Memorandum

Date: October 2, 2020

To: Brian Abbanat, City of Davis

From: Greg Behrens & Adrian Engel, Fehr & Peers

Subject: **Anderson Road Improvements**
Phase 1 Cesar Chavez Elementary School Improvements
Improvement Concepts & Multi-Modal Traffic Operations

RS20-3900

This memorandum summarizes the improvement concepts and multi-modal traffic operations analysis prepared in support of the SACOG Regional Funding grant application for Cesar Chavez Elementary School (Chavez E.S.) improvements (Phase 1 of the Anderson Road Improvements). This memorandum contains the following sections:

- Project Background
- Improvement Concepts
- Multi-Modal Traffic Operations

Accompanying figures are presented at the end of this memorandum.

Project Background

This section provides a summary of Fehr & Peers' understanding of the project background.

Location

The Phase 1 improvements would be located on Anderson Road in Central Davis. Anderson Road is a major north-south arterial, connecting Central Davis with North Davis to the north and the UC Davis campus to the south (where it transitions to La Rue Road). Anderson Road additionally provides connections with major east-west arterials including Russell Boulevard, Covell Boulevard, and Eighth Street, as well as local shopping centers including University Mall and Anderson Plaza.

Figure 1 shows the extents of the Phase 1 improvements. Phase 1 improvements would be concentrated on Anderson Road between Radcliffe Drive and Amherst Drive. This segment of Anderson Road includes the Chavez E.S. school

frontage as well as two signalized intersections at Rutgers Drive and Villanova Drive. Note that improvements to Anderson Road north and south of this segment would not be included as part of Phase 1.

Purpose and Need

The purpose of the Phase 1 improvements is to enhance safety on Anderson Road within the vicinity of Chavez E.S. by reducing potential conflicts between transit, bicyclists, pedestrians, and vehicles. Additionally, Phase 1 seeks to improve the safety, organization, and operations associated with the Chavez E.S. loading zone.

The City has determined that the Phase 1 improvements are needed for the following reasons:

- Anderson Boulevard is an **important multi-modal corridor**, serving over 10,900 vehicles, 2,100 bicyclists, and 100 bus trips per day. Anderson Road has not received major transportation infrastructure investments in recent decades, and thus requires improvement in order to best serve the varied needs of its current users.
- Anderson Road serves as the **primary access point for Chavez E.S.,** providing access for students who walk, bike, or are driven to and from school. The Rutgers Drive intersection serves high volumes of students and parents during school pick-up and drop-off times. Moreover, the existing on-street school loading zone on the school's Anderson Road frontage is very well utilized during school pick-up and drop-off times. The existing off-street parking lot accessed via Anderson Road provides parking supply for Chavez E.S. staff (currently, school loading activity is prohibited in this parking lot). The City and the Davis Joint Unified School District (DJUSD) share a joint interest in improving multi-modal access and circulation conditions along the school's Anderson Road frontage.
- The existing configuration of Anderson Road poses **numerous multi-modal conflicts**. Conflicts between bicyclists and vehicles occur along the lengthy on-street school loading zone as vehicles weave through the existing bike lane to pull to and from the curb. This is particularly prevalent during the morning drop-off period when high demand for the loading zone overlap with high volumes of southbound bicyclists. Conflicts between bicyclists and buses occur at bus stops near Villanova Drive and Amherst Drive as buses weave through the existing bike lane to pull to and from the curb. Finally, conflicts between bicyclists, pedestrians, and vehicles occur at the Anderson Road/Rutgers Drive intersection as high volumes of bicyclists and pedestrians mix in the marked crosswalks and conflict with turning vehicles. The Phase 1 improvements are needed to reduce the quantity and severity of these conflicts.
- Anderson Road has a **demonstrated collision history**. Between 2009 and 2019, 106 total collisions occurred on Anderson Road between Russell Boulevard and Covell Boulevard, including several within the Phase 1 segment. Of these collisions, 53 percent involved bicyclists. The Phase 1 improvements are needed to help reduce the number and rate of these collisions.

Planning History

Efforts to identify and implement safety improvements within the vicinity of Chavez E.S. date back to the 2014 City of Davis Walk and Bike Audit Report, which identified the need for improvements on Anderson Road and adjoining roadways in order to enhance bicycle and pedestrian access for Chaves E.S. students. In 2017, the City of Davis initiated the Anderson Road Streetscape Improvement Project, which established a long-term street design vision based on an extensive community engagement process. This project examined improvements to Anderson Road

along the 1-mile segment between Russell Boulevard and Covell Boulevard. Although vetted with the community, the Anderson Road Streetscape Improvement Project was never finalized and adopted by the City Council.

This current effort seeks to implement the first phase of improvements identified in part by the Anderson Road Streetscape Improvement Project, with a focus on the Chavez E.S. frontage. The City is pursuing funding for Phase 1 through the SACOG Regional Funding competitive grant program.

Improvement Concepts

This section describes the two improvement concepts currently under consideration for the Phase 1 improvements. Preliminary improvement concepts were prepared during Summer 2020 and refined based on community feedback received from an online survey and two virtual workshops held during Summer and Fall 2020. The improvement concepts were developed specifically to address the Phase 1 project purpose and needs described previously.

Concept 1

Figure 2 illustrates Concept 1, which would include the following features:

1. Install a separated bikeway on southbound Anderson Road from just north of Villanova Drive to just north of Amherst Drive.
2. Maintain a bike lane on northbound Anderson Road, but widen the bike lane to meet current City standards, including a painted buffer, high visibility conflict zone markings, and new signing and striping.
3. Relocate the southbound Anderson Road two-to-one lane merge from south of Villanova Drive to just south of Radcliffe Drive.
4. Install low impact corner treatments at the Anderson Road/Villanova Drive intersection.
5. Install transit boarding islands on southbound Anderson Road immediately south of Villanova Drive and on northbound Anderson Road in front of the United Methodist Church.
6. Maintain on-street loading zone operations on Anderson Road in front of Chavez E.S.
7. Install a pedestrian refuge and bulbouts at the Anderson Road/Rutgers Drive intersection.

Concept 2

Figure 3 illustrates Concept 2, which would include the following features:

1. Items 1 through 5 listed as components of Concept 1.
2. Relocate the school loading zone into the existing off-street school parking lot. Construct a new west leg of the Anderson Road/Rutgers Drive intersection to serve as the inbound driveway for the new off-street loading zone. Vehicles would circulate one-way counterclockwise through the loading zone, exiting the site at the existing driveway immediately north of the Redwood Park tennis courts.
3. Construct a new northbound left-turn lane and southbound right-turn lane at the Anderson Road/Rutgers Drive intersection to accommodate inbound vehicle trips to the new off-street loading zone.
4. Construct a new crossing on the south leg of the Anderson Road/Rutgers Drive intersection to increase crossing opportunities for bicyclists and pedestrians traveling to and from the school.

5. Install a bike signal and scramble phase at the Anderson Road/Rutgers Drive intersection.
6. Convert existing on-street loading zone to Chavez E.S. staff parking (to replace lost parking that would occur due to the new off-street loading zone) and manage this parking through the City's permit parking program. If additional parking supply is needed for Chavez E.S. staff, explore the conversion of the existing turf west of the Redwood Park tennis courts into additional staff parking spaces.

Concept Visualizations

Figures 3 and 4 provide additional visualizations of the two improvement concepts. Figure 3 shows the concepts from a bird's eye view, while Figure 4 shows the improvement concepts from the perspective of a southbound motorist approaching the school frontage.

Cost Estimates

Figures 5 and 6 provide total cost estimates for Concepts 1 and 2, respectively. Concept 1 would cost an estimated $1.5 million and Concept 2 would cost an estimated $3.4 million. The cost difference can largely be attributed to the Concept 2 costs associated with signal modifications at the Anderson Road/Rutgers Drive intersection and the reconfiguration of the existing off-street parking lot into a loading zone.

Multi-Modal Traffic Operations

This section describes the expected changes to multi-modal traffic operations associated with Concepts 1 and 2.

Multi-Modal Conflicts

Concepts 1 and 2 would address multi-modal conflicts in a similar manner, except for a few notable differences:

- Concepts 1 and 2
  - **Separated bikeway** – Both concepts would construct a new separated bikeway on southbound Anderson Road. The separated bikeway would allow southbound bicyclists to travel adjacent to the curb, substantially reducing conflicts between bicyclists and weaving vehicles and buses utilizing the curb in the existing condition.
  - **Southbound lane merge** – Both concepts would shift the location of the southbound Anderson Road two-to-one lane merge from south of Villanova Drive to just south of Radcliffe Drive. This modification would shift the southbound lane merge further north from the school zone (from 200 feet to over 800 feet north of the existing on-street loading zone), allowing for merge maneuvers to be completed well in advance of the school zone. This would help to reduce the speed of southbound traffic entering the school vicinity, particularly by addressing the behavior currently exhibited by some motorists who accelerate into the school zone in an attempt to merge in front of vehicles in the adjacent travel lane at the last possible moment.
  - **Anderson Road/Villanova Drive** – Both concepts would install low impact corner treatments at the Anderson Road/Villanova Drive intersection, which would reduce the corner turning radius (and

corresponding vehicle turning speeds), provide greater refuge for bicyclists and pedestrians, and reduce the crossing distance for bicyclists and pedestrians.

- **Transit boarding islands** – Both concepts would install transit boarding islands on southbound Anderson Road immediately south of Villanova Drive and on northbound Anderson Road in front of the United Methodist Church. The boarding islands would allow buses to serve passengers without the need to weave across bicyclists (i.e., bicyclists would travel between the boarding islands and the curb).

- Concept 1
  - **School loading zone** – Concept 1 would maintain on-street loading for Chavez E.S., but relocate the on-street loading zone in between the travel lane and the separated bikeway (i.e., switching the placement of the loading zone and the bikeway). Relative to existing loading zone operations, this would reduce conflicts between southbound bicyclists and weaving vehicles pulling to and from the curb, but increase conflicts between southbound bicyclists and people getting in and out of vehicles utilizing the on-street loading zone. Note that the proposed buffer area between the loading zone and the separated bikeway is intended to reduce this conflict potential by providing space for people exiting vehicles to wait for a gap in southbound bicycle traffic before crossing the bikeway to the adjacent sidewalk. A buffer area would also be provided on the driver's side of the vehicle to create space between the loading zone and the travel lane for passengers to get in and out of vehicles.
  - **Anderson Road/Rutgers Drive** – Concept 1 would install a pedestrian refuge and bulbouts at the Anderson Road/Rutgers Drive intersection, which would increase visibility of bicyclists and pedestrians and reduce the crossing distance for bicyclists and pedestrians.
- Concept 2
  - **School loading zone** – Concept 2 would relocate school loading activity to the existing off-street parking lot. This modification would shift all loading activity onto the Chavez E.S. campus, and thus substantially reduce related conflicts on the street. In contrast to Concept 1, this would substantially reduce the potential for conflicts between bicyclists and pedestrians in the southbound separated bikeway, as students and parents would no longer be required to cross the separated bikeway to travel between the campus and the loading zone. This modification would increase vehicle turning activity into the new inbound driveway at the west leg of the Anderson Road/Rutgers Drive intersection, however, the provision of a bike signal for southbound bicyclists would substantially reduce potential conflicts between southbound bicyclists and turning vehicles.
  - **Anderson Road/Rutgers Drive** – Concept 2 would install a bike signal and scramble phase at the Anderson Road/Rutgers Drive intersection. These signal modifications would allow the intersection to operate with exclusive bicycle and pedestrian crossing phases, substantially reducing potential conflicts between bicyclists, pedestrians, and turning vehicles.

Vehicle Delay and Level of Service

This study analyzes traffic conditions at the Anderson Road intersections with Rutgers Drive and Villanova Drive using Level of Service (LOS) as a measure of operational performance for motorists. LOS is a qualitative measure of traffic flow from the perspective of motorists and is an indication of the comfort associated with driving. Typical factors that affect LOS include speed, travel time, and traffic interruptions. Empirical LOS criteria and methods of calculation have been documented in the *Highway Capacity Manual, 6th Edition* (Transportation Research Board, 2016). LOS is a letter

classification system, from A (representing free-flow traffic conditions) to F (oversaturated conditions where traffic demand exceeds capacity, resulting in long queues and delays).

Traffic operations at the Anderson Road/Rutgers Drive and Anderson Road/Villanova Drive intersections were analyzed using Vissim traffic simulation software, which accounts for interactions between intersections, queue spillback, vehicle platooning, etc. Importantly, Vissim also accounts for vehicle, bus, bicycle, and pedestrian activity. Traffic operations were analyzed during the weekday AM peak hour. This hour was selected for analysis because the effects of the improvement concepts would be most prevalent during the AM peak arrival, when high levels of multi-modal travel activity occur along the school frontage due to the combination of school drop-offs and heavy volumes of southbound bicyclists and buses traveling southbound on Anderson Road towards the UC Davis campus.

Table 1 displays the existing peak hour delay and level of service at the two study intersections. Both intersections currently operate at LOS B during the AM peak hour, with traffic generally progressing smoothly and most motorists experiencing little delay as they progress through the signalized intersections.

As shown in Table 1, the implementation of Concept 1 would cause minor changes to AM peak hour delay and overall intersection LOS would remain at LOS B. The implementation of Concept 2 would increase delay at both study intersections. The Anderson Road/Villanova Drive intersection would remain at LOS B, while the Anderson Road/Rutgers Drive intersection would degrade to LOS D. This is primarily due to the introduction of two new signal phases (the northbound left-turn phase and the scramble phase) at the Rutgers Drive intersection, which would increase the total cycle length and overall intersection delay relative to existing conditions.

Note that these results represent the AM peak hour only, when school loading activity is at its greatest and background traffic is at elevated levels. Vehicle delay during off-peak hours would be lower than the results presented in Table 1, particularly for Concept 2. Much of the AM peak hour delay for Concept 2 is due to calls for bicycle/pedestrian crossings and for the northbound left-turn signal phase into the off-street loading zone, which would both be greatly reduced during off-peak time periods.

Table 1: AM Peak Hour Intersection Operations

Intersection	Traffic Control	Existing		Concept 1		Concept 2	
		Delay[1]	LOS[2]	Delay[1]	LOS[2]	Delay[1]	LOS[2]
Anderson Road/Rutgers Drive	Signal	18	B	17	B	37	D
Anderson Road/Villanova Drive	Signal	11	B	18	B	20	B

Notes:

1. Delay is reported as seconds per vehicle. Values are rounded to the nearest whole number so the same delay may represent two different LOS conditions if the delay is within 0.5 seconds of the LOS threshold. Average control delay for signalized intersections is the weighted average for all movements.
2. "LOS" represents level of service, calculated based on methodologies contained in the *Highway Capacity Manual*, *6th Edition* (Transportation Research Board, 2016).

Source: Fehr & Peers, 2020.

Videos of the simulations prepared for the traffic operations analysis can be viewed at the links below:

- Chavez E.S. frontage
  - Existing conditions
  - Concept 1
  - Concept 2
- Concept 2 – Anderson Road/Rutgers Drive intersection
- Concepts 1 and 2 – Anderson Road/Villanova Drive intersection

Appendix A. Figures