Appendix B2
Traffic Resources

ARLINGTON AVENUE BRIDGES PROJECT

Technical Memorandum

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Subject: **Traffic Reasonability Check** **Project Name:** Arlington Avenue Bridges Feasibility and Alternatives Analysis Project

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1. Introduction and background

The Regional Transportation Commission (RTC) of Washoe County is conducting a feasibility and alternatives analysis to determine options for the rehabilitation or replacement of the two Arlington Avenue Bridges (Project) located across the Truckee River in downtown Reno, Nevada. The Project is located between Island Avenue and W. First Street and includes the area of Wingfield Park.

Arlington Avenue provides vehicle access to Wingfield Park. Arlington Avenue was previously a four-lane road; however, in the early 2000's, the RTC reconfigured the roadway, reducing the number of travel lanes to one automobile lane in each direction (two-lane road), added a center two-way left turn lane, and added bike lanes.

The Project team reviewed the historical, existing, and future traffic volumes along/near the Arlington Avenue Bridges to determine the likely traffic operational performance of the proposed configuration (one through automobile travel lane in each direction) on the bridge.

2. Methodology

The following were the key steps undertaken to complete the traffic reasonability check:

- Obtain available field count data from RTC Washoe on the Arlington Avenue Bridge for the year 2016. Estimate year 2015[1] field volumes based on the year 2016 volumes.
- Obtain year 2015 and year 2050 travel demand model[2] volumes on the Arlington Avenue Bridge from RTC Washoe.

[1] Year 2015 field volumes were needed to refine the travel demand model volumes (explained in the third bullet in this section).
[2] The travel demand model corresponding to the RTC's 2050 Regional Transportation Plan is under development (at the time of preparation of this memorandum). RTC Washoe provided the volumes from the draft model to the Project team for use in this Reasonability Check.

- Compare the daily volumes from the travel demand model and the field count volume and refine the model volumes to improve their accuracy according to procedures outlined in NDOT's Traffic Forecasting Guidelines and Transportation Research Board's *NCHRP Report 765*.
- Use Transportation Research Board's *Highway Capacity Manual (HCM) 6th Edition* to determine a planning-level Level of Service (LOS) for the roadway segment on the bridge, based on volume, number of lanes, and speed.

3. Year 2050 Forecast Daily Traffic Volume

The year 2015 field volume on the Arlington Avenue Bridge was approximately 13,500 vehicles per day.

Future year 2050 traffic volumes for the Traffic Operations Reasonability Check were determined by refining the year 2050 travel demand model volumes using the procedures outlined in NDOT's Traffic Forecasting Guidelines and *NCHRP Report 765*. This is shown in Table 1. The Arlington Avenue Bridge is modeled as a two-lane (one lane in each direction) section in the year 2050 travel demand model.

As shown below, approximately 18,000 vehicles per day are expected to travel across the bridge by the year 2050. This corresponds to an approximate growth rate of 0.8 percent; which is reasonable for a mature urban area.

The Project team also reviewed the travel demand model corresponding to the RTC's 2040 Regional Transportation Plan. This is the current adopted model at the time of preparation of this memorandum. It appears that the year 2040 model underestimates the volumes on the Arlington Avenue Bridge. Based on coordination with RTC Washoe, the year 2050 travel demand model was determined to be more appropriate for developing forecast volumes for this reasonability check.

Table 1: Year 2015 and Year 2050 Daily Traffic Volumes

Location	Year 2015 Field Count - Daily Traffic Volume	Year 2015 Travel Demand Model - Daily Traffic Volume	Year 2050 Travel Demand Model - Daily Traffic Volume	Forecast Year 2050 - Daily Traffic Volume (based on NCHRP Report 765 Methods)
Arlington Avenue Bridge – Total of both directions	13,500	16,000	20,500	**18,000**

4. Traffic Operations Reasonability Check

The year 2015 and year 2050 daily traffic volumes discussed in Section 3 were compared to the Generalized Daily Service Volumes for Urban Street Facilities table found in the *HCM.* This is provided in Table 2.

Table 2: Generalized Daily Service Volumes for Urban Street Facilities[3]

K-Factor	D-Factor	Daily Service Volume by Lanes, LOS, and Speed (1,000 veh/day)											
		Two-Lane Streets				Four-Lane Streets				Six-Lane Streets			
		LOS B	LOS C	LOS D	LOS E	LOS B	LOS C	LOS D	LOS E	LOS B	LOS C	LOS D	LOS E
Posted Speed = 30 mi/h													
0.09	0.55	NA	1.7	11.8	17.8	NA	2.2	24.7	35.8	NA	2.6	38.7	54.0
	0.60	NA	1.6	10.8	16.4	NA	2.0	22.7	32.8	NA	2.4	35.6	49.5
0.10	0.55	NA	1.6	10.7	16.1	NA	2.0	22.3	32.2	NA	2.4	34.9	48.6
	0.60	NA	1.4	9.8	14.7	NA	1.8	20.4	29.5	NA	2.2	32.0	44.5
0.11	0.55	NA	1.4	9.7	14.6	NA	1.8	20.3	29.3	NA	2.1	31.7	44.1
	0.60	NA	1.3	8.9	13.4	NA	1.7	18.6	26.9	NA	2.0	29.1	40.5
Posted Speed = 45 mi/h													
0.09	0.55	NA	7.7	15.9	18.3	NA	16.5	33.6	36.8	NA	25.4	51.7	55.3
	0.60	NA	7.1	14.5	16.8	NA	15.1	30.8	33.7	NA	23.4	47.4	50.7
0.10	0.55	NA	7.0	14.3	16.5	NA	14.9	30.2	33.1	NA	23.0	46.5	49.7
	0.60	NA	6.4	13.1	15.1	NA	13.6	27.7	30.3	NA	21.0	42.7	45.6
0.11	0.55	NA	6.3	13.0	15.0	NA	13.5	27.5	30.1	NA	20.9	42.3	45.2
	0.60	NA	5.8	11.9	13.8	NA	12.4	25.2	27.6	NA	19.1	38.8	41.5

Notes: NA = not applicable; LOS cannot be achieved with the stated assumptions.
General assumptions include no roundabouts or all-way STOP-controlled intersections along the facility; coordinated, semiactuated traffic signals; Arrival Type 4; 120-s cycle time; protected left-turn phases; 0.45 weighted average *g/C* ratio; exclusive left-turn lanes with adequate queue storage provided at traffic signals; no exclusive right-turn lanes provided; no restrictive median; 2-mi facility length; 10% of traffic turns left and 10% turns right at each traffic signal; peak hour factor = 0.92; and base saturation flow rate = 1,900 pc/h/ln.
Additional assumptions for 30-mi/h facilities: signal spacing = 1,050 ft and 20 access points/mi.
Additional assumptions for 45-mi/h facilities: signal spacing = 1,500 ft and 10 access points/mi.

The nearest NDOT's ATR station that provides K-factor and D-factor is available on S. Virginia St (355 feet N. of Gentry Way [ATR 0312260]). The K-factor and D-factor from this station are 0.09 and 0.552 respectively.

Using the table above and extrapolating for a posted speed limit of 15 miles per hours, in the year 2015, with a daily volume of 13,500 vehicles, a K-factor of 0.09 and D-factor of 0.55, and a two-lane road, the Arlington Avenue Bridge likely performed at Level of Service (LOS) E.

By the year 2050, assuming the same lane configuration, same posted speed limit, same K-factor and D-factor, and a daily volume of 18,000 vehicles, the Arlington Avenue Bridge would likely perform at LOS F.

From Appendix G of the RTC's 2040 Regional Transportation Plan, the adopted LOS for a regional roadway facility projected to carry less than 27,000 ADT is LOS D. By the year 2050, the projected LOS F on the Arlington Avenue Bridge would be worse than the adopted LOS standard (LOS D). However, given that the RTC reconfigured the roadway and reduced the number of travel lanes on the bridge to accommodate pedestrian and bicycle travel on the bridge, multimodal traffic operations is considered the priority and degraded automobile performance is considered acceptable, especially given the context and urban location of the Project. A four-lane (two-lanes each direction) section of roadway would likely improve the automobile LOS on the bridge; the bridge would likely operate at LOS E. If further improvements to traffic operations are desired, the approaches of Arlington Avenue to/from the bridge (and the rest of the Arlington Avenue corridor and intersections that process traffic to/from the bridge)

[3] This table (Exhibit 16-16 of the HCM) provides LOS for roads with a speed limit of 30 miles per hour or 45 miles per hour. A road with a speed limit of 15 miles per hour would perform worse than that with a speed limit of 30 miles per hour (with the other parameters being constant) when using the table directly.

would become the constraints and would require significant and costly right-of-way acquisitions to serve increased traffic volumes or provide better LOS.

Though unlikely, if deemed appropriate in the future to improve the entire Arlington Avenue corridor to better serve increased traffic volumes, the proposed bridges, designed in accordance with current American Association of State Highway and Transportation Highway Officials (AASHTO) *LRFD Bridge Design Specifications*, would structurally accommodate the larger traffic volumes. From a functional perspective, if additional traffic lanes are considered in future corridor improvements, the proposed bridges could be widened to carry the wider corridor across the river.

5. Summary and Conclusion

The Project team reviewed the historical, existing, and future traffic volumes along/near the Arlington Avenue Bridge. Based on these volumes, the Project team determined that the likely planning-level automobile Level of Service experienced on the bridge by year 2050 would be LOS F. This is acceptable because of the urban nature of the surrounding area and the enhanced focus on multimodal (pedestrian and bicycle) mobility. In the next phases of NEPA documentation, more detailed traffic operations analysis is recommended, including an analysis of the Arlington Avenue corridor beyond the bridge (at least one signalized intersection on either side of the bridge). A Synchro/HCS analysis of the intersections for different horizon years (2030, 2040, and 2050) is recommended to identify the timeframe if/when the automobile traffic operations (on and around the bridge) worsen to LOS F. If appropriate, potential improvements are to be evaluated to alleviate the LOS F conditions.