both travel time and headway improvements. Of these new transit riders to the Route 9 service, between 23,800 and 49,200 were auto diversions which resulted in an annual reduction of between 166,800 and 344,500 vehicle miles travelled (VMT).

HDR

Table 1: Travel Demand Results: Transit Boardings

Route 9	Boardings							
Alternative	2019_Base	2021_Base	2022_Base	2022_Bld_a	2022_Bld_b	2035_Nbld	2035_Bld_a	2035_Bld_b
Daily								
Westbound Summary	445	307	278	297	318	1,335	1,422	1,514
Eastbound Summary	366	224	195	208	223	934	995	1,060
Total	811	531	473	505	541	2,269	2,417	2,574
Delta				33	69		148	305
Percent Change				6.9%	14.5%		6.5%	13.4%
Annual								
Westbound Summary	119,682	82,511	74,662	79,964	85,641	359,046	382,405	407,292
Eastbound Summary	98,465	60,269	52,465	55,974	59,949	251,333	267,683	285,104
Total	218,147	142,781	127,127	135,938	145,590	610,379	650,088	692,396
Delta				8,811	18,463		39,709	82,017
Percent Change				6.9%	14.5%		6.5%	13.4%

Scenario 'a' includes travel time improvements and scenario 'b' adds headway improvements to 'a'

Table 2: Travel Demand Results: Transit Metrics

Route 9	Transit Metrics			
Alternative	2022_Bld_a	2022_Bld_b	2035_Bld_a	2035_Bld_b
Change in Daily				
Linked Transit Trips	20	41	89	183
Unlinked Transit Trips	26	54	117	241
Change in Annual				
Linked Transit Trips	5,286	11,078	23,826	49,210
Unlinked Transit Trips	6,978	14,623	31,450	64,958

Table 3: Travel Demand Results: Auto

Route 9	Automotive Metrics			
Annual Auto Benefits	2022_Bld_a	2022_Bld_b	2035_Bld_a	2035_Bld_b
Auto Diversions	5,286	11,078	23,826	49,210
VMT Reduction	37,005	77,546	166,779	344,473
VHT reduction	1,396	2,915	7,008	14,413

Memo

Date:	Monday, April 04, 2022
Project:	VRT RAISE Grant
To:	Stephen Hunt, Valley Regional Transit
From:	Lewis Kelley, HDR
Subject:	**State Street Transit Time Savings Analysis**

1.0 Purpose

The purpose of this memo is to present findings from an analysis of potential transit travel and dwell time savings for the Route 9 bus along the State Street corridor. The time savings are generated from a set of capital and operational changes packaged together as part of the 2022 Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant program.

2.0 Methodology

This section outlines the methods used in formulating the time savings for the Route 9 bus along State Street. Two sets of time savings were calculated for the corridor, a near-term set of savings assuming implementation of the RAISE Grant improvements in the projected construction year, using a blend of pre- and post-COVID-19 ridership to simulate partial recovery of ridership to pre-COVID-19 levels. The second set of time saving calculations are for the future year 2035 and assume a growth in transit ridership based on two factors. The first growth factor is consistent with the Community Planning Association of Southwest Idaho's (COMPASS) growth factors in their regional travel demand model. The second growth factor involves ridership projections for 2035 that assume faster transit service and additional amenities that will attract additional riders to the route.

The two following separate types of time saving improvements are planned for the route:

- Travel Time Savings – Travel time is any time a transit vehicle is devoted to traveling between two points. Travel time improvements result in less time spent traveling along the corridor and include such things as transit signal priority (TSP), which allows a transit vehicle to travel through a congested intersection more efficiently.

- Dwell Time Savings – Dwell time is any time a transit vehicle spends not moving at a scheduled stop. This can also include time spent accessing a stop or merging into traffic after leaving a stop as traffic congestion, or conflicts with turning vehicles that hinder a transit vehicle at stops, adding to delay.

Table D outlines the types of investments planned for the Route 9 bus and the categories of time savings they fall under for the purposes of this analysis.

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Table D: Time Saving Investments and Categories

Time Saving Improvement	Definition	Time Saving Type	Saving Calculations
Business Access and Transit (BAT) Lane	A travel lane used only for general purpose vehicles to turn right while transit vehicles may use the lane for through travel.	Travel Time	Synchro operations modeling
Queue Jump Lane	A short lane on the approach to a signalized intersection that is only for transit vehicles so that they may avoid vehicle congestion at an intersection.	Travel Time	Synchro operations modeling
Transit Signal Priority (TSP)	TSP is a system for transit vehicles and traffic signals to communicate that shortens the phasing cycle to speed transit operations through an intersection.	Travel Time	Synchro operations modeling
Off-Board Fare Payment	A ticketing system that allows payment of transit fares prior to boarding a transit vehicle, which saves time on passenger boardings.	Dwell Time	Per passenger savings
All-Door Boarding	Associated with Off-Board Fare Payment, allows for more passengers to board in a shorter period of time.	Dwell Time	Per passenger savings
Stop Consolidation	Streamlining the number of transit stops to focus on the stops that generate the most ridership. Time is saved by transit vehicles accessing fewer stops along a route.	Travel Time	Per stop savings
Far Side Stop Placement	When a near-side stop is moved to the far-side of an intersection, conflicts with turning vehicles and congestion that prevent a bus from accessing a stop are reduced.	Dwell Time	Per stop savings
In-Lane Stop	An in-lane stop allows a bus quicker access and reduced time merging back into traffic.	Dwell Time	Per passenger savings
Near Level Boarding	Near level boarding reduces boarding times and eases access for passengers with disabilities or using wheelchairs.	Dwell Time	Per passenger savings
Bikes Behind a Bus Stop	Moving bicycle traffic behind a transit platform reduces conflicts between buses and bicycles, saving time accessing a stop and when merging back into traffic.	Dwell Time	Per bike savings

2.1 Travel Time Savings

The travel time savings were produced using the operational work undertaken during the State Street Corridor Transit Operations Analysis (TOA). The AM and PM peak periods in this study are from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM, respectively. COMPASS provided growth rates to compute future traffic volumes. Generally, traffic is estimated to grow on State Street at a rate of about 1.5 percent between 2021 and 2035, except between Whitewater Parkway and Gary/Glenwood where traffic is estimated to grow at about 2.5 percent. The Synchro modeling software was used to generate near-term and long-term travel time savings that are a result of operational improvements at intersections. These improvements generally reduce the severity of congestion at an intersection or allow a transit vehicle to bypass congestion to move through an intersection faster. For a full accounting of the methods used in the operations modeling, please refer to the TOA memo, *State Street Corridor Operational Analysis*.

2.2 Dwell Time Savings

The dwell time saving factors were created as part of the TOA Dwell-Time Reduction Toolkit. For the toolkit, a series of dwell-time reduction improvements were reviewed and selected that would fit the State Street corridor and help meet the operational objectives of improving transit operations Valley Regional Transit set for the corridor. A review of available research was then conducted to find accepted time-saving factors for each of the elements of the toolkit. Table E outlines the time saving factor used for each of the improvements. The complete information on the Dwell-Time Reduction Toolkit and referenced research is available in the accompanying time saving spreadsheets.

Table E: Applied Dwell-Time Reduction Factors

Time Saving Improvement	Saving Calculations	Time Factor (sec)
Off-Board Fare Payment	Per passenger savings	5
All-Door Boarding	Per passenger savings	1
Stop Consolidation	Per stop savings	20
Far Side Stop Placement	Per stop savings	5
In-Lane Stop	Per passenger savings	0.5
Near Level Boarding	Per passenger savings	1
Bikes Behind a Bus Stop	Per bike savings	0.5

The dwell time savings are calculated using several different methods but are primarily calculated on a per-passenger basis. Because many of the dwell time reduction improvements make the passenger payment and boarding process more efficient, a time value is applied to each passenger at a stop where improvements are planned. Valley Regional Transit provided average daily ridership at each stop, which was used to calculate the dwell time savings for those improvements calculated on a per-passenger basis.

The dwell-time improvements for stop consolidation and far-side placement are both calculated on a per-stop basis; therefore, each has a constant value for each instance along the corridor. The third type of dwell-time savings, on a per-bike basis, is applied for improvements where bikes are routed behind a bus platform, thus eliminating bike/bus conflicts at stops.

3.0 State Street Improvements

This section presents the planned RAISE Grant improvements and how they relate to improving the operational performance of Route 9 along State Street. Table F and Table G show the list of improvements planned for both the inbound and outbound journeys of Route 9 buses.

Table F: RAISE Grant Outbound Improvements Contributing to Improved Transit Operations

ID	Stop	Outbound Improvements						
		Off-Board Fare Payment	All-Door Boarding	Near Level Boarding	Far Side Stop	In-Lane Stop	Bike Behind Stop	BAT Lane
1	Main Street Station	X	X					
2	State/11th	X	X					
3	State 15th				X	X		
4	State 23rd	X	X	X	X	X	X	
5	State 27th	X	X	X		X	X	X
6	State/Whitewater/31st			X	X			
7	State/Dewey/Clover			X		X	X	
8	State/VMP							
9	State/Willow							
10	State/Collister	X	X					
11	State/Marketplace							
12	State/Plantation/Bloom							
13	State/Glenwood/Gary							
14	Gary/Bunch	X	X				X	
15	State/Saxton							
16	State/Bogart							

Table G: RAISE Grant Inbound Improvements Contributing to Improved Transit Operations

ID	Stop	Inbound Improvements						
		Off-Board Fare Payment	All-Door Boarding	Near Level Boarding	Far Side Stop	In-Lane Stop	Bike Behind Stop	BAT Lane
1	State/Bogart							
2	State/Saxton	X	X	X				
3	Gary/Bunch							
4	State/Glenwood/Gary							
5	State/Plantation/Bloom							
6	State/Marketplace							
7	State/Collister	X	X					
8	State/Willow							
9	State/VMP							
10	State/Dewey/Clover							
11	State/Whitewater/31st							X
12	State 27th	X	X	X				X
13	State 23rd	X	X	X				
14	State 15th							
15	State/11th	X	X					
16	Main Street Station							

4.0 Time Saving Results

This section reviews the results of the time saving calculations for Route 9. The results are reported in the following time periods:

- A single bus reported in each operational direction during the AM and PM peak hours
- The total time saved for all buses operating during the AM and PM peak hours
- The total cumulative savings for Route 9 during a full day of operations.

4.1 Near-Term Operational Improvements

Table H presents time savings results for a single Route 9 bus in each operational direction during both the AM and PM peak periods.

Table H: Peak Period Inbound and Outbound Time Savings

ID	Stop Location	Near Term Time Savings (min)*			
		Travel Time Savings		Dwell Time Savings	
		AM Peak	PM Peak	AM Peak	PM Peak
Outbound					
1	Main Street Station	-	-	0.69	0.92
2	State/11th	-	-	0.14	0.18
3	State 15th	-	-	0.09	0.09
4	State 23rd	-	-	0.10	0.10
5	State 27th	0.05	0.15	0.02	0.02
6	State/Whitewater/31st	-	-	0.09	0.09
7	State/Dewey/Clover	-	-	0.001	0.001
8	State/VMP	-	-	-	-
10	State/Collister	-	-	0.01	0.02
14	Gary/Bunch	-	-	0.08	0.11
15	State/Saxton	-	-	-	-
16	State/Bogart	-	-	-	-
Stop Consolidations (3 outbound)				**1.00**	**1.00**
TSP Implementation (5% constant on travel time)		**1.00**	**1.25**		
Total Travel Time Savings		**1.05**	**1.40**		
Total Dwell Time Savings				**2.21**	**2.54**
Inbound					
16	State/Bogart	-	-	-	-
15	State/Saxton	-	-	0.08	0.11
14	Gary/Bunch	-	-	-	-
10	State/Collister			0.06	0.08
8	State/VMP	-	-	-	-
7	State/Dewey/Clover	-	-	-	-
6	State/Whitewater/31st	-	-	-	-

ID	Stop Location	Near Term Time Savings (min)*			
		Travel Time Savings		Dwell Time Savings	
		AM Peak	PM Peak	AM Peak	PM Peak
5	State 27th	-	-	0.03	0.04
4	State 23rd	0.1		0.01	0.02
3	State 15th	-	-	-	-
2	State/11th	0.05	0.15	0.02	0.03
1	Main Street Station	-	-	-	-
Stop Consolidations (2 Inbound)				**0.67**	**0.67**
TSP Implementation (5% constant on travel time)		**1.00**	**1.25**		
Total Travel Time Savings		***1.15***	***1.40***		
Total Dwell Time Savings				***0.89***	***0.96***
**All savings reported in minutes, for a single, directional transit run.*					

Table I presents time savings during both the two-hour AM and PM peak periods and for a full day of Route 9 operations along State Street.

Table I: Cumulative Daily and Peak Period Time Savings

ID	Stop	Near-Term Benefits		
		Total Daily Time Saving (min)	Time Saving Benefit (min)	
			AM*	PM*
1	Main Street Station	18.48	5.54	7.39
2	State/11th	4.20	1.27	1.68
3	State 15th	4.34	0.72	0.74
4	State 23rd	4.85	0.88	0.94
5	State 27th	8.26	1.18	2.92
6	State/Whitewater/31st	5.96	1.48	0.69
7	State/Dewey/Clover	0.03	0.01	0.01
8	State/VMP	-	-	-
10	State/Collister	2.05	0.61	0.82
14	Gary/Bunch	2.15	0.65	0.86
15	State/Saxton	1.98	0.63	0.84
16	State/Bogart	-	-	-
Stop Consolidations		83.33	13.33	13.33
Transit Signal Priority (TSP)		95.29	15.15	15.57
Total Transit Travel Time Savings		**230.92**	**41.44**	**45.78**
Average Transit Cycle Time (Round Trip)		**50.82**	**50.5**	**51.9**
Existing Transit Travel Time (Total/AM/PM Peak)		**2541**	**404**	**415.2**
Transit Travel Time Savings %		**9.09%**	**10.3%**	**11.0%**
** Travel time benefits are reported for the entire, two-hour AM and PM peak periods.*				

A full Route 9 scheduled cycle (outbound and inbound operations with scheduled dwell-time at timepoints) averages between 50.5 and 52 minutes for the peak periods with the PM peak taking slightly longer due in part to more congested roadways in the PM peak period. Peak period savings represent 10.5 and 11.4 percent savings for the AM and PM peak periods, respectively. The greatest amount of savings come from TSP implementation and stop consolidations. These make up roughly 75 percent of time savings over the course of a day as these accrue as a bus moves through each intersection or each consolidated stop. The next largest time saving comes from the off-board fare payment at the Main Street Station, at 8 percent of total savings. The boarding at this location represents a significant portion of overall ridership for Route 9 and conversely represents a large portion of dwell-time savings.

The PM peak period is projected to have a greater amount of savings in part because intersections are more congested during the PM peak, and so travel time improvements at intersections are more effective during this time. Over the course of a full day of operations, Route 9 is projected to save 9.3 percent of operational time. This value is lower than for the peak periods because both dwell-time reduction strategies that improve operations on a per-passenger basis and travel time improvements at intersections are more effective with higher amounts of ridership and congestion.

4.2 2035 Operational Improvement

Table G presents time savings results for a single Route 9 bus in each operational direction during both the AM and PM peak periods.

Table G: Peak Period Inbound and Outbound Time Savings

ID	Stop Location	Future Year Time Savings (min)*			
		Travel Time Savings		Dwell Time Savings	
		AM Peak	PM Peak	AM Peak	PM Peak
Outbound					
1	Main Street Station	-	-	2.65	0.92
2	State/11th	-	-	0.40	0.18
3	State 15th	-	-	0.11	0.09
4	State 23rd	-	-	0.13	0.10
5	State 27th	0.03	0.10	0.09	0.02
6	State/Whitewater/31st	-	-	0.09	0.09
7	State/Dewey/Clover	-	-	0.01	0.001
8	State/VMP	-	-	-	-
10	State/Collister	-	-	0.01	0.02
14	Gary/Bunch	-	-	0.27	0.11
15	State/Saxton	-	-	-	-
16	State/Bogart	-	-	-	-
Stop Consolidations (3 outbound)				**1.00**	**1.00**
TSP Implementation (5% constant on travel time)		**1.00**	**1.25**		
Total Travel Time Savings		**1.03**	**1.35**		

ID	Stop Location	Future Year Time Savings (min)*			
		Travel Time Savings		Dwell Time Savings	
		AM Peak	PM Peak	AM Peak	PM Peak
Total Dwell Time Savings				**4.76**	**5.93**
Inbound					
16	State/Bogart	-	-	-	-
15	State/Saxton	-	-	0.60	0.80
14	Gary/Bunch	-	-	-	-
10	State/Collister			0.05	0.06
8	State/VMP	-	-	-	-
7	State/Dewey/Clover	-	-	-	-
6	State/Whitewater/31st	0.08	-	-	-
5	State 27th	0.03	0.10	0.15	0.19
4	State 23rd	-	-	0.06	0.08
3	State 15th	-	-	-	-
2	State/11th	-	-	0.08	0.11
1	Main Street Station	-	-	-	-
Stop Consolidations (2 Inbound)		-	-	**0.67**	**0.67**
TSP Implementation (5% constant on travel time)		**1.00**	**1.25**	-	-
Total Travel Time Savings		***1.11***	***1.35***	-	-
Total Dwell Time Savings				***1.60***	***1.91***
**All savings reported in minutes, for a single, directional transit run.*					

Table H presents time savings during both the two-hour AM and PM peak periods and for a full day of Route 9 operations along State Street.

Table H: Cumulative Daily and Peak Period Time Savings

ID	Stop	Future Year Benefits		
		Total Daily Time Saving (min)	Time Saving Benefit (min)	
			AM*	PM*
1	Main Street Station	76.81	21.17	28.22
2	State/11th	13.91	3.87	5.15
3	State 15th	4.88	0.88	0.95
4	State 23rd	7.24	1.51	1.78
5	State 27th	11.78	2.51	4.11
6	State/Whitewater/31st	5.81	1.38	0.77
7	State/Dewey/Clover	0.31	0.09	0.12
8	State/VMP	-	-	-
10	State/Collister	-	-	-
14	Gary/Bunch	1.49	0.46	0.62
15	State/Saxton	-	-	-
16	State/Bogart	-	-	-
Stop Consolidations		83.33	13.33	13.33
Transit Signal Priority (TSP)		95.29	15.15	15.57
Total Transit Travel Time Savings		**323.68**	**67.28**	**79.87**
Average Transit Cycle Time (Round Trip)		**50.82**	**50.5**	**51.9**
Existing Transit Travel Time (Total/AM/PM Peak)		**2541**	**404**	**415.2**
Transit Travel Time Savings %		**12.74%**	**16.7%**	**19.2%**
** Travel time benefits are reported for the entire, two-hour AM and PM peak periods.*				

In the future year 2035 Peak period savings represent 16.7 and 19.2 percent savings for the AM and PM peak periods respectively, while 12.7 percent savings can be expected for a whole day of operations. Main Street Station is expected to have the greatest time savings associated with a stop, at 77 total minutes saved for a whole day of operations. Boarding at the Main Street Station is expected to grow by approximately 5.5 times the current levels by 2035 leading to significant dwell-time savings at this location thanks to off-board fare payment and all-door boarding. Compared to the near-term implementation of the RAISE Grant investments, the future year 2035 savings are expected to be 39 percent larger for a full day, while also 60 and 71 percent larger for the AM and PM Peak Periods.

Memo

Date:	Friday, March 25, 2022
Project:	VRT RAISE Grant
To:	Stephen Hunt, Valley Regional Transit
From:	Lewis Kelley, HDR
Subject:	**State Street Multimodal Level of Service (MMLOS) Analysis Results**

1.0 Purpose

The purpose of this memo is to present analysis findings for a multimodal level of service (MMLOS) analysis, including bicycle, pedestrian, and transit, along the State Street corridor in Boise, Idaho. Both the existing roadway conditions and the planned future improvements packaged together for the 2022 Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant program are rated. A few intersections covered in this memo will not be part of the RAISE Grant as of the latest scoping information. These intersections are still present in the analysis but are highlighted as being a part of the State Street Transit Operations Analysis (TOA) instead.

2.0 MMLOS Defined

MMLOS scores are based on user perceptions (traveler satisfaction) and are graded from best to worst, A through F.

This memo uses the qualitative multimodal assessment (QMA) methodology, which is a modified version of the full MMLOS assessment methodology described in the 2010 *Highway Capacity Manual* (HCM). This QMA methodology uses roadway characteristics and applies a context-based, subjective “Excellent/Good/Fair/Poor” rating expressed alphabetically as A through F, with A being the highest rating. The full HCM MMLOS is most applicable on urban roadways with uniform segments broken up by signalized intersections; however, the methodology can be applied to other contexts.

2.1 Pedestrian Considerations

On roadway segments, MMLOS considers the following factors:

- Travel lanes, speed of motorized traffic, and traffic volumes: Fewer travel lanes, lower vehicle speeds, and lower volumes will rate higher than more lanes, higher speeds, and more volume.
- Sidewalk/path presence: The presence of sidewalks or paths will rate higher versus shoulders or no facilities. Wider sidewalks/paths rate better than narrower or non-existent sidewalks/paths.

At intersections, the following factors are considered:

- Traffic control: Intersections with a traffic signal or all-way stop control, or with marked crosswalks, rate better than locations with only two-way stop control or locations without marked crosswalks.
- Crossing width: Crossings with fewer turn lanes or through travel lanes rate better than crossings with more turn/though lanes due to reduced exposure to traffic and associated conflicts.
- Intersection geometry: Turning radii influences vehicle turning speed and sight lines. Facilitating slower vehicle turning speeds, tighter turning radii result in a higher level of service for pedestrians.
- Crossing delay: Longer pedestrian wait times to make a crossing translate to lower level-of-service (LOS) scores.
- Median islands: The presence of a median island is rated better than no islands, as two-stage crossings significantly yield potential to improve safety and ease when using a crossing.

2.2 Bicycle Considerations

On roadway segments, MMLOS considers the following factors:

- Preferred bicycle facility type: Bicycle facilities with greater separation from motor vehicle traffic rate higher compared with shared or less separated facilities. Wider bicycle facilities rate better than narrower or non-existent ones.
- Shoulder presence/width: Shoulders serve bicyclists in the absence of bike lanes, and wider shoulders rate higher than narrower or non-existent shoulders.
- Uncontrolled Access: Uncontrolled access points such as side streets or driveways result in lower level of service scores.
- Travel lanes and speed of motorized traffic: Fewer travel lanes and lower vehicle speeds will derive higher MMLOS scores.

At intersections, the following factors are considered:

- Traffic control: Intersections with a traffic signal or all-way stop control with crosswalks rate better than locations with only two-way stop control or locations without crosswalks. Intersections with bike signals rate the highest.
- Crossing width: Crossings with fewer turn lanes or through travel lanes rate better than crossings with more turn/though lanes due to reduced exposure to traffic and associated conflicts.
- Turning conflicts: Permissive left and right turns lower the level of service score due to potentially higher crash risks. Both left- and right-turn conflicts are taken into account,

including presence of exclusive turn lanes and relative location of bicycle facilities to turn lanes.

2.3 Transit Considerations

The following factors are considered for transit:

- Frequency and on-time reliability: More frequent service and higher on-time performance rate better than less frequent service and less reliable schedules.
- Schedule speed/travel times: Faster average peak hour schedule speeds and travel times are rated better than slower speeds and longer travel times.
- Transit stop infrastructure: The presence of shelters, benches, and lighting is rated better than stops with limited or no facilities. High-rated stops should have adequate boarding/maneuvering areas.
- Connecting pedestrian/bike network: Stops connected to a network of paths or sidewalk-equipped streets with improved crossings rate better than those lacking active transportation linkages. Approximately 40 percent of the transit LOS score derives from the pedestrian and bicycle LOS ratings, reflecting how accessible transit is along a given roadway.

3.0 Existing MMLOS Results and Predicted Future MMLOS

Table A summarizes the intersection-level MMLOS analysis while Table B summarizes the segment-level analysis conducted by HDR. Both tables display results for the current roadway conditions as well as the anticipated LOS changes due to the planned improvements along State Street.

3.1 Existing MMLOS

3.1.1 Pedestrian

The intersection and roadway segments east of Veteran's Memorial Parkway generally derive a MMLOS score of C, reflecting the area's lower relative vehicle volumes and speeds, complete sidewalk network, and four- to five-lane crossing distances at intersections. The intersection at 27th Street is an exception, rating a D, due to a missing crosswalk and the overall crossing distance across State Street. West of Veteran's Memorial Parkway, vehicle volumes and speeds increase, and the overall lane count is generally higher, resulting in lower scores in the D through F range. An exception to this is along Gary Lane and Saxton Drive, which both feature two through lanes, lower speeds, and lower vehicle volumes.

3.1.2 Bicycle

Most of State Street lacks bicycle facilities today, resulting in an LOS rating of D or lower, given the vehicle volumes, speeds, and number of through lanes present. The intersections of 23rd Street, Clover Drive, and Collister Drive are exceptions, all scoring a C due to the presence of bicycle lanes on at least a portion of the intersection legs. This includes a mix of treatments meant to increase the visibility of people bicycling while reducing crashes, including conflict markings at the intersection and bicycle lanes positioned to the left of exclusive right-turn lanes. Gary Lane and Saxton Drive score the best, LOS B, because they feature fewer travel lanes, lower speeds, and lower vehicle volumes.

3.1.3 Transit

Bus Route 9 primarily rates a transit LOS of C with several locations rating LOS B due to relatively complete pedestrian access to transit, transit vehicle speeds, and 15-minute headways. The intersection at Clover Drive rates a B in part due to the presence of a midblock pedestrian crossing that provides access to transit in the area. Overall, Route 9's 15-minute headways and 90 percent on-time performance result in a higher overall LOS.

3.2 Future MMLOS

3.2.1 Pedestrian

The improvements affiliated with this RAISE Grant are anticipated to improve pedestrian LOS scores at 8 of the 11 study intersections. Currently, no intersections rate an LOS A or B, but with the improvements, 23rd Street is rated an A while the intersections at Clover Drive, Northgate Shopping Center, and Gary/Bunch lanes all rate LOS B. The improved LOS ratings are mostly due to improved crosswalks, updated Americans with Disabilities Act (ADA) ramps, and sidewalks. The roadway segment LOS for pedestrians would largely remain unchanged, except for the segment between 27th Street and Willow Lane, where future LOS is rated an F. This is due to the projected increase in traffic volumes along these segments.

3.2.2 Bicycle

Bicycle LOS would improve at 8 of the 11 intersections. Under the existing conditions, many intersections are rated D, E and F. The RAISE Grant package of improvements improve the future LOS ratings so that only one LOS D and one LOS E remain at Northgate Shopping Center and the intersection at 18th Street. The improved LOS scores are the result of adding bicycle lanes or separated pathways, conflict markings, and reduced turning conflicts at many locations. The most substantial improvements would occur at the intersections at 23rd Street and Marketplace Lane; where the former will feature a protected intersection, providing a greater level of separation between bicycles and vehicles, while the latter will feature a separate pathway in the long term.

3.2.3 Transit

The transit LOS would improve along nearly the entire project area, generally from LOS C to an LOS B. The improvements are, in part, due to increased operating speeds and reduced headways along State Street with some minor improvements deriving from the access improvements for bicycle and pedestrian users.

Table A

FINAL Intersection Level Multimodal Level of Service (MMLOS)*

Intersection	ID	Street	Cross Street	EXISTING Pedestrian LOS	EXISTING Bicycle LOS	EXISTING Transit LOS	FUTURE Pedestrian LOS	FUTURE Bicycle LOS	FUTURE Transit LOS	NOTES: Factors Lowering Existing PLOS Scoring (from the view of the MMLOS calculations)	NOTES: Factors Lowering Existing BLOS Scoring (from the view of the MMLOS calculations)
State & 18th	1	State	18th	C	E	n/a	C	E	n/a	turning conflicts	No bicycle lanes, turning conflicts, outer lane width
State & 23rd	2	State	23rd	C	C	n/a	**A (+2)**	**A (+2)**	n/a	turning conflicts, missing crossing leg	No bicycle lanes, turning conflicts, outer lane width
State & 27th	3	State	27th	D	E	n/a	**C (+1)**	**D (+1)**	n/a	Crossing distance (# of lanes), permissive turns, missing crossing leg	No bicycle lanes, turning conflicts, outer lane width
State & Clover/Dewey	4	State	Clover/Dewey	C	C	n/a	**B (+1)**	**B (+1)**	n/a	Crossing distance (# of lanes)	turning conflicts, crossing distance, vehicle speeds
State & Willow (TOA)	5	State	Willow	D	D	n/a	**C (+1)**	**C (+1)**	n/a	Condition of ped facilities, Crossing distance (# of lanes), corner radii	turning conflicts, crossing distance, vehicle speeds
State & Collister	6	State	Collister	D	C	n/a	D	C	n/a	Crossing distance (# of lanes), corner radii	crossing distance, vehicle speeds
State & Marketplace (TOA)	7	State	Marketplace	D	F	n/a	D	**C (+3)**	n/a	Corner radii, RT conflict	No bicycle lanes, turning conflicts, crossing distance, vehicle speeds
State & Northgate (TOA)	8	State	Northgate/Plantation Entrance	E	D	n/a	**B (+2)**	D	n/a	Uncontrolled Crossing	turning conflicts, crossing distance, vehicle speeds
State & Saxton	9	State	Saxton/Walmart	D	E	n/a	**C (+1)**	**D (+1)**	n/a	Condition of ped facilities, Crossing distance (# of lanes), corner radii, turning conflicts	turning conflicts, crossing distance, vehicle speeds
State & Bogart	10	State	Bogart	D	E	n/a	**C (+1)**	**D (+1)**	n/a	turning conflicts, missing crossing leg	turning conflicts, crossing distance, vehicle speeds
Gary & Bunch	11	Gary	Bunch	C	C	n/a	**B (+1)**	**B (+1)**	n/a	missing crossing leg	

**Highlighted rows are not part of the final RAISE grant application and reflective of the State Street Transit Operations Analysis (TOA)*

Table B

FINAL Segment Level Multimodal Level of Service (MMLOS)*												
				EXISTING			**FUTURE**			**NOTES**		
Roadway	**Segment**	**Dir**	**From-To**	**Pedestrian LOS**	**Bicycle LOS**	**Transit LOS**	**Pedestrian LOS**	**Bicycle LOS**	**Transit LOS**	**Factors Lowering Existing PLOS Scoring (from the view of the MMLOS calculations)**	**Factors Lowering Existing BLOS Scoring (from the view of the MMLOS calculations)**	**Factors Lowering Existing TLOS Scoring (from the view of the MMLOS calculations)**
Main/5th	1	OB/WB	Main St Station to 7th Station	C	D	C	C	**C (+1)**	**B (+1)**	Number of Lanes	Number of Lanes, Level of Bicycle Facilities	Service Frequency, Average Travel Speeds
9th/Main	1	IB/EB	State/9th to Main St Station	C	D	C	C	**C (+1)**	**B (+1)**	Number of Lanes	Number of Lanes, Level of Bicycle Facilities	Service Frequency, Average Travel Speeds
State	2	OB/WB	State/7th to State/18th	C	D	C	C	**C (+1)**	**B (+1)**		Number of Lanes, Level of Bicycle Facilities	Service Frequency, Average Travel Speeds
State	2	IB/EB	State/18th to State/9th	C	D	C	C	**C (+1)**	**B (+1)**		Number of Lanes, Level of Bicycle Facilities	Service Frequency, Average Travel Speeds
State	3	OB/WB	State/18th to State/27th	C	D	C	C	**C (+1)**	**B (+1)**		Number of Lanes, Level of Bicycle Facilities	Service Frequency, Average Travel Speeds
State	3	IB/EB	State/27th to State/18th	C	D	C	C	**C (+1)**	**B (+1)**		Number of Lanes, Level of Bicycle Facilities	Service Frequency, Average Travel Speeds
State	4	OB/WB	State/27th to State/Clover	F	F	C	F	F	**B (+1)**	Number of Lanes, Vehicle Volumes	Number of Lanes, Level of Bicycle Facilities, Vehicle Speeds	Service Frequency, Average Travel Speeds, PLOS

State	4	IB/EB	State/Clover to State/27th	E	F	C	**F (-1)**	F	**B (+1)**	Number of Lanes, Vehicle Volumes	Number of Lanes, Level of Bicycle Facilities, Vehicle Speeds	Service Frequency, Average Travel Speeds, PLOS
State	5	OB/WB	State/Clover to State/Willow	C	F	B	**F (-2)**	F	B		Number of Lanes, Level of Bicycle Facilities, Vehicle Speeds	
State	5	IB/EB	State/Willow to State/Clover	E	F	C	**F (-1)**	F	**B (+1)**	Number of Lanes, Vehicle Volumes	Number of Lanes, Level of Bicycle Facilities, Vehicle Speeds	Service Frequency, Average Travel Speeds, PLOS
State	6	OB/WB	State/Willow to State/Marketplace	F	F	C	F	F	**B (+1)**	Number of Lanes, Vehicle Volumes	Number of Lanes, Level of Bicycle Facilities, Vehicle Speeds	Service Frequency, Average Travel Speeds, PLOS
State	6	IB/EB	State/Marketplace to State/Willow	F	F	C	F	F	**B (+1)**	Number of Lanes, Vehicle Volumes	Number of Lanes, Level of Bicycle Facilities, Vehicle Speeds	Service Frequency, Average Travel Speeds, PLOS
State	7	OB/WB	State/Marketplace to Northgate	F	F	C	F	F	**B (+1)**	Number of Lanes, Vehicle Volumes, Vehicle Speeds	Number of Lanes, Level of Bicycle Facilities, Vehicle Speeds	Service Frequency, Average Travel Speeds, PLOS
State	7	IB/EB	Northgate to State/Marketplace	F	F	C	F	F	**B (+1)**	Number of Lanes, Vehicle Volumes, Vehicle Speeds	Number of Lanes, Level of Bicycle Facilities, Vehicle Speeds	Service Frequency, Average Travel Speeds, PLOS
Gary/Saxton	8	OB/WB	Glenwood to Saxton/State	B	B	B	E	B	**A (+1)**			
Gary/Saxton	8	IB/EB	Glenwood to Saxton/State	B	B	B	E	B	**A (+1)**			

**Highlighted rows are not part of the final RAISE grant application and reflective of the State Street Transit Operations Analysis (TOA)*