

APPENDIX I

Draft Vehicle Mobility Analysis

This page is intentionally left blank

Draft Vehicle Mobility Analysis

**Little Cottonwood Canyon
Environmental Impact Statement
S.R. 210 - Wasatch Boulevard to
Alta**

Lead agency:
Utah Department of Transportation

April 3, 2020

This page is intentionally left blank

Contents

1.0	Introduction	1
2.0	Design-hour Travel Time Analysis.....	1
2.1	Design Hour and Traffic Volume Used in the Analysis.....	1
2.2	Design-hour Person Demand Used in the Analysis	2
2.3	Per-person Travel Time Used in the Analysis	3
2.4	Per-person Travel Time Modeling	3
2.4.1	Travel Time Estimations	4
2.5	Alternatives Evaluated	5
2.6	Travel Time Results	10
2.6.1	Design Hour Travel Time in the Morning (Eastbound Entering Canyon)	10
2.6.2	Design Hour Travel Time in the Afternoon (Westbound Leaving Canyon)	13
2.7	Tolling Considerations	16
3.0	Vehicle Queuing Analysis	16
4.0	Results of the Travel Time and Vehicle Queuing Analysis.....	18
5.0	References.....	21

Tables

Table 1.	Alternatives Evaluated in the Travel Time Analysis for the Peak-direction (Eastbound) Conditions in the Design Hour	6
Table 2.	Travel Time Analysis for the Design Hour in the Eastbound Direction (AM)	11
Table 3.	Travel Time Analysis for the Design Hour in the Westbound Direction (PM)	14
Table 5.	Queuing Analysis during the Design Hour in the Eastbound Direction (AM)	17
Table 6.	Travel Time and Queuing Analysis Results during the Design Hour in the Eastbound (AM) and Westbound (PM) Directions.....	19

Figures

Figure 1.	S.R. 210 in Little Cottonwood Canyon – Existing Conditions	8
Figure 2.	S.R. 210 in Little Cottonwood Canyon – Peak-period Shoulder Lanes	9
Figure 3.	Queuing Results	18

Acronyms and Abbreviations

HOV	high-occupancy vehicle
PPSL	peak-period shoulder lane
S.R.	state route
SPT	Sketch Planning Tool
UDOT	Utah Department of Transportation

Glossary

30th-busiest hour: the 30th-busiest hour on a road as determined by traffic counts taken on the road over an entire year. For this analysis, the traffic volume on S.R. 210 during the 30th-busiest hour in 2017 was used as the basis for the traffic volume during the design hour in 2050.

design hour: the future hour whose projected traffic volume is used as the basis for designing or improving a road. A roadway is designed to accommodate the number of vehicles (traffic volume) during the design hour. For this analysis, the design hour is in 2050.

peak hour: the single busiest hour on a road as determined by traffic counts taken on the road over an entire year.

peak period: a period of the day with a high volume of traffic. Peak periods occur on S.R. 210 during the morning and afternoon.

1.0 Introduction

The purpose of this report is to explain the methods used, evaluation, and results of the per-person travel and queuing length analysis for the alternatives considered in the Little Cottonwood Canyon Environmental Impact Statement (EIS). The analysis is for roadway-based alternatives only. Travel times for gondola and train alternatives are provided in a separate report.

2.0 Design-hour Travel Time Analysis

2.1 Design Hour and Traffic Volume Used in the Analysis

Roads are designed to accommodate a specific number of vehicles per hour. This traffic volume, called the design-hour traffic volume, is typically less traffic than what is expected during the single busiest or peak hour on that road during the entire year. Designing for the yearly peak hour is usually not economical or feasible because it would mean building the road to accommodate more vehicles than what will be on the road most days (FHWA 2018).

What is the design-hour traffic volume?

The design-hour traffic volume is the maximum number of vehicles per hour that a roadway is designed to accommodate.

For the Little Cottonwood Canyon Project, the Utah Department of Transportation (UDOT) is proposing improvements to S.R. 210 in the canyon. These improvements consider future travel in the canyon in 2050 (the project's design year). To determine the design-hour traffic volume, UDOT performed the following two steps.

1. Using traffic count data, select a specific hour during which S.R. 210 had a high volume of traffic during a recent year. Typically, in rural settings similar to S.R. 210 in Little Cottonwood Canyon, the hour that is selected is the 30th-busiest hour over the entire year (FHWA 2018). By using the 30th-busiest hour, UDOT avoids designing roads for extremely busy days that are outliers from the more common traffic volumes.
2. Determine the rate at which traffic volumes are projected to increase in the future, and use this rate to increase the traffic volume during the recent 30th-busiest hour to the projected traffic volume during the future design hour. This is the design-hour traffic volume.

Roadway projects are usually designed using a single design hour and associated design-hour traffic volume. However, in Little Cottonwood Canyon, there are different traffic impacts for people entering the canyon in the morning (traveling eastbound) and people leaving the canyon in the afternoon (traveling westbound). For this reason, UDOT initially looked at two 30th-busiest hours for S.R. 210 in the canyon: one for traffic going eastbound and one for traffic going westbound.

To determine the 30th-busiest hours, UDOT used traffic data from 2017 from its automated traffic counters in the canyon (Fehr & Peers 2018a).

Eastbound. The 30th-busiest hour on S.R. 210 for eastbound traffic was the hour from 10 AM to 11 AM on Saturday, January 14. According to the traffic data, 1,061 vehicles entered the canyon going eastbound during this hour in 2017.

Westbound. The 30th-busiest hour on S.R. 210 for westbound traffic was the hour from 4 PM to 5 PM on Friday, March 3. According to the traffic data, 1,051 vehicles left the canyon going westbound during this hour in 2017.

Since these traffic counts were similar, and since the 30th-busiest hour in either direction occurred in the eastbound direction, UDOT decided to use the 30th-busiest hour in the eastbound direction as the basis for the future design hour. Therefore, the traffic volume during the 30th-busiest hour in 2017 was 1,061 vehicles.

The Little Cottonwood Canyon EIS is using 2050 as its design year. To determine the expected traffic volume during the design hour in 2050, UDOT increased the traffic volume from the 30th-busiest hour in 2017. According to an analysis conducted for UDOT (Fehr & Peers 2018b), traffic on S.R. 210 has been increasing at a rate of 1.2% per year. Using this rate, UDOT increased the traffic volume during the 30th-busiest hour in 2017 (1,061 vehicles) over a 32-year period (2018 to 2050) to calculate the projected traffic volume during the design hour in 2050 (1,555 vehicles).

What are the design hour and design-hour traffic volume for this analysis?

For this analysis, the design hour is the 30th-busiest hour in the eastbound direction on S.R. 210 in 2050, and the design-hour traffic volume is 1,555 vehicles.

Therefore, for this analysis, the design hour is the 30th-busiest hour in the eastbound direction on S.R. 210 in 2050, and the design-hour traffic volume is 1,555 vehicles. This number is assumed to include both personal vehicles and buses.

2.2 Design-hour Person Demand Used in the Analysis

UDOT next determined the number of people who would be traveling on S.R. 210 during the design hour in 2050 as this would be the basis for screening alternatives. According to vehicle occupancy data from 2018 (L2 Data Collection 2018), the average number of occupants during the peak morning hour (on a weekend day) was 1.89 occupants per personal vehicle and 42 occupants per bus. For buses, the current 15-minute headways on Routes 953 and 994 were assumed (that is, 4 buses per route for a total of 8 buses per hour).

In 2050 during the design hour (1,555 vehicles), 336 people are projected to travel by bus (8 buses × 42 occupants) and about 2,924 people are projected to travel by personal vehicle (1,547 personal vehicles × 1.89 occupants) for a total of about 3,260 people entering Little Cottonwood Canyon during the design hour.