720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

MEMORANDUM

DATE: February 15, 2019

TO: Inga Note, City of Spokane

FROM: Reah Flisakowski, DKS Associates
Kevin Chewuk, DKS Associates
Amanda Deering, DKS Associates

SUBJECT: Spokane 29th Avenue Corridor Study P18161-000

This memorandum summarizes a traffic study for the Spokane 29th Avenue corridor. The objective of this traffic study is to evaluate multi-modal safety and operations along 29th Avenue, review connectivity of surrounding streets, and review pedestrian and bicycle crossing needs of 29th Avenue. The study identifies improvement needs and develops solutions to address safety and mobility needs for all transportation system users of the nearly 2-mile corridor.

Study Area

The study area extends along 29th Avenue from Grand Boulevard to Ray Street, as shown in Figure 1. The following list provides the study intersections with existing control:

1. 29th Avenue / Grand Boulevard (signalized intersection)
2. 29th Avenue / Arthur Street (unsignalized intersection)
3. 29th Avenue / Perry Street (signalized intersection)
4. 29th Avenue / Pittsburg Street (unsignalized intersection)
5. 29th Avenue / Southeast Boulevard (signalized intersection)
6. 29th Avenue / Regal Street (signalized intersection)
7. 29th Avenue / Ray Street (signalized intersection)
8. Regal Street / Southeast Boulevard (signalized intersection)
9. 37th Avenue / Regal Street (signalized intersection)

Figure 1: Study Corridor

Current Facilities

The existing system includes a range of facilities for people who walk, ride bikes, use transit, or drive.

Pedestrians

Pedestrian facilities are provided throughout the study area, as shown in Table 1 and Figure 2. Sidewalk facilities exist on both the north and south sides of 29th Avenue for the entire study corridor. The sidewalk is curb-tight to the travel way, with no separation between motor vehicle traffic. Sidewalk widths are generally around 5 feet along the corridor, with wider sidewalks up to 8 feet adjacent to newer developments. The effective width of sidewalk is at times narrowed due to light poles, signing, or driveway accesses along the corridor.

Pedestrian crossing data over a 12-hour period was counted at the Garfield Street, Arthur Street, Pittsburg Street, and Martin Street intersections with 29th Avenue. The Martin Street and Pittsburg Street intersections had the most observed crossings, with 62 and 58 respectively. The Garfield Street intersection had 37 observed crossings, while the Arthur Street intersection had 30. The Grand Boulevard, Perry Street, Southeast Boulevard, Regal Street, and Ray Street intersections provide signalized pedestrian crossings on 29th Avenue. These intersections have marked crosswalks, although the paint is faded in many cases. Pittsburg Street provides a marked pedestrian crossing and signage. Curb ramps and street lighting are provided at most intersections, although the lighting is not pedestrian scaled and at times not in locations convenient for transit riders.

Figure 2: Pedestrian Facilities

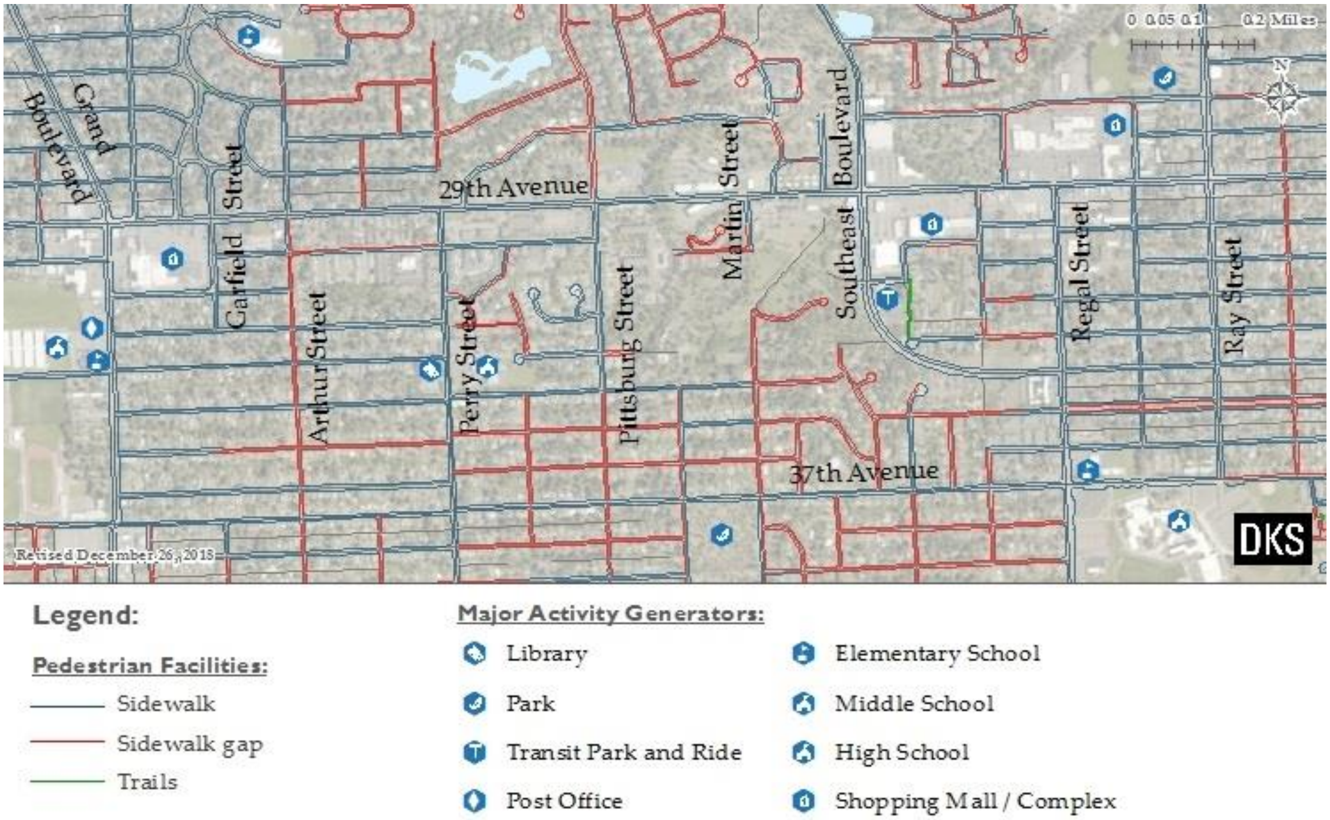


Table 1: Existing Pedestrian and Bicycle Characteristics		
Roadway (limits)	**Pedestrian Facilities**	**Bike Facilities**
29th Avenue (Grand Boulevard to Ray Street)	Sidewalks on both sides	None
Grand Boulevard (near 29th Avenue)	Sidewalks on both sides	None
Garfield Street (near 29th Avenue)	Sidewalks on both sides	None
Arthur Street (near 29th Avenue)	Sidewalks on both sides north of 29th Ave.; one side south of 29th Ave.	None
Perry Street (near 29th Avenue)	Sidewalks on both sides	None
Pittsburg Street (near 29th Avenue)	Sidewalks on both sides south of 29th Ave., intermittent sidewalks north of 29th Ave.	None
Martin Street (near 29th Avenue)	Sidewalk on one side	None
Southeast Boulevard (near 29th Avenue)	Sidewalks on both sides	None
Regal Street (near 29th Avenue)	Sidewalks on both sides	None
Ray Street (near 29th Avenue)	Sidewalks on both sides	None

Bicyclists

Bike facilities are not currently provided along the study corridor, as shown in Table 1 and Figure 3. While intersecting roadways to the 29th Avenue study corridor also lack bike facilities, many of these streets are low-speed and low-volume bike friendly roadways.

Bike crossing data over a 12-hour period was counted at the Garfield Street, Arthur Street, Pittsburg Street, and Martin Street intersections with 29th Avenue. The Pittsburg Street intersection had the most observed crossings, with 16 over the 12-hour period. The Garfield Street, Arthur Street, and Martin Street intersections each had fewer than 6 crossings over the 12-hour period.

Figure 3: Bicycle Facilities

Transit Users

Transit service is provided along the study corridor through the Spokane Transit Authority (STA). Existing transit stops are located along the study corridor near Grand Boulevard, Arthur Street/Ivory Street, Perry Street, Pittsburg Street, Martin Street, Southeast Boulevard, Regal Street, and Ray Street. The South Hill Park and Ride is located just to the south of 29th Avenue, near the Southeast Boulevard intersection with 31st Avenue.

Transit service is provided between downtown Spokane and the South Hill Park and Ride on weekdays generally between 6 a.m. and 11 p.m., on Saturday generally between 7 a.m. and 11 p.m., and 9 a.m. to 8 p.m. on Sundays. Buses run every 15 minutes to an hour during the week, and hourly during the weekend.

STA is implementing a new high-performance transit route, the Monroe-Regal Line, that will provide frequent, all-day service between North Monroe Street and South Regal Street. The following improvements will be made at study area bus stops:

- **Grand Boulevard:** Enhanced stops, with a shelter for the westbound direction
- **Arthur Street/Ivory Street:** Standard stops at Arthur Street; Ivory Street bus stop will be closed
- **Perry Street:** Enhanced stop with a shelter for the westbound direction; standard stop for the eastbound direction
- **Pittsburg Street:** Standard stops
- **Martin Street:** Standard stops
- **Southeast Boulevard:** Enhanced stops with shelters

Drivers

29th Avenue is a principal arterial, serving as a key east-to-west route in the south end of the city. A four-lane cross section (i.e., two through lanes in each direction) is maintained through the study area, although in some sections left turn lanes are provided to further facilitate traffic flow. The posted speed on 29th Avenue through the study corridor is 30 miles per hour.

Within the study area, 29th Avenue also connects to other north-to-south principal arterials, including Grand Boulevard and Ray Street, minor arterial roadways including Southeast Boulevard and Regal Street, and major collector roadway including Perry Street at traffic signals. Other local streets connect 29th Avenue to the neighborhoods to the north and south. The remaining roadways in the study corridor serve local traffic needs or business access and primarily connect with 29th Avenue at stop-controlled intersections. Characteristics of the major roadways in the study area are summarized in Table 2.

Table 2: Study Area Roadway Characteristics

Roadway (limits)	Functional Classification*	Cross Section	Posted Speed
29th Avenue (Grand Boulevard to Ray Street)	Principal Arterial	4 to 5 lanes	30 mph
Grand Boulevard (near 29th Avenue)	Principal Arterial	3 to 5 lanes	30 mph
Garfield Street (near 29th Avenue)	Local Street	2 lanes	25 mph
Arthur Street (near 29th Avenue)	Local Street	2 lanes	25 mph
Perry Street (near 29th Avenue)	Major Collector	2 lanes	30 mph
Pittsburg Street (near 29th Avenue)	Local Street	2 lanes	25 mph
Martin Street (near 29th Avenue)	Local Street	2 lanes	25 mph
Southeast Boulevard (near 29th Avenue)	Minor Arterial	3 to 5 lanes	30 mph
Regal Street (near 29th Avenue)	Minor Arterial	3 lanes	30 mph
Ray Street (near 29th Avenue)	Principal Arterial	3 to 5 lanes	30 mph

*Source: Spokane Comprehensive Plan, Retrieved November 2018.

29th Avenue Safety and Access Survey

As part of understanding existing travel conditions along the 29th Avenue corridor, an online survey solicited feedback from residents that use the corridor. The online survey for the 29th Avenue Safety and Access project received responses from 190 people. Most of the responses were from people who live nearby and drive along the corridor regularly. Around 25 to 30 percent of the respondents walk or bike along or across the corridor regularly, and 5 percent use transit.

Around 40 percent of the responses suggested users felt unsafe or uncomfortable when walking across or along 29th Avenue. People most often felt that traffic was too fast and busy, traffic signals were too far apart, and the roadway was too wide to cross.

Around 35 percent of the responses suggested users felt unsafe or uncomfortable when biking across or along 29th Avenue, and another 25 percent avoid it for the same reasons. People most often felt that traffic was too fast and busy, intersections lack access to bike-appropriate streets, and that the corridor does not have enough bike route crossings.

Around 10 percent of the responses suggested users felt unsafe or uncomfortable when accessing transit along 29th Avenue, and another 20 percent avoid it for the same reasons. People most often felt that traffic was too fast and busy to cross and access a transit stop, and that traffic signals were too far apart.

Users felt the most problematic intersections were at Regal Street, Arthur Street, Mt Vernon Street, and Garfield Street.

Travel Conditions

This section summarizes the existing and future travel conditions for the study area.

Safety Evaluation

Safety of the intersections in the study area was assessed through historic crash data to identify deficiencies. Intersection crash data was reviewed to identify potential patterns for motor vehicle, pedestrian, and bicyclist crashes. Crash data from the past five years (January 2013 through December 2017) was obtained from WSDOT for 29th Avenue and intersecting roadways in the study area.

Over the past five years, 254 crashes occurred along the study corridor, with 149 of these crashes occurring at study intersections. Half of the crashes at study intersections occurred at the Southeast Boulevard, Regal Street, and Ray Street intersections (74 of 149 crashes), while the remaining intersections had 20 or fewer recorded crashes each. Most of the crashes occurring at the three intersections noted above were either rear end or turning movement crashes. Most of the crashes at other study locations were rear end crashes.

While many crashes occurred at the study intersections, they were generally not severe; 75 of 149 crashes were property damage only. Most of the remaining crashes did not involve serious injuries. Over the last five years, no fatalities were recorded. Two severe injuries occurred, one at the 29th Avenue / Southeast Boulevard intersection, and one at the Regal Street/ 37th Avenue intersection, and 19 other crashes resulted in moderate injuries.

Pedestrian Safety

There were nine reported crashes along the study corridor involving pedestrians over the past five years, with four occurring at study intersections. Four of the pedestrian crashes were near the Mt Vernon Street intersection with 29th Avenue. Two pedestrian involved crashes was recorded over the past five years at the Southeast Boulevard intersection, and one pedestrian involved crash at the Grand Boulevard, Regal Street, and Fiske Street intersections.

Pedestrians sustained injuries in all nine reported pedestrian crashes. One of these crashes involved a severe injury for the pedestrian, at the Mt Vernon Street intersection. Five of the crashes resulted in moderate injuries to pedestrians and three resulted in minor injuries. A recent pedestrian fatality (in November 2018) occurred near the Mt Vernon Street intersection with 29th Avenue, although this was not included in the crash data.

The majority of pedestrian-involved crashes (6 of 9) were caused by drivers failing to yield the right of way to a pedestrian in a crosswalk or on a sidewalk. All of the pedestrian-involved crashes occurred during the day or at night in a location with street lighting.

Bicycle Safety

There were eight bicycle-involved crashes over the past five years. The majority of the bicycle-involved crashes occurred at signalized study intersections (7 of 8). A cyclist sustained severe injuries in two of the crashes, and moderate injuries in each of the remaining crashes. The bicycle-involved collisions occurred most often between Southeast Boulevard and Ray Street (six collisions involving a bicycle).

Most of the crashes involving a bicyclist were caused by drivers failing to yield the right of way when turning (63 percent). Most of the bicycle crashes occurred during the day.

Intersection Safety

Crash rates provide an additional perspective on intersection safety and identify locations where people have a higher risk of being involved in a crash. Crash frequencies (the number of crashes in a period of time) tend to increase with higher vehicle traffic. With more exposure to vehicles, there are more opportunities for crashes to occur. Crash rates consider the amount of crashes relative to the traffic volume at the intersection and are expressed in units of crashes per million entering vehicles (MEV). Where an intersection's crash rate is at or greater than 1.0 MEV, it is an indication that a problem might exist, and that further study is warranted.

There was one intersection, 29th Avenue at Regal Street, with a crash rate that exceeded 1.0 MEV as shown in Table 3.

Table 3: Study Intersection Crash Rates

Study Intersections	Total Collisions (2013 to 2017)	Collision Type: Rear-end	Collision Type: Turning	Collision Type: Pedestrian / Bike	Collision Type: Other	Collision Severity: Property Damage Only	Collision Severity: Injury	Collision Rate per MEV*
29th Avenue / Grand Boulevard	19	4	7	2	6	5	12	0.41
29th Avenue / Arthur Street	5	1	1	0	3	1	4	0.19
29th Avenue / Perry Street	15	8	5	0	2	9	6	0.50
29th Avenue / Pittsburg Street	2	1	0	0	1	2	0	0.08
29th Avenue / Southeast Boulevard	22	4	10	3	5	7	14	0.53
29th Avenue / Regal Street	29	8	15	2	4	14	15	**1.06**
29th Avenue / Ray Street	23	9	8	3	3	14	9	0.61
Regal Street / Southeast Boulevard	14	6	2	0	6	8	6	0.54
37th Avenue / Regal Street	20	7	6	1	6	10	10	0.57
Supplemental Intersections								
29th Avenue / Garfield Street	6	1	0	0	5	4	2	n/a
29th Avenue / Martin Street	2	1	1	0	0	1	1	n/a

Note: * Per MEV = Crashes per million entering vehicles

The study intersection that exceeded the 1.0 MEV crash rate is discussed below.

- **29th Street / Regal Street (signalized):** This four-leg intersection had 29 collisions. Turning crashes were most prominent here. The intersection has a permitted left turn on the eastbound and westbound 29th Avenue approaches (the westbound approach also has a permitted phase), without left-turn lanes. Failure to yield was the most common cause of crashes, possibly related to the permissive turn phasing**.** A majority of these crashes (12 of 14) involved drivers traveling eastbound on 29th Avenue making a left-turn into the shopping center getting hit by drivers traveling westbound on 29th Avenue. There was one pedestrian and one bicycle involved crash each caused by inattention of the pedestrian and bicyclist. About half of the crashes resulted in injuries (15 of 29). A potential mitigation strategy could be to add a protected-permitted left-turn phase for eastbound 29th Avenue (similar to the westbound direction).

Walking and Bicycle Network Conditions

As a major street connection through the area, 29th Avenue should not be a barrier to pedestrian and bicycle travel between the neighborhoods and businesses on the north and south side of the street. 29th Avenue is currently a four to five lane principal arterial street with a posted speed of 30 miles per hour. Safe and comfortable pedestrian and bicycle crossings should be provided in convenient areas to encourage ease of access.

Arthur Street, Pittsburg Street, and Martin Street are proposed to be improved to neighborhood greenways and/or bike routes in the Spokane Comprehensive Plan. These locations, in addition to Garfield Street were reviewed for potential enhanced crossing treatments. Given the facility characteristics and available data, each of the potential pedestrian crossing locations was evaluated using the National Cooperative Highway Research Program (NCHRP) Report 562 to determine the most suitable design treatments. This report discusses the various ways of improving pedestrian crossings and recommends a category of pedestrian crossing treatment based on roadway characteristics, traffic volumes, and pedestrian behavior.

Given the relatively low hourly pedestrian crossing volumes (less than five at each location) and based on NCHRP 562 worksheet, all four crossing locations meet the criteria for the "gray" treatment category, which includes consideration of raised median islands, curb extensions, or other traffic calming measures where feasible (the worksheets are included in the appendix). Without being able to reach the threshold of 20 pedestrians during the peak hour, the recommended crossing treatments are all static in nature.

In addition to evaluating crash rates and the NCHRP worksheet, it was confirmed that the Manual on Uniform Traffic Control Devices (MUTCD) Warrant 4 for Pedestrian Volume was not met at any of the four potential crossing locations.

Roadway Network Conditions

Study intersections are compared to mobility standards intended to maintain a minimum level of efficiency for motor vehicle travel. Two methods to gauge intersection operations include volume-to-capacity (v/c) ratios and level of service (LOS).

- **Volume-to-capacity (v/c) ratio:** A decimal representation (between 0.00 and 1.00) of the proportion of occupied capacity (capacity defined as the theoretical maximum vehicle throughput in a given time frame) at a turn movement, approach leg, or intersection. It is the peak hour traffic volume divided by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. A ratio approaching 1.00 indicates increased congestion and reduced performance. A ratio greater than 1.00 indicates the turn movement, approach leg, or intersection is oversaturated, which usually results in excessive queues and long delays.

- **Level of service (LOS):** A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and traffic is highly congested.

Intersection mobility targets vary by jurisdiction of the roadways. A LOS "E" is the minimum performance standard during the peak-hour for intersections of arterial and collector streets under city jurisdiction. There is no standard for intersections with local streets. Study intersections that do not meet the mobility standard may require mitigation strategies to be identified.

Existing Intersection Operations

Table 4 shows the study intersection operational analysis under the existing (2018) a.m. and p.m. peak hour (traffic volumes can be seen in the appendix). All of the study intersections meet the respective mobility standard under existing peak hour conditions. It should be noted that the northbound left movement at the 29th Avenue / Arthur Street intersection operates with a LOS F during the p.m. peak hour, however, the intersection does not have a mobility standard since Arthur Street is classified as a local street.

Table 4: Existing (2018) Traffic Operational Analysis

Intersection	Mobility Target	AM Peak Hour Level of Service	AM Peak Hour Delay	AM Peak Hour Volume / Capacity	PM Peak Hour Level of Service	PM Peak Hour Delay	PM Peak Hour Volume / Capacity
29th Avenue / Grand Boulevard	LOS E	C	21	0.5	C	26	0.71
29th Avenue / Arthur Street	N/A	B/D	10/32	0.01/0.25	B/F	12/>100	0.03/0.63
29th Avenue / Perry Street	LOS E	A	9	0.57	A	9	0.72
29th Avenue / Pittsburg Street	N/A	A/B	0/12	0/0.19	A/B	0/14	0/0.18
29th Avenue / Southeast Blvd	LOS E	C	22	0.52	D	36	0.77
29th Avenue / Regal Street	LOS E	B	12	0.55	C	22	0.77
29th Avenue / Ray Street	LOS E	B	14	0.65	B	14	0.73
Regal Street / Southeast Boulevard	LOS E	A	9	0.63	B	11	0.74
37th Avenue / Regal Street	LOS E	C	21	0.55	C	29	0.72

Signalized intersections:
LOS = Level of Service of Intersection
Delay = Delay of Intersection
V/C = Volume-to-Capacity Ratio of Intersection

Stop Controlled intersections:
LOS = Level of Service of Major / Minor Movement
Delay = Delay of Major / Minor Movement
V/C = Volume-to-Capacity Ratio of Major / Minor Movement

Traffic Forecasting

Determining future street network needs requires the ability to forecast traffic volumes resulting from estimates of future population and employment for the 29th Avenue corridor, and the rest of the city and region. The objective of the transportation planning process is to provide the information necessary for making decisions about how and where improvements should be made to create a safe and efficient transportation system that provides travel options.

Estimating Driving Trips

The travel demand forecasting process generally involves estimating travel patterns for new development based on the decisions and preferences demonstrated by existing residents, employers and institutions around the region. Travel demand models are mathematical tools that help us understand future commuter, school and recreational travel patterns including information about the length, mode and time of day a trip will be made. Model forecasts are refined by comparing outputs with observed counts and behaviors on the local system. This refinement step is completed before any evaluation of system performance is made. Once the traffic forecasting process is complete, the 2040 volumes are used to determine the areas of the street network that are expected to be congested and that may need future investments to accommodate growth.

Spokane Regional Transportation Council (SRTC) has a travel demand model for the Spokane region. For the 29th Avenue corridor, the 2015 and 2040 travel demand models were used to develop traffic volumes for the study area.

Circulation Scenarios

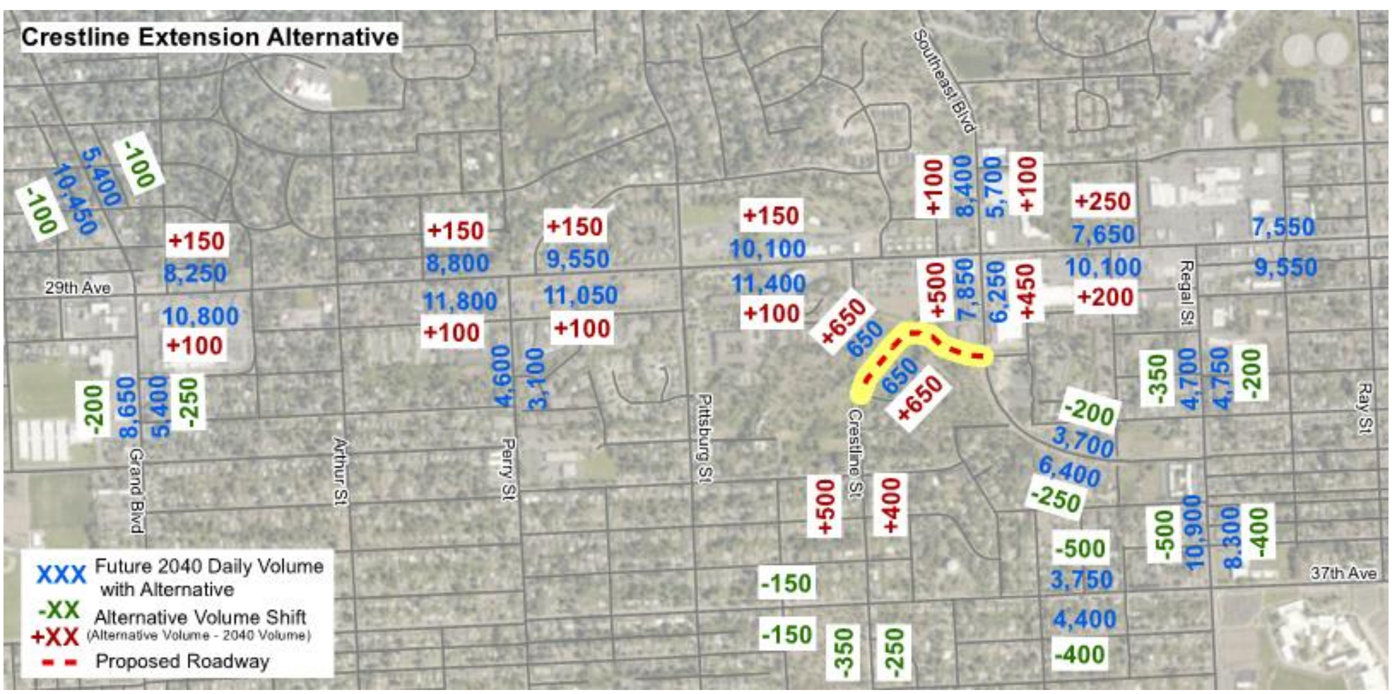
Future traffic volumes were prepared for 2040 for three roadway circulation scenarios, including:

- **2040 Baseline –** This scenario assumes no changes to the transportation network and represents the baseline condition to compare to other scenarios. The peak hour volumes can be seen in the appendix.
- **2040 Reopen Pittsburg Scenario**– This scenario assumes the removal of the traffic barrier on 29th Avenue at the Pittsburg Street intersection. Pittsburg Street is expected to attract up to 500 vehicles per day in the future. The daily traffic volumes are shown in Figure 4. The peak hour volumes can be seen in the appendix.
- **2040 Crestline Extension Scenario** – This scenario assumes the extension of Crestline Street to Southeast Boulevard as a two-lane facility. Crestline Street is expected to attract up to 650 vehicles per day in the future. The daily traffic volumes are shown in Figure 5. The peak hour volumes can be seen in the appendix.

DKS

Figure 4: Reopen Pittsburg Scenario 2040 Daily Traffic Volumes

Figure 5: Crestline Extension Scenario 2040 Daily Traffic Volumes



2040 Intersection Operations

Motor vehicle conditions were evaluated for each future scenario during the a.m. and p.m. peak hour at the study intersections (see Table 5, 6 and 7). During baseline 2040 conditions, all of the study intersections meet the respective mobility standard. However, the 29th Avenue at Arthur Street intersection is forecasted to operate with a LOS F for the northbound and southbound left-turn stop-controlled movements during both the a.m. and p.m. peak hour (the intersection does not have a mobility standard since Arthur Street is classified as a local street). This is caused by high delay for these movements due to the heavy volume of traffic on 29th Avenue.

In the Reopen Pittsburg Scenario, both the 29th Avenue intersections with Arthur Street and Pittsburg Street are forecasted to operate with a LOS F during the peak hours (these intersections do not have a mobility standard since the side street is classified as a local street). While opening Pittsburg Street is good for connectivity for all users, the side street northbound and southbound left-turn movements have high delay during the morning and evening peak hours due to steady traffic volumes on 29th Avenue. This is similar to the issue at the Arthur Street intersection. Eastbound and westbound drivers now able to turn left from 29th Avenue to Pittsburg Street would experience low delay. It is expected the intersection would operate with moderate to low delay for all movements during hours outside the morning and evening peaks.

The Crestline Street extension provides an important connection for all users and reduces out of direction travel for the surrounding neighborhood. The Crestline Extension Scenario slightly affects operations at the study intersections but does not cause any intersections to exceed mobility standards. Similar to the future baseline condition, the 29th Avenue/Arthur Street intersection is forecasted to operate with a LOS F during both the a.m. and p.m. peak hour.

Signal Warrant Analysis

A signal warrant analysis was performed for the 29th Avenue intersections with Arthur Street and Pittsburg Street to determine if side street volumes are high enough to justify (i.e. warrant) the construction of a traffic signal. For this analysis, the MUTCD[1] Warrant #3 (peak hour) was assessed. The result of the analysis found that a traffic signal would not be warranted at the intersections based on forecasted 2040 volumes. A signal would likely attract some traffic from adjacent streets to these intersections, but the level of side street traffic would still likely not be enough during the peak hours to warrant a traffic signal.

---

[1] Manual on Uniform Traffic Control Devices 2003 Ed., Federal Highway Administration, November 2004.

DKS

Table 5: 2040 Baseline Traffic Operational Analysis

Intersection	Mobility Target	AM Peak Hour Level of Service	AM Peak Hour Delay	AM Peak Hour Volume / Capacity	PM Peak Hour Level of Service	PM Peak Hour Delay	PM Peak Hour Volume / Capacity
29th Avenue / Grand Boulevard	LOS E	C	23	0.55	C	30	0.79
29th Avenue / Arthur Street	N/A	B/F	11/58	0.03/0.45	B/F	12/>200	0.03/0.94
29th Avenue / Perry Street	LOS E	A	10	0.64	A	10	0.80
29th Avenue / Pittsburg Street	N/A	A/B	0/13	0/0.23	A/C	0/16	0/0.25
29th Avenue / Southeast Boulevard	LOS E	C	24	0.57	D	43	0.85
29th Avenue / Regal Street	LOS E	B	14	0.60	C	30	0.86
29th Avenue / Ray Street	LOS E	B	16	0.74	B	20	0.85
Regal Street / Southeast Boulevard	LOS E	A	9	0.60	B	11	0.77
37th Avenue / Regal Street	LOS E	C	22	0.57	C	31	0.77

Signalized intersections:
LOS = Level of Service of Intersection
Delay = Delay of Intersection
V/C = Volume-to-Capacity Ratio of Intersection

Stop Controlled intersections:
LOS = Level of Service of Major / Minor Movement
Delay = Delay of Major / Minor Movement
V/C = Volume-to-Capacity Ratio of Major / Minor Movement

Table 6: 2040 Reopen Pittsburg Scenario Traffic Operational Analysis

Intersection	Mobility Target	AM Peak Hour Level of Service	AM Peak Hour Delay	AM Peak Hour Volume / Capacity	PM Peak Hour Level of Service	PM Peak Hour Delay	PM Peak Hour Volume / Capacity
29th Avenue / Grand Boulevard	LOS E	-	-	-	-	-	-
29th Avenue / Arthur Street	N/A	-	-	-	-	-	-
29th Avenue / Perry Street	LOS E	A	9	0.61	A	9	0.74
29th Avenue / Pittsburg Street	N/A	B/D	10/34	0.06/0.55	B/F	12/>100	0.09/1.06
29th Avenue / Southeast Boulevard	LOS E	C	24	0.54	D	43	0.85
29th Avenue / Regal Street	LOS E	-	-	-	-	-	-
29th Avenue / Ray Street	LOS E	-	-	-	-	-	-
Regal Street / Southeast Boulevard	LOS E	-	-	-	-	-	-
37th Avenue / Regal Street	LOS E	-	-	-	-	-	-

Note: Cells denoted with "-" have no change in traffic operations from the Baseline scenario.

Table 7: 2040 Crestline Extension Scenario Traffic Operational Analysis

Intersection	Mobility Target	AM Peak Hour			PM Peak Hour		
		Level of Service	Delay	Volume / Capacity	Level of Service	Delay	Volume / Capacity
29th Avenue / Grand Boulevard	LOS E	C	22	0.55	C	31	0.81
29th Avenue / Arthur Street	N/A	B/F	11/63	0.03/0.48	B/F	12/>200	0.04/0.92
29th Avenue / Perry Street	LOS E	B	10	0.65	B	10	0.82
29th Avenue / Pittsburg Street	N/A	A/B	0/13	0.00/0.23	A/C	0/16	0.00/0.24
29th Avenue / Southeast Boulevard	LOS E	C	25	0.59	D	46	0.88
29th Avenue / Regal Street	LOS E	B	14	0.59	C	29	0.85
29th Avenue / Ray Street	LOS E	-	-	-	-	-	-
Regal Street / Southeast Boulevard	LOS E	A	8	0.57	B	10	0.74
37th Avenue / Regal Street	LOS E	C	22	0.57	C	31	0.75

Note: Cells denoted with "-" have no change in traffic operations from the Baseline scenario.

Recommendations

Recommendations of the 29th Avenue corridor study are summarized below.

Circulation Scenarios

The future analysis found the circulation scenarios have a moderate overall effect on travel patterns and intersection operations along adjacent streets.

- **Reopen Pittsburg Scenario:** The traffic barrier at 29th Avenue should be removed to allow the intersection to operate with full access. The side street left-turn movements onto 29th Avenue would not attract a high volume of drivers during the peak hours due to the high delay waiting for a break in traffic flow. Opening the intersection would attract drivers to other turning movements (such as left turns from 29th Avenue to Pittsburg Street) during the peak hours and all movements during off-peak hours to improve connectivity in the neighborhood to help disperse traffic.

  The existing marked crosswalk would should remain with the opening of the intersection. The proposed neighborhood greenway along Pittsburg Street may trigger the need for a signalized crossing at 29th Avenue in the future. The installation of a traffic signal should also be considered in the future to provide a controlled intersection for all users. Although the vehicle volumes may not be high enough to warrant a traffic signal, benefits to city wide pedestrian and bicycle connectivity and safety for all users may justify the need.

- **Crestline Extension Scenario:** Crestline Street should be connected between 32nd Avenue and Southeast Boulevard to improve neighborhood connectivity. The street extension is expected to attract a moderate level of traffic (650 daily vehicles) which is within the acceptable range for a city local access street (less than 1,000 daily vehicles). There is a range of appropriate functional classification designations for the new extension, ranging from a local access street to a collector.

  Based on future volume forecasts, a two-lane section would operate adequately. A three-lane section will likely be need at the eastbound approach to Southeast Boulevard to provide a separate left-turn lane. The conditions on the new roadway will support bicycles sharing the road with drivers and not require dedicated bike lanes.

  It is also recommended that Martin Street be extended southeast to the Crestline Street extension to serve local connectivity needs for all users in the area. This will connect 30th Avenue and Martin Street to Southeast Boulevard, where drivers can access 29th Avenue at the traffic signal. With this street connection, it is recommended that a center raised median be constructed on 29th Avenue to restrict the Martin Street approach and Applebee's driveway to right-in/right-out movements. The Applebee's driveway and Martin Street have offset approaches to 29th Avenue that create safety concerns. Restricting the turning movements at these intersections would have a minor affect on travel patterns. The Applebee's parking lot connects to a full access driveway on 29th Avenue to the west and Martin Street will connect to the Crestline Street extension and Southeast Boulevard to the east.

- **Combine Reopen Pittsburg + Crestline Extension Scenarios:** It is recommended that both scenarios are implemented together to improve overall local connectivity and offset potential changes in traffic travel patterns. South of 29th Avenue, Pittsburg Street and Crestline Street are parallel north-south facilities two-blocks apart (approximately 1,300 feet). The opening of the Pittsburg Street/29th Avenue intersection to full access may attract some local drivers that would otherwise use the Crestline Extension. Similarly, the Crestline Extension may attract some local drivers that don't want to experience the Pittsburg Street/29th Avenue delays during the peak hours. The benefit of constructing a full street grid is to provide drivers several route choices which may change during different times of the day and varying arterial traffic operations.

Potential 29th Avenue Crossings

The NCHRP worksheets did not indicate installing enhanced crossing treatments would be warranted. This is primarily due to low pedestrian crossing activity combined with high vehicle volumes and wide crossing widths. To increase crossing safety and comfort, a center median is needed to provide a pedestrian refuge and break up the long crossing distance. However, the 29th Avenue right-of-way is constrained at each potential crossing location, and a median would likely require removal of a travel lane or obtaining additional right-of-way. This is not currently an option, so a median was not recommended. The city has been collecting 7.5 feet of right of way as lots are being developed along 29th Avenue for a future center turn lane. If development in the future allows for a center turn lane, it would allow for safety improvements including a median and pedestrian refuge at crossings.

Recommendations for each potential crossing of 29th Avenue including proposed neighborhood greenways and/or bike routes are summarized below. While each crossing is unique, several similar type crossing treatments are recommended at each location for consistency along the corridor. Below is a list of improvements that could be implemented to enhance a pedestrian crossing at each location.

Garfield Street Crossing

Garfield Street crossing is located approximately 850 feet east of the Grand Boulevard signalized intersection. This location connects the neighborhood to the north to the Manito Shopping Center and the eastbound bus stop.

- Close the eastbound left turn lane and construct a raised median. Install a marked crosswalk and pedestrian signage on the west leg of the intersection.

- Install lighting as needed to meet recommend lighting levels for crossings

Arthur Street Crossing

Arthur Street is located approximately 1,500 feet east of Grand Boulevard and 1,300 feet west of the Perry Street signalized intersections.

- Install lighting as needed to meet recommend lighting levels for crossing.

Pittsburg Street Crossing

Pittsburg Street is located approximately 1,300 feet miles east of Perry Street and 2,000 feet west of the Southeast Boulevard signalized intersections.

- Maintain current marked crosswalk and signage as needed.
- Install lighting as needed to meet recommend lighting levels for pedestrian crossings.

Martin Street Crossing

Martin Street is located approximately 1,000 feet west of the Southeast Boulevard signalized intersection.

- Install lighting as needed to meet recommend lighting levels for crossings.

Rosauers Crossing

The Rosauers Crossing is located approximately 600 feet east of the Southeast Boulevard signalized intersection. This location connects the neighborhood to the north to the Rosauers Shopping Center and the eastbound bus stop. A recent pedestrian fatality (in November 2018) occurred at this crossing. The city is planning on improvements here and submitted a grant application in 2018.

Mt Vernon Street Crossing

The Mt Vernon Street Crossing is located approximately 400 feet west of the Regal Street signalized intersection. This location connects the shopping centers on the north and south side of 29^{th} Avenue and the westbound bus stop. The city is planning on improvements here and submitted a grant application in 2018.