Little Cottonwood Canyon ENVIRONMENTAL IMPACT STATEMENT
Wasatch Boulevard to Alta

APPENDIX 10A

Air Quality Technical Report

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S.R. 210 | Wasatch Blvd. to Alta

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Little Cottonwood Canyon Environmental Impact Statement Wasatch Boulevard to Alta

Lead agency:
Utah Department of Transportation

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1.0 Introduction

The Utah Department of Transportation (UDOT) is preparing an Environmental Impact Statement (EIS) to study proposed transportation solutions to State Route (S.R.) 210 from its intersection with S.R. 190/Fort Union Boulevard through the town of Alta in Little Cottonwood Canyon in Salt Lake County, Utah. Transportation improvements are needed to improve the safety, reliability, and mobility on S.R. 210 for residents, visitors, and commuters who use this highway. The S.R. 210 Project is intended to address existing safety, reliability, and mobility associated with both commuter traffic and winter recreational traffic in Little Cottonwood Canyon.

What is the purpose of this technical report?

This technical report discusses the quantitative air quality analyses for particulate matter ($PM_{2.5}$ and PM_{10}) that were conducted in support of the EIS for the S.R. 210 Project.

The EIS is being prepared consistent with the National Environmental Policy Act (NEPA) and follows the guidelines in UDOT's environmental process manual. The environmental review, consultation, and other actions required by applicable federal environmental laws for this action are being, or have been, carried out by UDOT pursuant to 23 United States Code Section 327 and a Memorandum of Understanding dated January 17, 2017, and executed by the Federal Highway Administration and UDOT.

This technical report discusses the quantitative air quality analyses for particulate matter ($PM_{2.5}$ and PM_{10}) (also called "hot-spot" or project-level analyses) that were conducted in support of the EIS. These hot-spot analyses will be used by the U.S. Environmental Protection Agency (EPA) to help determine whether the S.R. 210 Project meets transportation conformity requirements. The process of making a project-level conformity determination requires consultation between UDOT and EPA to evaluate and choose models and associated methods and assumptions to be used in the hot-spot analyses.

UDOT prepared and submitted an initial draft *Modeling Protocol for $PM_{2.5}$ and PM_{10} Quantitative Hot-spot Analysis Technical Memorandum* to EPA for its review and comment in June 2020 and a revised draft in September 2020. EPA responded in January 2021 that UDOT could proceed with the air quality modeling after adjusting the modeling protocol as recommended by EPA in its responses from July and November 2020 (EPA 2021). UDOT has incorporated EPA's recommendations into the methodology used to conduct these hot-spot analyses.

2.0 Project Description

2.1 Purpose of the Project

UDOT intends to improve the transportation-related commuter, recreation, and tourism experiences for all users of S.R. 210 through transportation improvements that improve roadway safety, reliability, and mobility on S.R. 210. In developing alternatives for these improvements, UDOT will consider the character, natural resources, watershed, diverse uses, and scale of Little Cottonwood Canyon.

UDOT's purpose is reflected in one primary objective for S.R. 210: to substantially improve safety, reliability, and mobility on S.R. 210 from Fort Union Boulevard through the town of Alta for all users on S.R. 210.

2.2 EIS Alternatives

As part of the EIS process, UDOT is evaluating five primary alternatives, which are described below.

2.2.1 Enhanced Bus Service Alternative

The goal of the Enhanced Bus Service Alternative is to reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon on a busy ski day by about 30%, which in turn would move about 5,200 people a day to buses. This alternative includes the following elements:

This alternative would widen Wasatch Boulevard from Fort Union Boulevard to just past the intersection of Wasatch Boulevard and North Little Cottonwood Road to either four or five lanes.

This alternative would implement winter enhanced bus service that would operate for about 140 days per year. The service would consist of two mobility hubs providing service directly (no intermediate stops) to two ski resorts. The mobility hubs would be located at the gravel pit and at 9400 South and Highland Drive (Figure 1). The gravel pit mobility hub would have a 1,500-car parking structure, and the 9400 South and Highland Drive mobility hub would have a 1,000-car parking structure.

What is a mobility hub?

A mobility hub is a location where users can transfer from their personal vehicle to a bus.

The gravel pit mobility hub would be located near the aggregate mining operation (gravel pit) just east of Wasatch Boulevard and north of Fort Union Boulevard. The 9400 South mobility hub would be located at 9400 South and Highland Drive.

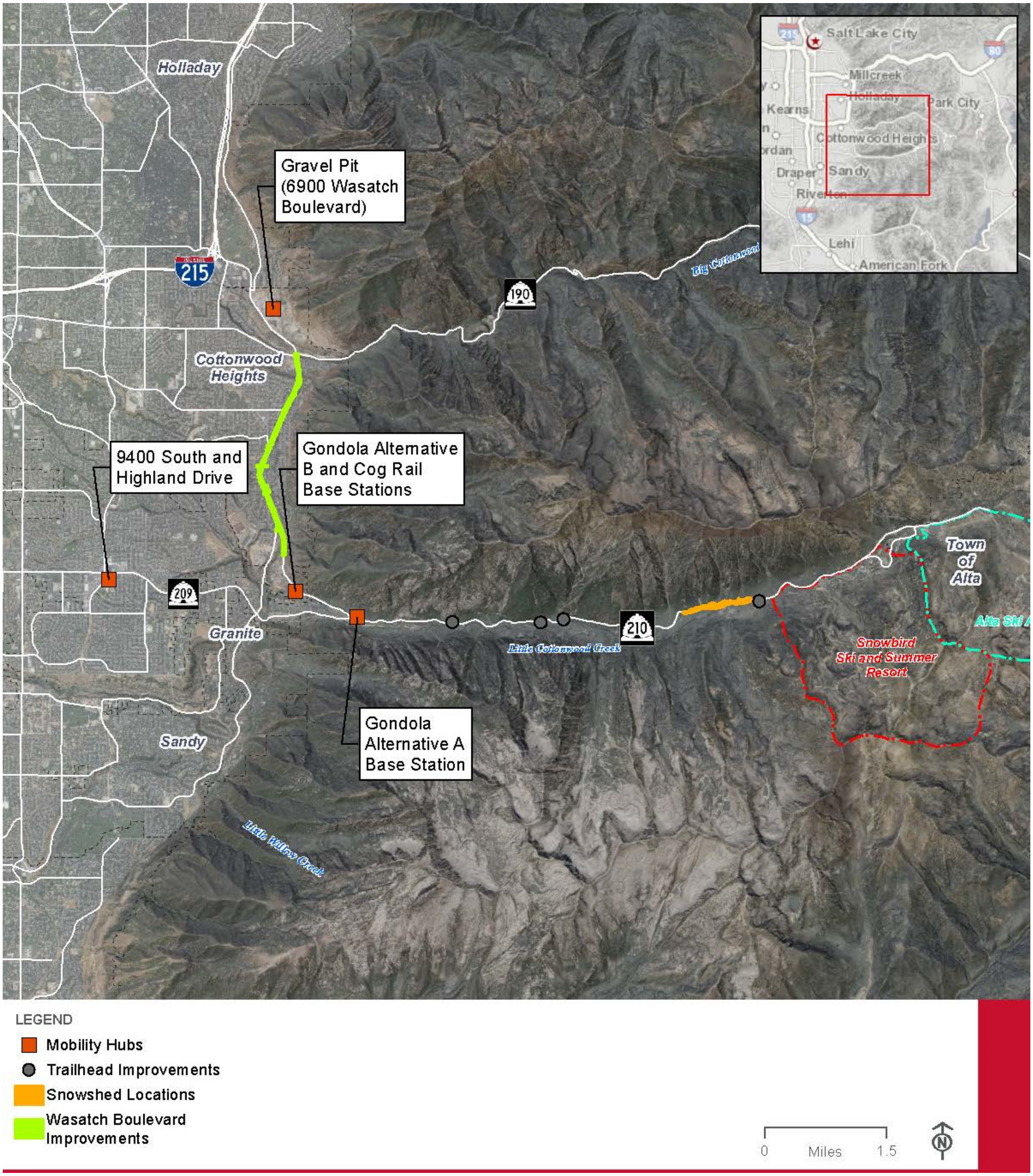
During peak periods (6 hours per day, for 3 hours during the morning and 3 hours during the afternoon), about 12 buses per hour would originate from each mobility hub (24 per hour total) heading to two ski resorts in Little Cottonwood Canyon. During the off-peak periods (about 6 hours per day), about 6 buses per hour would originate from each mobility hub (12 per hour) heading to the two ski resorts. On average, a total of 108 bus trips from each mobility hub per day would be made for a total of 216 bus trips per day from both mobility hubs. No summer bus service would be provided with this alternative.

Tolling would be considered to further reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon.

Avalanche mitigation options and trailhead parking options are being evaluated with this alternative.

Winter roadside parking would be eliminated on S.R. 210 adjacent to the ski resorts.

Figure 1. Mobility Hub, Gondola Base Station, and Cog Rail Base Station Locations



2.2.2 Enhanced Bus Service in Peak-period Shoulder Lane Alternative

The goal of the Enhanced Bus Service in Peak-period Shoulder Lane Alternative is to reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon on a busy ski day by about 30%, which in turn would move about 5,200 people a day to buses. This alternative includes the following elements:

- This alternative would widen Wasatch Boulevard from Fort Union Boulevard to just past the intersection of Wasatch Boulevard and North Little Cottonwood Road to four lanes.
- A peak-period shoulder lane would be implemented both eastbound and westbound on S.R. 210 from the intersection with Wasatch Boulevard to the Alta Bypass Road. These lanes would be for buses only to improve bus travel times over that of personal vehicles.
- This alternative would implement winter enhanced bus service that would operate for about 140 days per year. The service would consist of two mobility hubs providing service directly (no intermediate stops) to two ski resorts. The mobility hubs would be located at the gravel pit and at 9400 South and Highland Drive (Figure 1 above). The gravel pit mobility hub would have a 1,500-car parking structure, and the 9400 South and Highland Drive mobility hub would have a 1,000-car parking structure.
- During peak periods (6 hours per day, for 3 hours during the morning and 3 hours during the afternoon), about 12 buses per hour would originate from each mobility hub (24 per hour total) heading to two ski resorts in Little Cottonwood Canyon. During the off-peak periods (about 6 hours per day), about 6 buses per hour would originate from each mobility hub (12 per hour) heading to the two ski resorts. On average, a total of 108 bus trips from each mobility hub per day would be made for a total of 216 bus trips per day from both mobility hubs. No summer bus service would be provided with this alternative.
- Tolling would be considered to further reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon.
- Avalanche mitigation options and trailhead parking options are being evaluated with this alternative.
- Winter roadside parking would be eliminated on S.R. 210 adjacent to the ski resorts.

What is a peak-period shoulder lane?

A peak-period shoulder lane is an upgraded roadway shoulder that functions as a travel lane during periods of peak congestion. During non-peak times, it functions as a shoulder.

2.2.3 Gondola Alternative A (Starting at Canyon Entrance)

The goal of Gondola Alternative A is to reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon on a busy ski day by about 30%, which in turn would move about 5,200 people a day to the gondola system. This alternative includes the following elements:

- A gondola base station would be located at the existing park-and-ride lot on the north side of S.R. 210 at the entrance to Little Cottonwood Canyon (Figure 1 above), and the gondola system would provide service to the two ski resorts in the canyon. Stops would include the entrance to the canyon and the ski resorts only. Users would not be allowed to park their personal vehicles or drop off skiers at the base station because it would create traffic congestion. Users of the gondola service would need to take the bus to the base station. The gondola would operate from 7 AM to 7 PM 7 days per week during the winter. About 30 gondola cabins with an assumed capacity of about 35 people per cabin would travel up and down the canyon per hour.
- This alternative would widen Wasatch Boulevard from Fort Union Boulevard to just past the intersection of Wasatch Boulevard and North Little Cottonwood Road to either four or five lanes.
- This alternative would implement winter enhanced bus service that would operate for about 140 days per year. The service would consist of two mobility hubs providing service to the gondola loading platform at the entrance of Little Cottonwood Canyon. The mobility hubs would be located at the gravel pit and at 9400 South and Highland Drive. The gravel pit mobility hub would have a 1,500-car parking structure, and the 9400 South and Highland Drive mobility hub would have a 1,000-car parking structure.
- During peak periods (6 hours per day, for 3 hours during the morning and 3 hours during the afternoon), about 12 buses per hour would originate from each mobility hub (24 per hour total) heading to the gondola loading platform. During the off-peak periods (about 6 hours per day), about 6 buses per hour would originate from each mobility hub (12 per hour) heading to the gondola loading platform. On average, a total of 108 bus trips from each mobility hub per day would be made for a total of 216 bus trips per day from both mobility hubs. No summer bus service would be provided with this alternative.
- Tolling would be considered to further reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon.
- Avalanche mitigation options and trailhead parking options are being evaluated with this alternative.
- Winter roadside parking would be eliminated on S.R. 210 adjacent to the ski resorts.

2.2.4 Gondola Alternative B (Starting at La Caille)

The goal of Gondola Alternative B is to reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon on a busy ski day by about 30%, which in turn would move about 5,200 people a day to the gondola. This alternative includes the following elements:

- A gondola base station would be located on North Little Cottonwood Road about 0.75 mile from the intersection with S.R. 209/S.R. 210 (Figure 1 above), and the gondola system would provide service to the two ski resorts in the canyon. Stops would include the gondola base station and the ski resorts only. A 1,500-space parking structure would be built at the gondola base station to allow personal vehicles to park at the base station. The gondola would operate from 7 AM to 7 PM 7 days per week during the winter. About 30 gondola cabins with an assumed capacity of about 35 people per cabin would travel up and down the canyon per hour.
- This alternative would widen Wasatch Boulevard from Fort Union Boulevard to just past the intersection of Wasatch Boulevard and North Little Cottonwood Road to either four or five lanes.
- Two southbound travel lanes would be continued on Wasatch Boulevard to the base station with the right lane becoming the dedicated access to the base station. The access lane would enter the second level of the parking structure.
- A northbound exit ramp would be added at the base station, going under S.R. 210 and connecting to the east side of S.R. 210.
- A signalized intersection would be added to S.R. 210 at the base station.
- This alternative would implement winter enhanced bus service that would operate for about 140 days per year. The service would consist of two mobility hubs providing service to the gondola loading platform near La Caille. The mobility hubs would be located at the gravel pit and at 9400 South and Highland Drive. The gravel pit mobility hub would have a 600-car parking structure, and the 9400 South and Highland Drive mobility hub would have a 400-car parking structure.
- During operating hours (7 AM to 7 PM), six buses per hour would originate from each mobility hub (12 per hour) heading to the gondola loading platform. On average, a total of 72 bus trips from each mobility hub per day would be made, for a total of 144 bus trips per day from both mobility hubs to the gondola base station. No summer bus service would be provided with this alternative.
- Tolling would be considered to further reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon.
- Avalanche mitigation options and trailhead parking options are being evaluated with this alternative.
- Winter roadside parking would be eliminated on S.R. 210 adjacent to the ski resorts.

2.2.5 Cog Rail Alternative (Starting at La Caille)

The goal of Cog Rail Alternative is to reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon on a busy ski day by about 30%, which in turn would move about 5,200 people a day to the cog rail. This alternative includes the following elements:

- A cog rail base station would be located on North Little Cottonwood Road about 0.75 mile from the intersection with S.R. 209/S.R. 210 (Figure 1 above), and the cog rail system would provide service to the two ski resorts in the canyon. Stops would include the cog rail base station at La Caille and the ski resorts only. A 1,500-space parking structure would be built at the cog rail base station to allow personal vehicles to park at the station. The cog rail would operate from 7 AM to 7 PM 7 days per week during the winter. From 7 AM to 10 AM and from 3 PM to 6 PM, the cog rail would operate every 15 minutes, and the remainder of the time it would operate every 30 minutes.
- This alternative would widen Wasatch Boulevard from Fort Union Boulevard to just past the intersection of Wasatch Boulevard and North Little Cottonwood Road to either four or five lanes.
- Two southbound travel lanes would be continued on Wasatch Boulevard to the cog rail base station with the right lane becoming the dedicated access to the station. The access lane would enter the second level of the parking structure.
- A northbound exit ramp would be added at the base station, going under S.R. 210 and connecting to the east side of S.R. 210.
- A signalized intersection would be added to S.R. 210 at the base station.
- This alternative would implement winter enhanced bus service that would operate for about 140 days per year. The service would consist of two mobility hubs providing service to the cog rail base station. The mobility hubs would be located at the gravel pit and at 9400 South and Highland Drive. The gravel pit mobility hub would have a 600-car parking structure, and the 9400 South and Highland Drive mobility hub would have a 400-car parking structure.
- During operating hours (7 AM to 7 PM), six buses per hour would originate from each mobility hub heading to the cog rail base station. On average, a total of 72 bus trips from each mobility hub per day would be made, for a total of 144 bus trips per day from both mobility hubs to the cog rail base station. No summer bus service would be provided with this alternative.
- Tolling would be considered to further reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon.
- Avalanche mitigation options and trailhead parking options are being evaluated with this alternative.
- Winter roadside parking would be eliminated on S.R. 210 adjacent to the ski resorts.

3.0 Regulatory Environment and Compliance

3.1 National Ambient Air Quality Standards

The U.S. Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. These standards include both primary and secondary standards. Primary standards protect public health, while secondary standards protect public welfare (such as protecting property and vegetation from the effects of air pollution).

These standards have been adopted by the Utah Division of Air Quality as the official ambient air quality standards for Utah. For the pollutants addressed in this report, the primary and secondary standards are the same. The current NAAQS are listed in Table 1. The pollutants in Table 1 are referred to as criteria pollutants because air quality standards (criteria) have been established for these pollutants.

If an area meets the NAAQS for a given air pollutant, the area is called an attainment area for that pollutant (because the NAAQS have been attained). If an area does not meet the NAAQS for a given air pollutant, the area is called a nonattainment area. A maintenance area is an area previously designated as a non-attainment area that has been redesignated as an attainment area and is required by Section 175A of the Clean Air Act, as amended, to have a maintenance plan.

What are attainment, non-attainment, and maintenance areas?

An attainment area is an area that meets (or "attains") the NAAQS for a given air pollutant.
A nonattainment area is an area that does not meet the NAAQS for a given air pollutant.
A maintenance area is an area previously designated as a nonattainment area that has been redesignated to attainment status and is required to have a maintenance plan.

The improvements associated with the action alternatives would be made in Salt Lake County, which is a nonattainment area for particulate matter 2.5 microns in diameter or smaller ($PM_{2.5}$), ozone (O_3), and sulfur dioxide (SO_2). Salt Lake County is a maintenance area for particulate matter 10 microns in diameter or smaller (PM_{10}), having recently transitioned from a nonattainment area effective March 27, 2020. Table 1 shows Salt Lake County's attainment status for each criteria pollutant.

Sulfur dioxide (SO_2) and lead (Pb) are not currently considered transportation-related criteria pollutants and are not discussed further.

Table 1. National and Utah Ambient Air Quality Standards for Criteria Pollutants and Attainment Status for Salt Lake County

Pollutant	Primary/Secondary Standard	Averaging Time	Level	Form	Attainment Status for Salt Lake County
Carbon monoxide (CO)	Primary	8 hours	9 ppm	Not be exceeded more than once per year	Partial attainment area[a]
		1 hour	35 ppm	Not be exceeded more than once per year	
Ozone (O_3)	Primary and secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	Marginal nonattainment area
Particulate matter ($PM_{2.5}$)	Primary	1 year	12.0 μg/m^3	Annual mean, averaged over 3 years	Serious nonattainment area
	Secondary	1 year	15.0 μg/m^3	Annual mean, averaged over 3 years	
	Primary and secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years	
Particulate matter (PM_{10})	Primary and secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years	Maintenance area
Nitrogen dioxide (NO_2)	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years	Attainment area
	Primary and secondary	1 year	53 ppb	Annual mean	Attainment area
Sulfur dioxide (SO_2)	Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.	Attainment area
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year.	Nonattainment area
Lead (Pb)	Primary and secondary	Rolling 3-month average	0.15 μg/m^3	Not to be exceeded	Attainment area

Sources: 49 Code of Federal Regulations (CFR) Part 50 (NAAQS) and 40 CFR Part 81 (attainment status)

μg/m^3 = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion; $PM_{2.5}$ = particulate matter 2.5 microns in diameter or less; PM_{10} = particulate matter 10 microns in diameter or less

[a] A section of Salt Lake County is a CO maintenance area, but the rest is an attainment area. The study area is located in the attainment area.

3.2 Transportation Conformity Requirements

What is transportation conformity?

Transportation conformity is a process required by Clean Air Act Section 176(c), which establishes the framework for improving air quality to protect public health and the environment.

Transportation conformity is a process required by Clean Air Act Section 176(c), which establishes the framework for improving air quality to protect public health and the environment. All state governments are required to develop a state implementation plan (SIP) for each pollutant for which an area is in nonattainment or maintenance status, which explains how the State will comply with the requirements of the Clean Air Act.

Section 176(c) of the Clean Air Act, and its related amendments, require that transportation plans, programs, and projects that are developed, funded, or approved by the Federal Highway Administration and metropolitan planning organizations must demonstrate that such activities conform to the SIP. Transportation conformity requirements apply to any transportation-related criteria pollutants for which the project area is designated a nonattainment or maintenance area.

Unless the project is exempt from conformity requirements, federal agencies are required to make a conformity determination before adopting, accepting, approving, or funding an activity or project located in a nonattainment or maintenance area. A conformity determination is a finding that the activity or project conforms to the SIP's purpose of "eliminating or reducing the severity and number of violations" of the NAAQS and "achieving expeditious attainment of the NAAQS" [42 United States Code (USC) Section 7506(c)] and the project or activity will not:

- Cause or contribute to new air quality violations of the NAAQS,
- Worsen existing violations of the NAAQS, or
- Delay timely attainment of the NAAQS or required interim milestones.

A project-level conformity determination for ozone can be made by confirming that the project is included in the currently conforming regional transportation plan (RTP) and transportation improvement program (TIP). A project-level conformity determination may also require a hot-spot analysis for CO, PM_{10}, and/or $PM_{2.5}$ in areas which are designated as nonattainment or maintenance. A hot-spot analysis is defined in 40 CFR Section 93.101 as an estimation of likely future local pollutant concentrations and a comparison of those concentrations to the relevant NAAQS. A hot-spot analysis assesses air quality impacts on a smaller scale than an entire nonattainment or maintenance area. A PM hot-spot analysis is required only for specific types of projects, which are listed in the transportation conformity regulations at 40 CFR Section 93.123(b)(1). EPA uses the term *project of air quality concern* (POAQC) to refer to any of the project types for which a PM hot-spot analysis is required.

The S.R. 210 Project is not an exempt project for transportation conformity purposes under 40 CFR Section 93.126. The current RTP for the project area is the Wasatch Front Regional Council's (WFRC) 2019–2050 *Wasatch Front Regional Transportation Plan* (WFRC 2019). Key aspects of the S.R. 210 Project are identified in WFRC's conforming 2019–2050 RTP as well as in WFRC's conforming 2021–2026 TIP. Conformity for O_3 is met due to the requirement that the RTP and TIP approvals must be based on a finding that O_3 precursor emissions of volatile organic compounds and nitrogen oxides from projects in the RTP and TIP are consistent with the SIP to bring the area into attainment with the O_3 national standard. Project-level conformity for ozone is met by demonstrating that the project area has a conforming transportation plan and

TIP, and that the project is found in that transportation plan and TIP, per Table 1 in 40 Code of Federal Regulations (CFR) Section 93.109. EPA approved the maintenance plan for the Salt Lake County 1-hour O_3 nonattainment area on July 17, 1997 (62 Federal Register [FR] 38213). However, the 1-hour standard was replaced by an 8-hour standard on July 18, 1997 (62 FR 38856). EPA partially approved the maintenance plan for the Salt Lake County 8-hour O_3 standard on September 26, 2013 (78 FR 59242), and approved the SIP for PM_{10} on July 8, 1994 (59 FR 35036). Salt Lake County does not yet have an approved SIP for $PM_{2.5}$.

Because the action alternatives for the S.R. 210 Project would be located in a $PM_{2.5}$ nonattainment and PM_{10} maintenance area, the project is subject to the procedures described in 40 CFR Section 93.123(b)(1) which determine whether a project should be classified as a POAQC and quantitative hot-spot analysis is warranted. Projects that require quantitative hot-spot analyses for $PM_{2.5}$ and PM_{10} include:

(i) New highway projects that have a significant number of diesel vehicles, and expanded highway projects that have a significant increase in the number of diesel vehicles

(ii) Projects affecting intersections that are at a level of service (LOS) of LOS D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project

(iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location

(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location

(v) Projects in or affecting locations, areas, or categories of sites that are identified in the PM_{10} or $PM_{2.5}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation

At a minimum, item (iii) applies to the S.R. 210 Project for each alternative listed in Section 2.2, EIS Alternatives, and therefore the S.R. 210 Project is a POAQC and requires quantitative $PM_{2.5}$ and PM_{10} hot-spot analysis (see Attachment A, POAQC Evaluation, for more information).

There are no project-level CO requirements because the air quality impact analysis area is not in a CO nonattainment or maintenance area.

3.3 Hot-spot Analysis

> **What is a hot-spot analysis?**
>
> A hot-spot analysis assesses air quality impacts on a smaller scale than an entire nonattainment or maintenance area.

In general, a hot-spot analysis compares air quality concentrations with a proposed project (the build scenario) to the air quality concentrations without the project (the no-build scenario). The air quality concentrations are determined by calculating a “design value,” a statistic that describes future air quality concentration in the project area that can be compared to a particular NAAQS. The EPA guidance *Transportation Conformity Guidance for Quantitative Hot-spot Analysis in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (EPA 2015a) suggests modeling the build scenario first. If the design values for the build scenario are less than or equal to the relevant NAAQS, the project meets the conformity rule’s hot-spot requirements, and no further modeling is needed.

Section 93.116(a) of the conformity rule requires that PM hot-spot analyses consider either the full timeframe of an area's transportation plan or, in an isolated rural nonattainment or maintenance area, the 20-year regional emissions analysis. Conformity requirements are met if the analysis demonstrates that no new or worsened violations occur in the year(s) of highest expected emissions, which includes the project's emissions in addition to background concentrations. Analysis years must be within the timeframe of the transportation plan. For the S.R. 210 Project, analyses were conducted for the year 2050.

Additionally, hot-spot analyses should include the entire project area [40 CFR Section 93.123(c)(2)]. However, for larger projects, it might be appropriate to focus the analysis only on the locations of the highest air quality concentrations. If conformity is demonstrated at such locations, then it can be assumed that conformity is met in the entire project area.

4.0 Methodology

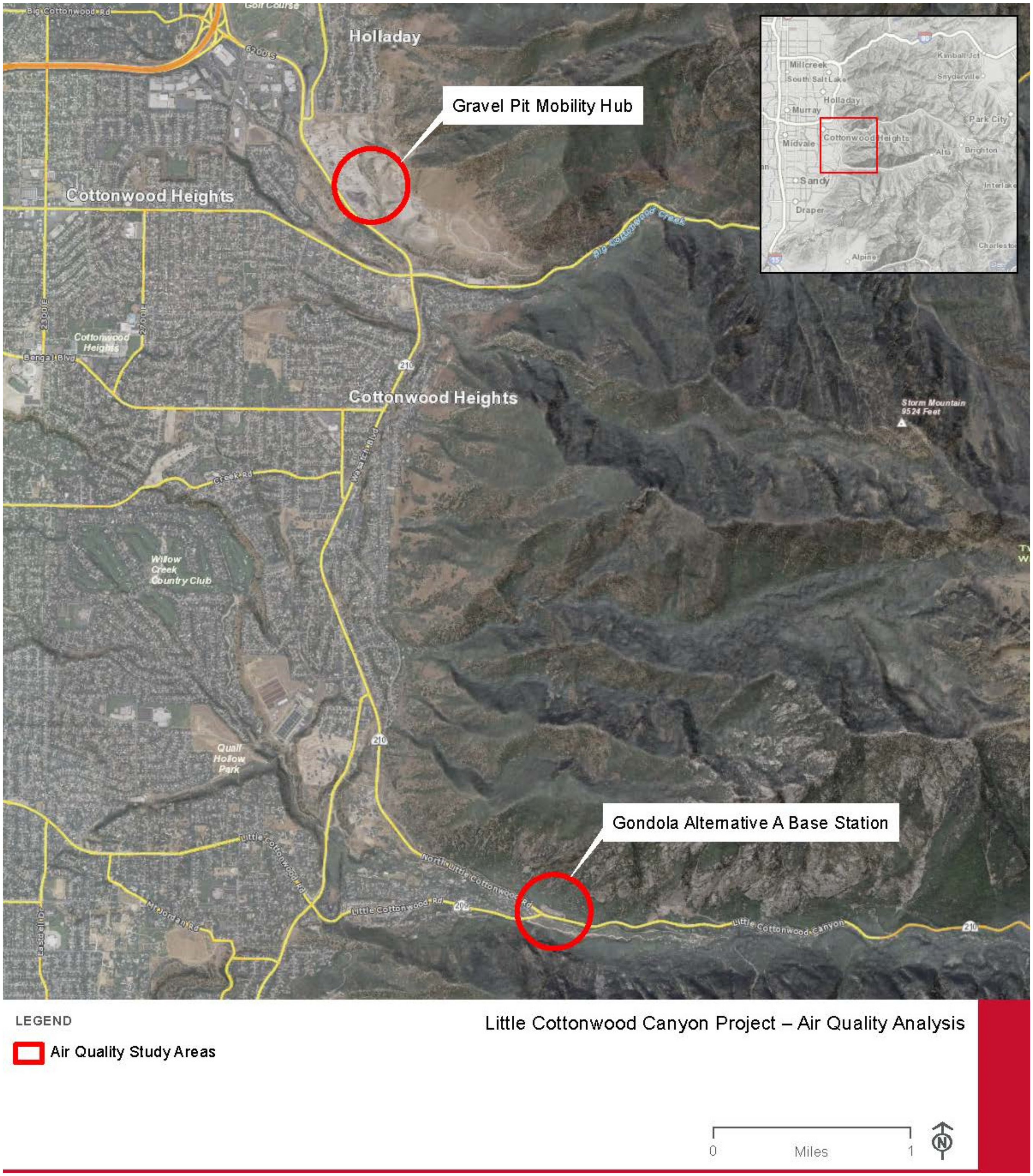
The design for Gondola Alternative A [Section 2.2.3, Gondola Alternative A (Starting at Canyon Entrance)] includes the most buses (108 per day) departing from a single mobility hub and the most buses (216 per day) dropping off passengers at a single location (the gondola base station). Therefore, quantitative hot-spot analysis of PM_{10} and $PM_{2.5}$ was conducted for Gondola Alternative A. This analysis modeled vehicle activity associated with the gondola base station as well as the gravel pit mobility hub given that this mobility hub accommodates the largest number of personal vehicles (1,500-car parking structure). UDOT assumes that the PM_{10} and $PM_{2.5}$ concentrations would be the highest at these locations for the activities described for Gondola Alternative A compared to other alternatives. EPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* states that it "may be appropriate in some cases to focus the PM hot-spot analysis only on the locations of highest air quality concentrations" (EPA 2015a).

UDOT used EPA's MOVES2014b model to estimate on-road and off-network motor vehicle emission rates from vehicle exhaust, brake wear, and tire wear caused by Gondola Alternative A. These estimates were then used in AERMOD, the air quality dispersion model, which estimates PM concentrations. UDOT followed EPA guidelines (EPA 2015a, 2015b), as well as materials used in EPA-sponsored training classes (for example, "Completing Quantitative PM Hot-spot Analyses: 3-Day Course"), to complete the hot-spot analyses for 24-hour PM_{10}, 24-hour $PM_{2.5}$, and annual $PM_{2.5}$.

Emissions from vehicles on arterial roads within 300 meters (984 feet) of the center of each analysis location (gravel pit mobility hub and gondola base station) were included in the analysis. Figure 2 shows the general locations of the gravel pit mobility hub and gondola base station study areas. Roads and other emissions sources beyond this radius were assumed to be part of the background concentrations used for this analysis. Note that the gravel pit currently operating at the site of the proposed mobility hub is assumed to be shut down when the mobility hub begins operation.

Since winter is expected to have the greatest traffic levels, the analysis was performed for January of calendar year 2050. The year 2050 was modeled because traffic and demand for transit will not reach its peak until 2050. Prior to 2050, the system would be built in phases, starting with a limited number of buses and growing each year, gradually ramping up to maximum capacity in 2050. At the midpoint of this ramp-up period, only about 50% to 60% of the buses would be operating, and traffic would not be at its full peak.

Figure 2. Air Quality Study Areas



If the model results for the winter scenario of Gondola Alternative A are found to be acceptable with respect to air quality standards, then further analysis of other alternatives or time periods would not be needed, since UDOT expects the winter scenario of Gondola Alternative A to represent the worst case in terms of air quality. If Gondola Alternative A's air quality impacts are not acceptable, mitigation measures would need to be considered for this alternative, and other alternatives might need to be analyzed as well to demonstrate acceptable levels of air quality impacts.

4.1 MOVES 2014b Methodology

Under transportation conformity rules, emissions estimates for hot-spot analyses must be made using the latest approved analysis software and tools (40 CFR Section 93.111). Although MOVES3 is EPA's latest motor vehicle emissions model (released in November 2020), there is a 2-year grace period for project-level conformity analyses. For this reason, UDOT used EPA's MOVES2014b for estimating $PM_{2.5}$ and PM_{10} emissions from vehicle exhaust, brake wear, and tire wear. The MOVES 2014b methodology used for the S.R. 210 Project is described below.

4.1.1 Links and Traffic Data

Before beginning the analyses, UDOT defined the project links. Figure 3 depicts the link setup for the gravel pit mobility hub study area, and Figure 4 depicts the link setup for the Gondola Alternative A base station study area. In order to include all of the road segments in the gravel pit mobility hub, Figure 3 includes some links outside the 300-meter analysis perimeter. Attachments B and C provide a table of links for the gravel pit mobility hub and Gondola Alternative A base station, respectively, keyed to Figure 3 and Figure 4, with traffic volumes and speeds for each link.

For the hot-spot analysis, there were 173 proposed on-road links and 1 off-network link for the gravel pit mobility hub and 46 proposed links for the Gondola Alternative A base station.[1] The off-network link for the gravel pit mobility hub represents the parking structures. Each link represents a section of road where a certain type of vehicle activity occurs. In the case of the S.R. 210 Project, links represent road segments with similar traffic, activity conditions, and characteristics; for example, decelerating vehicles approaching an intersection were treated as one link. Links are characterized by facility type, length (miles), hourly traffic volume (units of vehicles per hour), average speed (miles per hour), and road grade (percent).

The schematic in Figure 3 depicts two parking structures. These structures were modeled together as one off-network link. The built structures would have five levels. Links were defined to represent the in-and-out movements for the first 2.5 levels of the structures.

UDOT determined hourly traffic volumes from data provided by the project traffic consultant and from UDOT traffic counts. Link-specific traffic volumes were developed for four periods: the morning peak (7:00 AM – 10:00 AM), midday (10:00 AM – 3:00 PM), the evening peak (3:00 PM – 6:00 PM), and overnight (6:00 PM – 7:00 AM). Link speeds were assigned for accelerating and decelerating links, idle speeds at intersections, and cruise speeds on the S.R. 210 and S.R. 209 mainlines near the Gondola Alternative A base station and on Wasatch Boulevard near the gravel pit mobility hub. Vehicle speeds were based on UDOT's best professional judgment consistent with EPA guidance and the availability of conceptual project-level design information describing vehicle activity.

[1] The Gondola Alternative A base station would have a small parking area that would be limited to employees working at the station and people using the existing Alpenbock Trailhead. The trailhead would be used primarily during the summer. For this reason, activity at this small, limited parking lot is not included in the analysis.

Figure 3. Gravel Pit Mobility Hub Links

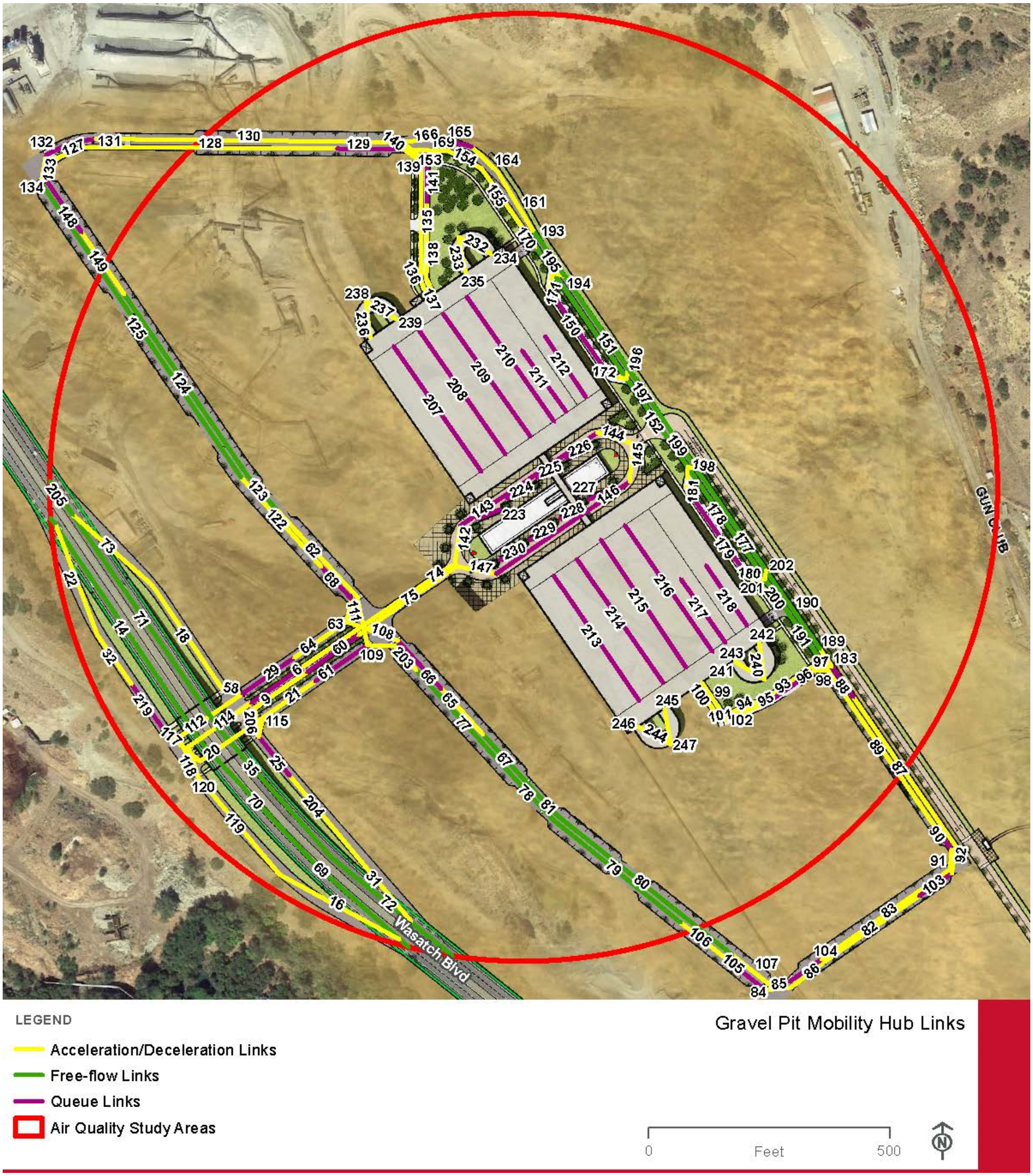
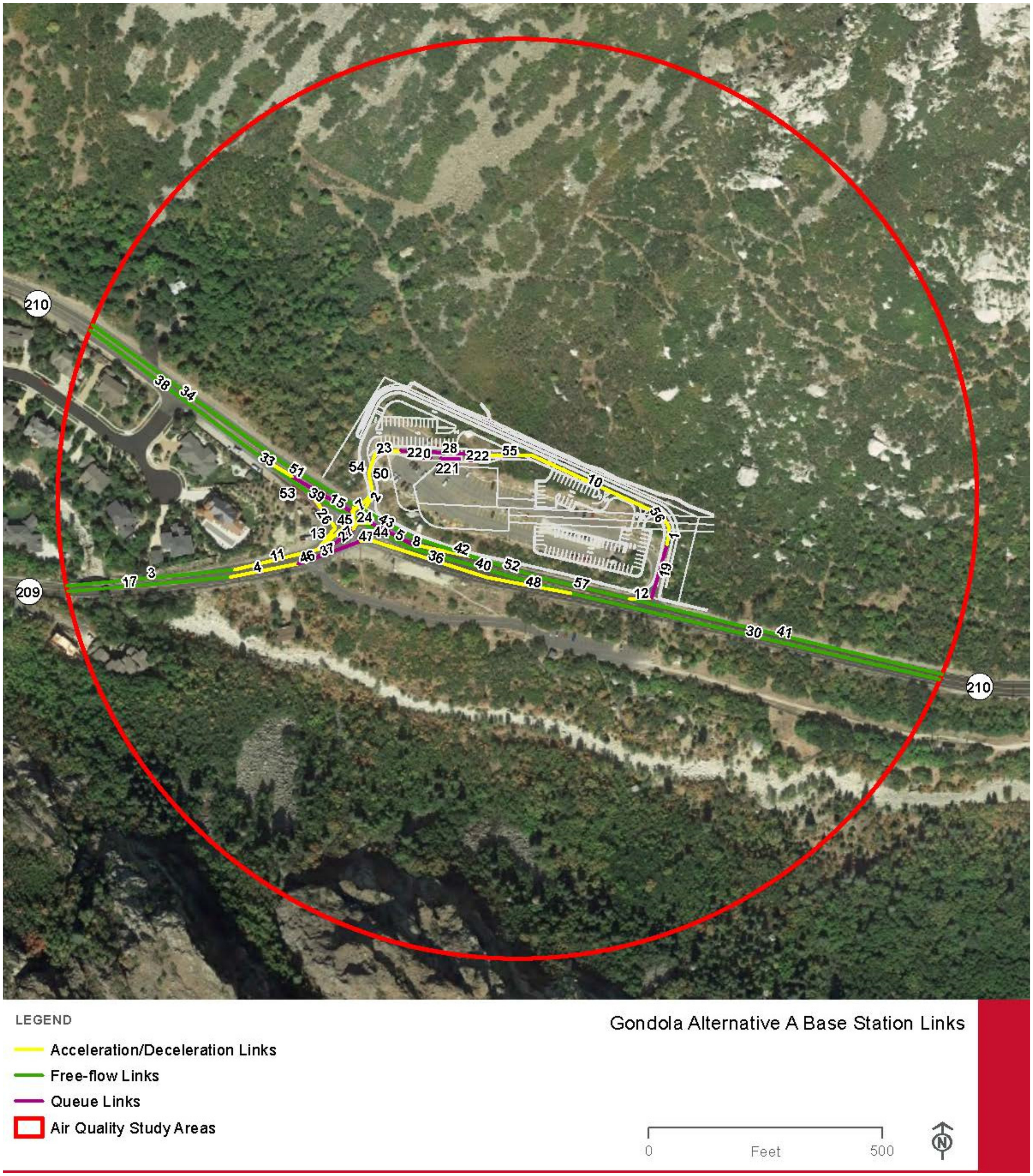


Figure 4. Gondola Alternative A Base Station Links



4.1.2 MOVES 2014b Run Specification Setup

MOVES 2014b run specifications were set up as follows:

- **Description.** A short description of the run specification was provided.
- **Scale.** MOVES was run at the project scale using “inventory” for output.
- **Time Spans.** MOVES was executed for January 1 of the year 2050 and run for the morning peak, midday, evening peak, and overnight periods for a total of four runs.
- **Geographic Bounds.** Geographic bounds were set for Salt Lake County, Utah.
- **Vehicles/Equipment.** All fuel and source types were selected in the vehicle/equipment panel.
- **Road Type.** The “urban unrestricted” road type was selected when modeling both the Gondola Alternative A base station and the gravel pit mobility hub. The gravel pit mobility hub also included the “off-network” road type to account for the parking garage.
- **Pollutants and Processes.** The pollutants and processes selected in the pollutants and processes panel included “Primary Exhaust $PM_{2.5}$ – Total,” “Primary $PM_{2.5}$ – Brake Wear Particulate,” “Primary $PM_{2.5}$ – Tire Wear Particulate,” “Primary Exhaust PM_{10} – Total,” “Primary PM_{10} – Brake Wear Particulate,” and “Primary PM_{10} – Tire Wear Particulate.”
- **Manage Input Data Sets.** Not used.
- **Strategies.** Not used.
- **Output.** Output units were set to grams per mile, and “distance traveled” and “population” were set for activity output. “Emission process” and “source use type” were selected for output emissions detail.

4.1.3 MOVES 2014b Input Database

MOVES input files are described below according to the MOVES Project Data Manager tabs (described below):

- **Age Distribution.** The age distribution data were those used by the local metropolitan planning organization, WFRC, for 2050 regional conformity analysis and SIP analysis (Billings 2020a; WFRC 2019).
- **Fuel.** MOVES default fuel data were used.
- **Meteorological Data.** The meteorological data were those used by WFRC for 2050 regional conformity analysis and SIP analysis (Billings 2020a; WFRC 2019).
- **Links.** Link data inputs were set up as described in Section 4.1.1, Links and Traffic Data.
- **Link Source Types.** Link source type varied according to link. The regional fleet composition used by WFRC for 2050 regional conformity analysis and SIP analysis (Billings 2020a; WFRC 2019) was used for links representing the S.R. 210, S.R. 209, and Wasatch Boulevard mainlines, and extra buses were added into the total percentages. Link source type was bus only for bus-only links in the Gondola Alternative A base station and the gravel pit mobility hub. Additionally, the gravel pit mobility hub had a number of links that included light-duty cars and trucks only (the ratio of each is based on that of the regional fleet).
- **Off-network.** Off-network data were provided for the off-network link representing the parking garages at the gravel pit mobility hub. The vehicle population for this off-network link included light-duty cars and trucks only. The start fraction for vehicles was set to 0.03 for the AM peak, 0.13 for midday, 0.97 for the PM peak, and 0 for overnight. In addition, buses would be parked in the lower level of the garage overnight; therefore, the start fraction for buses in the AM peak was set to 1.
- **Operating Mode Distribution.** Operating mode distribution data described the soak-time distribution of vehicles in the parking garage at the gravel pit mobility hub. Most light-duty vehicles would be parked for 7 or more hours. Buses would be parked in the lower level of the garage overnight.
- **Hoteling, Inspection and Maintenance (I/M) Programs, Retrofit Data, Link Drive Schedules, and Generic.** Not used.

4.1.4 MOVES 2014b Output

For links represented by the full regional fleet, buses only, or light-duty vehicles only, a MOVES2014b post-processing script was used to generate link-specific emission rates for total PM_{10} and $PM_{2.5}$. For links represented by a mix of light-duty vehicles and buses, emission rates were separated by light-duty vehicles and buses.

In addition, emissions of re-entrained road dust were added to the link emissions rates to generate a total emission rate for PM_{10}. Values for re-entrained road dust were obtained from WFRC and are those used in the 2050 regional conformity analysis (Billings 2020b; WFRC 2017). Road

What is re-entrained road dust?

Re-entrained road dust is particulates that are resuspended in the air when vehicles travel over roadway surfaces.

dust is not included in the $PM_{2.5}$ regional conformity analysis and is therefore not included in the $PM_{2.5}$ emissions for this hot-spot analysis. Emission rates were then used for AERMOD dispersion modeling, which is further described in Section 4.2.

4.2 AERMOD Dispersion Modeling

The latest approved version of EPA's AERMOD dispersion model (version 19191) was used in the dispersion analysis in conjunction with Lakes Environmental's AERMOD View (version 9.8.3). AERMOD is now required for quantitative hot-spot analyses of $PM_{2.5}$ and PM_{10} for analyses performed under transportation conformity rules. The AERMOD dispersion modeling methodology is described below.

4.2.1 Meteorology Data

Five years (2008–2012) of hourly surface meteorological data for the Salt Lake City International Airport, combined with upper-air/profile data from the airport, are available in preprocessed format on the Utah Division of Air Quality's (UDAQ) website. These meteorological data, processed using 1-minute Automated Surface Observing System (ASOS) wind data, were used as an input to AERMOD. A more recent preprocessed data set was not available from UDAQ. However, UDOT's comparison of wind roses for the available preprocessed data (2008–2012) and the most recent 5 calendar years (2015–2019) of data from the Salt Lake City International Airport shows that the average wind speed of the two data sets, the percentage of calm winds, and the wind rose patterns are virtually identical between the two data sets. Therefore, UDOT considers the existing 2008–2012 meteorological data set to be representative for modeling purposes, given there are no significant differences compared to the wind data collected during the most recent 5 calendar years (2015–2019).

4.2.2 Receptors

Receptors were spaced at 25 meters (82 feet) on the borders of each facility (gravel pit mobility hub and gondola base station), generally on sidewalks or trails bordering each facility (terminal station or base station). Because the primary emissions sources of concern (diesel-powered buses) would emit pollutants relatively near the ground level, it can be assumed that the greatest ambient air impacts would be at boundary receptors. However, to help demonstrate the drop-off of pollutant concentrations with distance from each facility, UDOT placed a general Cartesian receptor grid, with 25-meter (82-foot) receptor-spacing within 100 meters of the property boundary and 100-meter (328-foot) receptor-spacing from 100 meters to 500 meters (1,640 feet) from the property boundary. Receptor ground-level elevations were obtained from the National Elevation Dataset distributed by the U.S. Geological Survey, which are based on the North American Datum of 1983 (NAD83). This dataset has a resolution of 1/3 arc-second (or approximately 10 meters, or 32.8 feet) and was used to provide input to the AERMAP preprocessor to develop the required parameters for each receptor.

Figure 5 and Figure 6 show the receptor locations for the gravel pit mobility hub and the gondola base station, respectively. There are 1,582 receptors for the gravel pit mobility hub and 471 receptors for the gondola base station.

Figure 5. Gravel Pit Mobility Hub Receptors

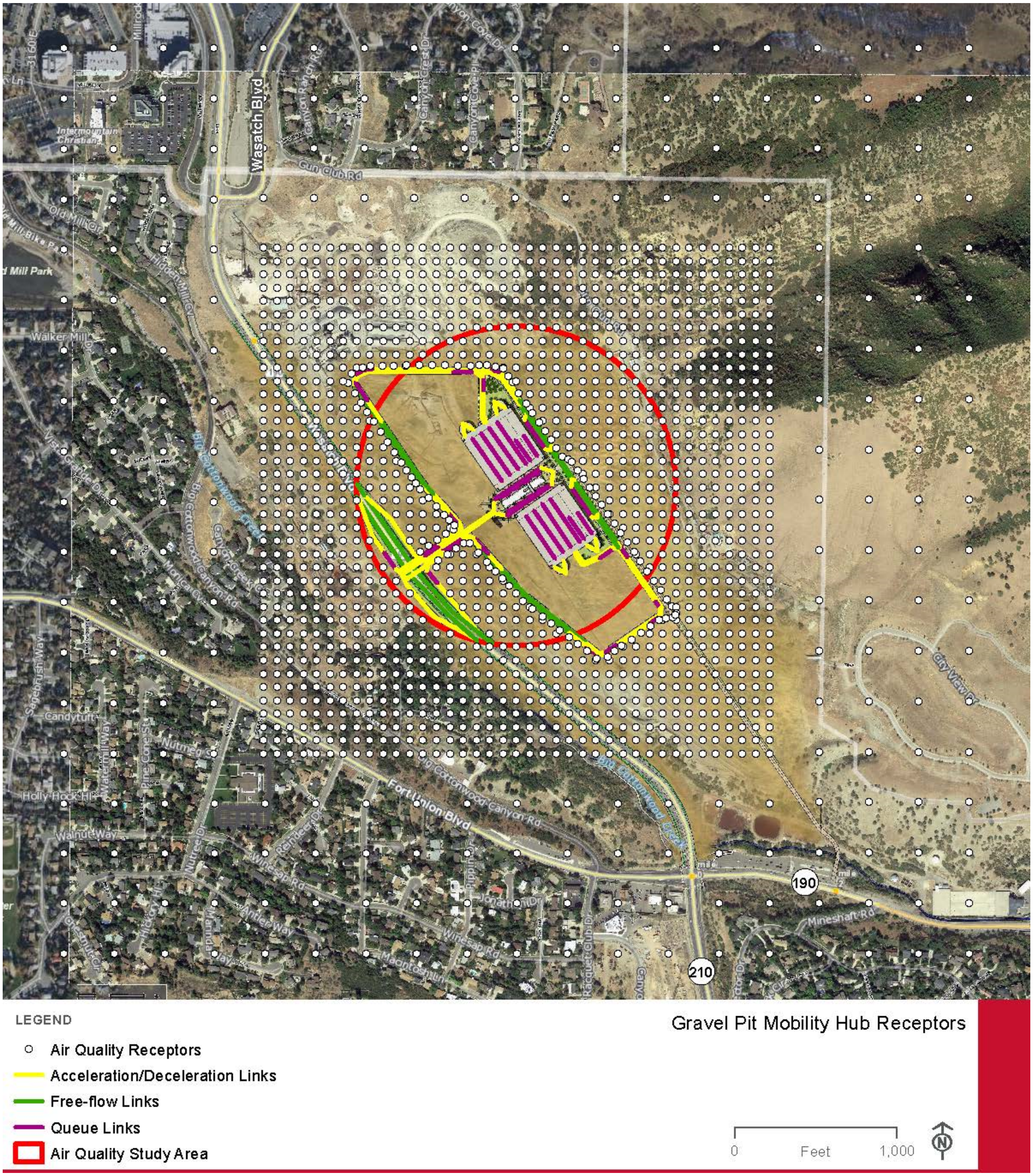
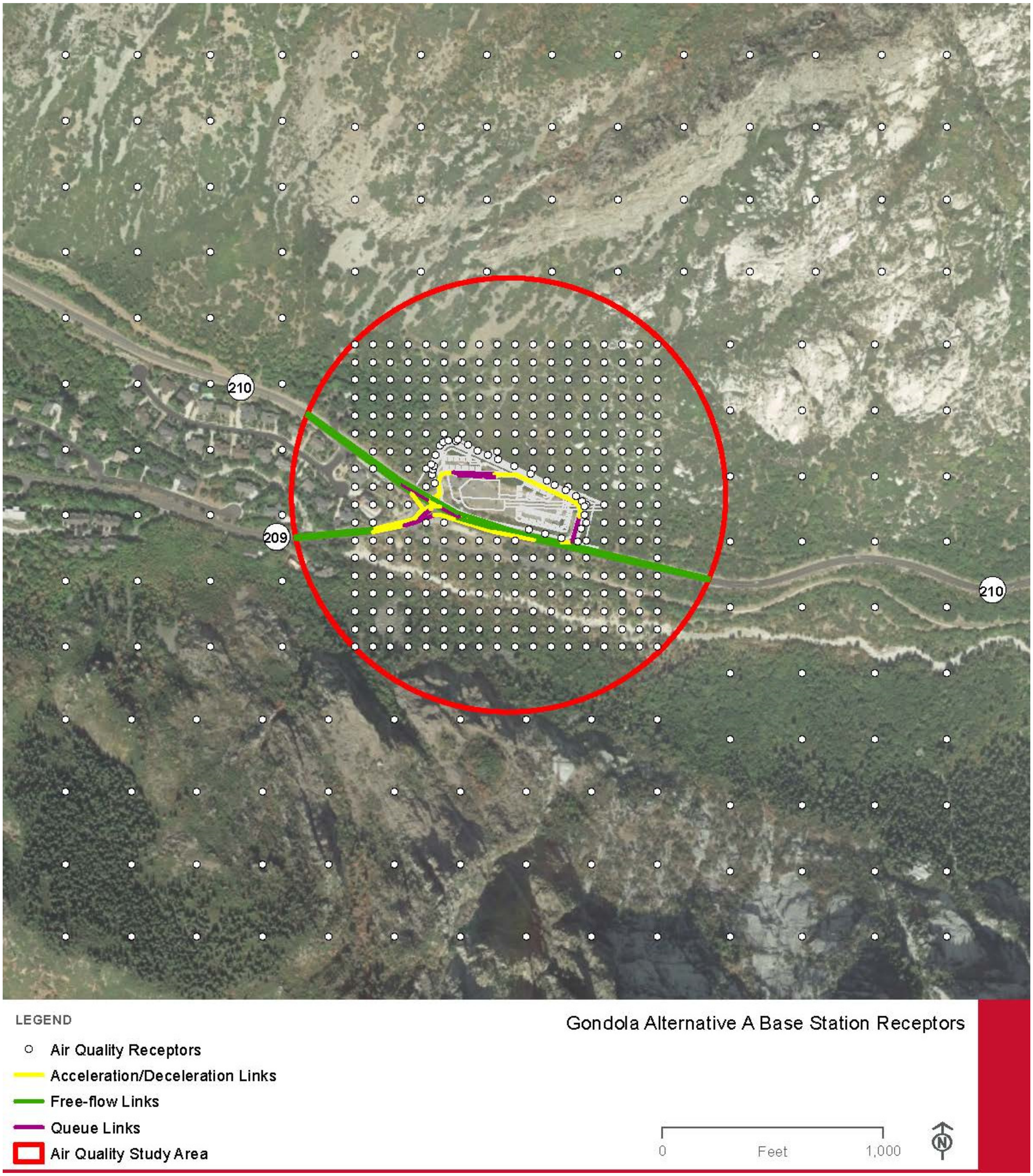


Figure 6. Gondola Base Station Receptors



4.2.3 AERMOD Input

AERMOD input included the Universal Transverse Mercator (UTM) coordinates for emissions sources and the coordinates of the receptors. Roadway emissions sources were modeled as volume sources.

- The emissions sources were input to AERMOD with 1 gram/second emission rates that were multiplied by the emission rate calculated for each link to produce 24-hour emission profiles by hour of day based on MOVES output and road dust values. The 24-hour emission profiles, based on the four daily time periods assessed in the MOVES runs, were simulated in AERMOD using 24 hourly emission scalars for each source. Attachment D, Variable Emission Generator Methodology, details the methodology for using temporally varying emission rates for each source of emissions.
- The discrete emissions sources included the appropriate road segments for moving traffic, the idling bus locations, and the parking ramps with emissions based on personal vehicle moving, idling, and startup emissions. Volume sources were used for the moving vehicle links in this analysis. Area sources were used for the idling bus locations (with initial dimensions based on the length, width, and height of buses). The parking garages were modeled as area sources with the horizontal dimensions (length and width) of the parking garages and a release height equal to half the design height of the garage, based on the assumption that the average release height will be half the height of the parking garages.
- Other physical source parameters (such as source release height, initial vertical dispersion coefficient, etc.) besides emission rates were based on guidance provided in EPA Publication EPA-420-B-15-084, *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (EPA 2015a). Table 2 provides the modeling design parameters of each source of emissions.

Table 2. Modeling Design Parameters for Emissions Sources

Modeling Parameters	Mobile Sources	Idling Buses	Garages
Source type	Volume	Area	Area
Emission rates	1 g/s	3.17E-02 g/sec-m^2 (1 g/s)	7.42E-05 g/sec-m^2 (1 g/s)
Plume height	6.8 m	—	—
Plume width	3.66 m	—	—
Configuration	Adjacent	—	—
Release Height	3.4.m	1.524 m	7.925 m
Length of X side	—	12.19 m	122.53 m
Length of Y side	—	2.59 m	110.00 m
Initial vertical dimension	—	4.65 m	7.373 m

g/s = grams per second, g/sec-m^2 = grams per second per square meter, m = meters

4.3 Background Concentrations

UDOT derived the background concentrations used in developing the design values for the 24-hour PM_{10} standard, the 24-hour $PM_{2.5}$ standard, and the annual $PM_{2.5}$ standard from data reports from the Hawthorne Monitoring Station in Salt Lake County, Utah (EPA AIRS Code 490353006), which is the closest air quality monitor to the study areas for the S.R. 210 Project.

The 24-hour PM_{10} background concentration is based on identifying the appropriate 24-hour monitor value from the 3 most recent years of monitoring data (2017–2019) based on Exhibit 9-6 in EPA's transportation conformity guidance (EPA 2015a). The 24-hour $PM_{2.5}$ background concentration is based on the 3-year average of the 98th percentile of 24-hour recorded concentrations. The annual $PM_{2.5}$ background concentration is based on the 3-year average of the annual arithmetic mean $PM_{2.5}$ recorded at the monitoring station.

Table 3 lists the background concentrations for each of these pollutants. UDOT did not identify any other nearby individual sources that could contribute to local background PM concentrations measured at the Hawthorne Monitoring Station.

Table 3. Background Concentrations Used in PM Hot-spot Analyses

Pollutant	Background Concentration ($\mu g/m^3$)[a]
24-hour PM_{10}	85.0[b]
24-hour $PM_{2.5}$	29.3[c]
Annual $PM_{2.5}$	7.47[d]

[a] Background concentrations are reported to one decimal place beyond the NAAQS value.
[b] Based on the fourth-highest 24-hour monitoring values for 2017–2019.
[c] Based on 98th-percentile values for 2017–2019.
[d] Based on annual averages for 2017–2019.

4.4 Design Values

Design values were calculated by adding modeled receptor values to background monitor values. The resulting design value concentration was then compared to the NAAQS.

- **24-hour PM_{10} Design Values.** The 24-hour PM_{10} design value was calculated by first identifying the sixth-highest 24-hour concentration at each receptor across 5 years of meteorological data (as done by AERMOD). The receptor with the highest modeled concentration for a 24-hour period was then added to the background monitor value and compared to the NAAQS.
- **24-hour $PM_{2.5}$ Design Values.** The 24-hour $PM_{2.5}$ design value was calculated by identifying the receptor with the highest 5-year average 98th-percentile concentration (as done by AERMOD). The receptor with the highest modeled concentration for a 24-hour period was then added to the background monitor value and compared to the NAAQS.
- **Annual $PM_{2.5}$ Design Values.** The annual $PM_{2.5}$ design value was calculated directly by AERMOD by the model averaging the 5 years of annual averages for each receptor and reporting the highest receptor. The receptor with the highest modeled 5-year average concentration was identified, and this value was then added to the background monitor value and compared to the NAAQS.

5.0 Results

5.1 24-hour PM_{10}

The 24-hour PM_{10} design value was calculated by adding the modeled receptor value to the background monitor value (EPA 2015a). The resulting 24-hour PM_{10} design value concentration was then rounded to the nearest 10 micrograms per cubic meter (μg/m^3) (EPA 2015a).

Table 4 shows the results of the analysis for the 24-hour PM_{10} standard. The 24-hour PM_{10} design values of 90 μg/m^3 are less than the 24-hour PM_{10} NAAQS (150 μg/m^3). This demonstrates that the S.R. 210 Project would not contribute to any new local violations, increase the frequency or severity of any existing violation, or delay timely attainment of the PM_{10} NAAQS. Therefore, the S.R. 210 Project is consistent with the SIP and would not cause an exceedance of the PM_{10} NAAQS.

Table 4. Design Values for the 24-hour PM_{10} Standard in 2050

In μg/m^3

Location	Modeled Value[a]	Background Concentration[b]	Design Value[c]	24-hour PM_{10} NAAQS
Gravel pit mobility hub	5.1	85.0	90	150
Gondola Alternative A	4.8		90	

[a] Modeled values were derived from AERMOD and are reported to one decimal place beyond the NAAQS value.
[b] Background concentrations are reported to one decimal place beyond the NAAQS value.
[c] 24-hour PM_{10} design value is rounded to the nearest 10 μg/m^3 (EPA 2015a).

5.2 24-hour $PM_{2.5}$

The 24-hour $PM_{2.5}$ design value was calculated by adding the modeled receptor value to the background monitor value (EPA 2015a). The resulting 24-hour $PM_{2.5}$ design value concentration was then rounded to the nearest 1 μg/m^3 (EPA 2015a).

Table 5 shows the results of the analysis for the 24-hour $PM_{2.5}$ standard. The 24-hour $PM_{2.5}$ design values of 30 μg/m^3 are less than the 24-hour $PM_{2.5}$ NAAQS (35 μg/m^3). This demonstrates that the S.R. 210 Project would not contribute to any new local violations, increase the frequency or severity of any existing violation, or delay timely attainment of the 24-hour $PM_{2.5}$ NAAQS. Therefore, the S.R. 210 Project is consistent with the SIP and would not cause an exceedance of the 24-hour $PM_{2.5}$ NAAQS.

Table 5. Design Values for the 24-hour $PM_{2.5}$ Standard in 2050

In μg/m^3

Location	Modeled Value[a]	Background Concentration[b]	Design Value[c]	24-hour $PM_{2.5}$ NAAQS
Gravel pit mobility hub	0.2	29.3	30	35
Gondola Alternative A	0.2		30	

[a] Modeled values were derived from AERMOD and are reported to one decimal place beyond the NAAQS value.
[b] Background concentrations are reported to one decimal place beyond the NAAQS value.
[c] 24-hour $PM_{2.5}$ design value is rounded to the nearest 1 μg/m^3 (EPA 2015a).

5.3 Annual $PM_{2.5}$

The annual $PM_{2.5}$ design value was calculated by adding the modeled receptor value to the background monitor value (EPA 2015a). The resulting annual $PM_{2.5}$ design value concentration was then rounded to the nearest 0.1 μg/m³ (EPA 2015a).

Table 6 shows the results of the analysis for the annual $PM_{2.5}$ standard. The annual $PM_{2.5}$ design values of 7.6 μg/m³ is less than the annual $PM_{2.5}$ NAAQS (12 μg/m³). This demonstrates that the S.R. 210 Project would not contribute to any new local violations, increase the frequency or severity of any existing violation, or delay timely attainment of the annual $PM_{2.5}$ NAAQS. Therefore, the S.R. 210 Project is consistent with the SIP and would not cause an exceedance of the annual $PM_{2.5}$ NAAQS.

Table 6. Design Values for the Annual $PM_{2.5}$ Standard in 2050

In μg/m³

Location	Modeled Value[a]	Background Concentration[b]	Design Value[c]	Annual $PM_{2.5}$ NAAQS
Gravel pit mobility hub	0.09	7.47	7.6	12.0
Gondola Alternative A	0.07		7.5	

[a] Modeled values were derived from AERMOD and are reported to one decimal place beyond the NAAQS value.

[b] Background concentrations are reported to one decimal place beyond the NAAQS value.

[c] Annual $PM_{2.5}$ design value is rounded to the nearest 0.1 μg/m³ (EPA 2015a).

6.0 References

Billings, Kip

2020a Email communication from Kip Billings of WFRC to Amy Croft of HDR regarding data sets for MOVES inputs. June 15.

2020b Email communication from Kip Billings of WFRC to Amy Croft of HDR regarding road dust emission rates. August 31.

[EPA] U.S. Environmental Protection Agency

2015a Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas. EPA-420-B-15-040. November.

2015b Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas (Appendices). EPA-420-B-15-084. November.

2021 Email from Tim Russ, EPA, to Naomi Kisen, UDOT, regarding review of the *Little Cottonwood Canyon Draft Modeling Protocol for $PM_{2.5}$ and PM_{10} Quantitative Hot-spot Analysis*. January 22.

[WFRC] Wasatch Front Regional Council

2017 Air Quality Memorandum. Report No. 36. http://wfrc.org/Programs/AirQuality/AirQualityMemoArchive/AQ%20memo36_RTP_2015-2040_Amended_FINAL.pdf. August 24.

2019 Wasatch Front Regional Transportation Plan 2019–2050. https://wfrc.org/VisionPlans/RegionalTransportationPlan/Adopted2019_2050Plan/RTP_2019_2050_ADOPTED.pdf.

Attachment A. Draft Project of Air Quality Concern Evaluation

Little Cottonwood Canyon ENVIRONMENTAL IMPACT STATEMENT
S.R. 210 | Wasatch Blvd. to Alta

Draft Project of Air Quality Concern Evaluation

Little Cottonwood Canyon Environmental Impact Statement Wasatch Boulevard to Alta

Lead agency:
Utah Department of Transportation

May 22, 2020

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Acronyms and Abbreviations

CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
LRTP	Long-Range Transportation Plan
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_x	nitrogen oxides
O_3	ozone
Pb	lead
PM_{10}	particulate matter 10 microns in diameter or smaller
$PM_{2.5}$	particulate matter 2.5 microns in diameter or smaller
POAQC	Project of Air Quality Concern
S.R.	state route
SO_2	sulfur dioxide
TIP	Transportation Improvement Program
UDOT	Utah Department of Transportation

1.0 Introduction

The Utah Department of Transportation (UDOT) is preparing an Environmental Impact Statement (EIS) to study proposed transportation solutions to State Route (S.R.) 210 from its intersection with S.R. 190/Fort Union Boulevard through the town of Alta in Little Cottonwood Canyon in Salt Lake County, Utah. Transportation improvements are needed to improve the safety, reliability, and mobility on S.R. 210 for residents, visitors, and commuters who use this highway.

The EIS will be prepared consistent with the National Environmental Policy Act (NEPA) and will follow the guidelines in UDOT's environmental process manual. The environmental review, consultation, and other actions required by applicable federal environmental laws for this action are being, or have been, carried out by UDOT pursuant to 23 United States Code 327 and a Memorandum of Understanding dated January 17, 2017, and executed by the Federal Highway Administration and UDOT.

The S.R. 210 Project is intended to address existing safety, reliability, and mobility associated with both commuter traffic and winter recreational traffic in Little Cottonwood Canyon. The project study area is shown in Figure 1 on page 3.

Alternatives Evaluated. As part of the EIS process, UDOT will be evaluating both bus and gondola alternatives. These alternatives are described below.

1. **Enhanced Bus Service with No Widening of S.R. 210 in Little Cottonwood Canyon**, which includes the following elements:
    - This alternative would widen Wasatch Boulevard for 2.2 miles from two traffic lanes to four traffic lanes. It includes bus priority at key intersections.
    - This alternative would implement winter enhanced bus service that would operate for about 140 days per year. The service would consist of two mobility hubs providing service directly (no intermediate stops) to two ski resorts. One hub would have a 1,500-car parking structure, and the other hub would have a 1,000-car parking structure. During peak periods (6 hours per day, for 3 hours during the morning and 3 hours during the afternoon), about 12 buses per hour would originate from each mobility hub (24 per hour total) heading to two ski resorts in Little Cottonwood Canyon. In the off-peak periods (about 6 hours per day), about 6 buses per hour would originate from each mobility hub (12 per hour) heading to the two ski resorts. On average, a total of 108 bus trips from each mobility hub per day would be made for a total of 216 bus trips per day from both mobility hubs.
    - No summer bus service would be provided with this alternative.
    - This alternative would reduce personal vehicle use to the ski resorts by 30%.
    - With this alternative tolling would be considered to further reduce personal vehicle use.
2. **Enhanced Bus Service with Peak-period Shoulder Lanes on S.R. 210 in Little Cottonwood Canyon**, which includes the following elements:
    - This alternative would include the same features as alternative 1 above along with shoulder-running bus lanes on S.R. 210 in Little Cottonwood Canyon during the peak periods. This alternative would require adding 22 feet of pavement width to the existing roadway.

3. **Gondola**, which includes the following elements:
   - This alternative would widen Wasatch Boulevard for 2.2 miles from two traffic lanes to four traffic lanes. It includes bus priority at key intersections.
   - This alternative would implement winter enhanced bus service that would operate for about 140 days per year. The service would consist of one mobility hub with about 2,500 parking spaces providing service directly (no intermediate stops) to the start of the gondola system at the entrance to Little Cottonwood Canyon. About 18 bus trips in the peak-period hours would be made from the mobility hub to the gondola base station, and about 9 bus trips per hour would be made in the off-peak hours. A total of about 162 bus trips would be made per day.
   - Electricity would power the gondola system, and diesel generators would be included for emergency backup power.
   - This alternative would reduce personal vehicle use to the ski resorts by 30%.
   - Tolling would be considered to further reduce personal vehicle use.

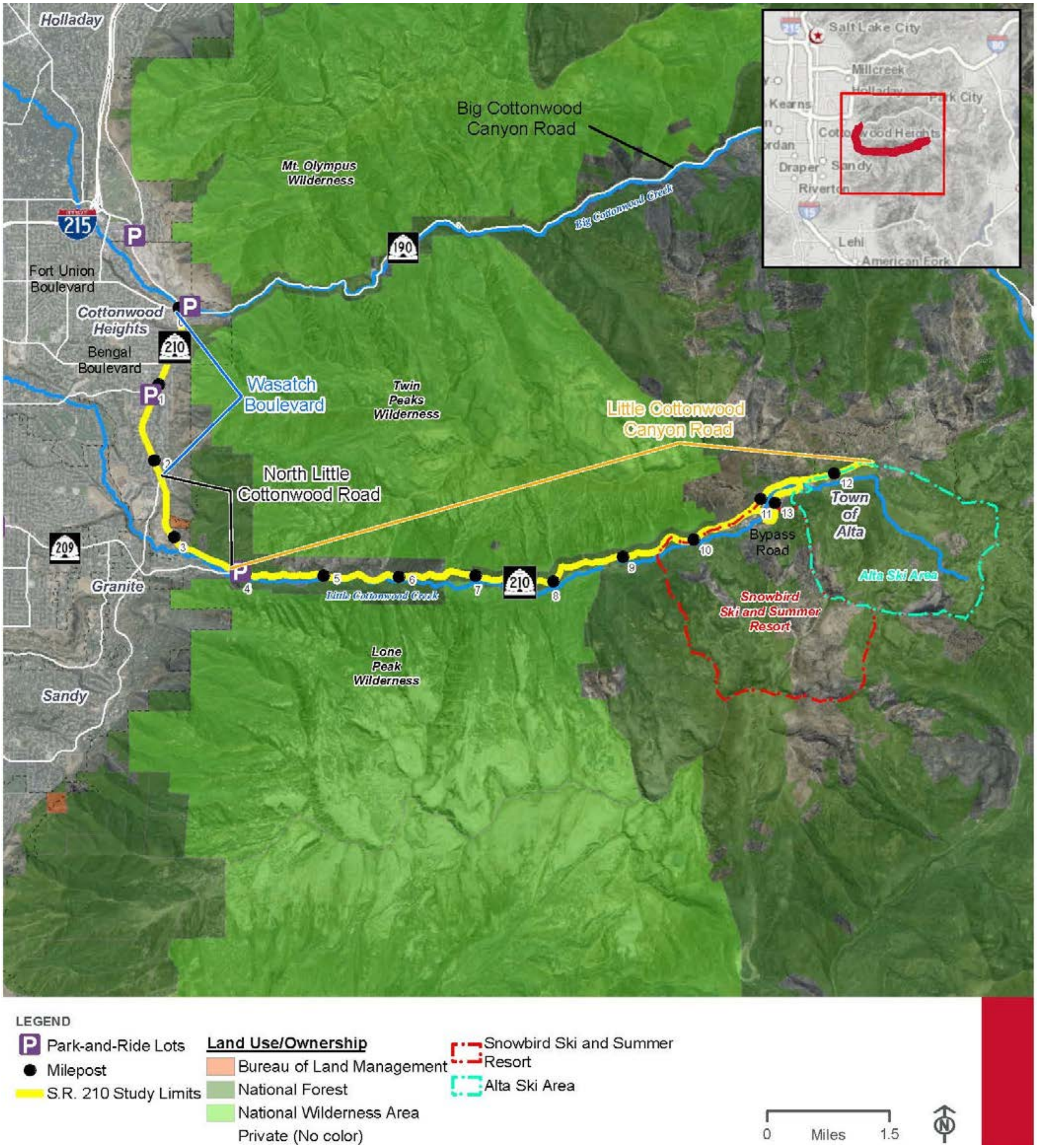
Bus Fuel Types Evaluated. UDOT evaluated the bus fuel type as part of the bus service analysis. The existing ski buses to the ski resorts are diesel-powered. For this Project of Air Quality Concern (POAQC) evaluation, the project team considered diesel buses, electric buses, and hybrid buses.

Although electric bus technology is rapidly advancing, electric bus batteries currently have both limited range and performance issues on steep grades. Further, when primary electric heaters are used in cold weather, the heaters drain the batteries, limiting the range the bus can travel before needing to charge. (Currently, most transit authorities heat any electric buses in their fleet using a diesel fuel heating system.)

Because electric bus technology is still evolving, electric buses were eliminated from consideration when this report was written. This POAQC evaluation assumes the use of diesel buses with a total capacity of 42 riders, the same as current ski buses. If electric bus technology improves in the future, electric buses could be considered.

Hybrid buses could be considered as a bus option if they can be designed to meet the requirements of the steep mountain grades in the canyon and maneuverability at the resorts, and can be fitted with automatically deploying snow chains.

Figure 1. Project Area Map



2.0 Purpose of the Project

The primary purpose of the project is to substantially improve safety, reliability, and mobility on S.R. 210 from Fort Union Boulevard through the town of Alta for all users on S.R. 210.

The transportation needs used to develop the project purpose in the study area are related primarily to traffic during peak periods, avalanche risk and avalanche control in Little Cottonwood Canyon, multiple on-road users in constrained areas, and anticipated future increases in visitation to Little Cottonwood Canyon as a result of population growth in Utah. The following deficiencies occur in the study area:

- Decreased mobility in winter during the morning (AM) and afternoon (PM) peak travel periods related to visits to ski areas, with the greatest traffic volumes on weekends and holidays and during and after snowstorms.
- Decreased mobility on Wasatch Boulevard resulting from weekday commuter traffic.
- Safety concerns associated with avalanche hazard and traffic delays caused by the current avalanche-control program in Little Cottonwood Canyon. Periodic road closures for avalanche control can cause 2-to-4-hour travel delays or longer, which can cause traffic to back up in the neighborhoods at the entrance of the canyon.
- Limited parking at trailheads and ski areas that leads to roadside parking.

3.0 Attainment Status of the Project Area

An *attainment area* is an area that meets (or "attains") the National Ambient Air Quality Standards (NAAQS) for a given criteria air pollutant. A *nonattainment area* is an area that does not meet the NAAQS for a given criteria air pollutant. A *maintenance area* is an area previously designated as a nonattainment area that has been redesignated to attainment status and is required to have a maintenance plan.

The improvements associated with the S.R. 210 Project would be made in Salt Lake County, which is a nonattainment area for particulate matter 2.5 microns in diameter or smaller ($PM_{2.5}$), ozone (O_3), and sulfur dioxide (SO_2). Salt Lake County is a maintenance area for particulate matter 10 microns in diameter or smaller (PM_{10}), having recently transitioned from a nonattainment area effective March 27, 2020. Table 1 shows the NAAQS (which are also the Utah standards) for the six criteria air pollutants as well as Salt Lake County's attainment status for each pollutant.

Sulfur dioxide (SO_2) and lead (Pb) are not currently considered transportation-related criteria pollutants and are not discussed further in this evaluation.

The S.R. 210 Project is listed in a conforming Long-Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP), so a project-level conformity determination for O_3 is not required. Conformity for O_3 is met due to the requirement that the LRTP and TIP approvals must be based on a finding that O_3 precursor emissions of volatile organic compounds (VOC) and nitrogen oxides (NO_x) from projects in the LRTP and TIP are consistent with the State Implementation Plan to bring the area into attainment with the O_3 NAAQS.

Table 1. National and Utah Ambient Air Quality Standards for Criteria Pollutants and Attainment Status for Salt Lake County

Pollutant	Primary/Secondary Standard	Averaging Time	Level	Form	Attainment Status for Salt Lake County
Carbon monoxide (CO)	Primary	8 hours	9 ppm	Not be exceeded more than once per year	Attainment area
		1 hour	35 ppm	Not be exceeded more than once per year	
Ozone (O_3)	Primary and secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	Marginal nonattainment area
Particulate matter ($PM_{2.5}$)	Primary	1 year	12.0 µg/m^3	Annual mean, averaged over 3 years	Serious nonattainment area
	Secondary	1 year	15.0 µg/m^3	Annual mean, averaged over 3 years	
	Primary and secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years	
Particulate matter (PM_{10})	Primary and secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years	Maintenance area
Nitrogen dioxide (NO_2)	Primary and secondary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.	Attainment area
	Primary and secondary	1 year	53 ppb	Annual mean	Attainment area
Sulfur dioxide (SO_2)	Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.	Attainment area
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year.	Nonattainment area
Lead (Pb)	Primary and secondary	Rolling 3-month average	0.15 µg/m^3	Not to be exceeded	Attainment area

Sources: 49 CFR Part 50 (NAAQS) and 40 CFR Part 81 (attainment status)

µg/m^3 = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion; $PM_{2.5}$ = particulate matter 2.5 microns in diameter or less; PM_{10} = particulate matter 10 microns in diameter or less

4.0 Definitions and Examples of Projects of Air Quality Concern

Title 40, *Protection of Environment*, is the section of the Code of Federal Regulations (CFR) that pertains to the environmental regulations implemented by the U.S. Environmental Protection Agency (EPA). Subchapter C of Title 40 covers air quality programs such as the Clean Air Act and NAAQS. The S.R. 210 Project is not an exempt project for transportation conformity purposes under 40 CFR Section 93.126. Some elements that do not qualify for an exemption include the added travel lanes to Wasatch Boulevard for each alternative and the new bus terminals for each alternative. Although O_3 conformity is satisfied for the project as explained in Section **Error! Reference source not found.**, project conformity must also be demonstrated for $PM_{2.5}$ (due to the $PM_{2.5}$ NAAQS nonattainment status of the study area) and for PM_{10} (due to the PM_{10} NAAQS nonattainment status of the study area). Therefore, the S.R. 210 Project requires further review to determine whether it qualifies as a POAQC requiring $PM_{2.5}$ and PM_{10} quantitative hot-spot analysis.

If a project is of air quality concern, 40 CFR Section 93.123 requires a quantitative hot-spot analysis for those transportation-related criteria pollutants for which the area has been designated as a nonattainment or maintenance area (for this project, that would mean hot-spot analyses for $PM_{2.5}$, and PM_{10}).

$PM_{2.5}$ and PM_{10} Project-Level Analysis Requirements. Projects defined by 40 CFR Section 93.123(b)(1) as projects requiring quantitative hot-spot analyses for $PM_{2.5}$, and PM_{10}, referred to as POAQC include:

(i) New highway projects that have a significant number of diesel vehicles, and expanded highway projects that have a significant increase in the number of diesel vehicles

(ii) Projects affecting intersections that are at a level of service (LOS) of LOS D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project

(iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location

(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location

(v) Projects in or affecting locations, areas, or categories of sites that are identified in the PM_{10} or $PM_{2.5}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation

At a minimum, item (iii) applies to the S.R. 210 Project for each alternative listed in Section 1.0, and therefore the S.R. 210 Project is a POAQC and requires quantitative $PM_{2.5}$ and PM_{10} hot-spot analysis.

5.0 Project of Air Quality Concern Evaluation

This section reviews the characteristics of the S.R. 210 Project according to Appendix B, *Examples of Projects of Local Air Quality Concern*, of EPA's transportation conformity guidance (EPA 2015a) and in accordance with the five criteria listed in the Section 4.0, any of which can qualify a project as a POAQC requiring quantitative hot-spot analyses for $PM_{2.5}$, and PM_{10}.

5.1 New Highway Capacity

Definition. Is this a new highway project that has a significant number of diesel vehicles?

Response. No. The S.R. 210 Project would improve traffic mobility on an existing road and would add capacity (lanes) on a segment of the route.

5.2 Expanded Highway Capacity

Definition. Is this an expanded highway project that has a significant increase in the number of diesel vehicles?

Response. No. The S.R. 210 Project would add travel lanes on a segment of Wasatch Boulevard to reduce congestion levels. The proposed project is intended to improve safety and accommodate expected traffic growth in the future. However, as explained below, the project-related increase in diesel truck traffic would probably not be considered significant.

With project implementation, Wasatch Boulevard would average about 26,500 vehicles per day in 2050 in the busiest segment, representing about a 6% increase over the No-Action Alternative (25,000 vehicles per day). Wasatch Boulevard currently has about 8% diesel trucks (single- and double-tractor trailers) and in 2050 is expected to have about 9% diesel trucks. UDOT does not expect the percentage of diesel trucks to change substantially, S.R. 210 is not a major truck corridor since it services primarily residential areas and two ski resorts and dead-ends at the top of Little Cottonwood Canyon. In addition, there are no trucking businesses on or near S.R. 210. Finally, the expected increase in diesel trucks from 8% to 10% by 2050 would not be due to the proposed project (Fehr & Peers, 2019). See Appendix A, SR-210 EIS Traffic Study for more information on the traffic analysis.

With the increase in bus service from each of the project alternatives, total diesel traffic (bus and truck) on Wasatch Boulevard would increase from 9% to 10%. For a new highway, 8% or more diesel trucks (presumably including diesel buses) on a facility with greater than 125,000 vehicles per day would be considered a "significant amount of diesel truck traffic," according to Appendix B of EPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in* $PM_{2.5}$ *and* PM_{10} *Nonattainment and Maintenance Areas* (EPA 2015). This guidance does not specify what would be considered a "significant increase" in diesel trucks for an expanded highway, but a 1% increase in total traffic due to the increase in diesel bus traffic from the proposed S.R. 210 Project is probably not be considered a significant increase.

5.3 Projects with Congested Intersections

Definition. Does this project affect intersections that are at LOS D, E, or F with a significant number of diesel vehicles, or will this project change an intersection to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project?

Response. No. The S.R. 210 Project would affect four intersections: Fort Union Boulevard and Wasatch Boulevard, Bengal Boulevard and Wasatch Boulevard, 3500 East and Wasatch Boulevard, and North Little Cottonwood Road and Wasatch Boulevard. Currently, these intersections operate at LOS B, C, E, and B, respectively, and in 2050 with the project they are all projected to operate at LOS B or C with the project (Fehr & Peers, 2019). See Appendix A, SR-210 EIS Traffic Study for more information on the traffic analysis.

5.4 New Bus and Rail Terminals

Definition. Does this project include new bus and rail terminals and transfer points that will have a significant number of diesel vehicles congregating at a single location?

Response. Yes. With the enhanced bus service alternatives (alternatives 1 and 2 in Section 1.0), two mobility hubs would operate a significant number of diesel buses, and the ski resort stops would also include a significant number of diesel buses. With the gondola alternative (alternative 3 in Section 1.0), a single mobility hub would operate a significant number of diesel buses, and the gondola base station would operate a significant number of buses.

5.5 Expanded Bus and Rail Terminals

Definition. Does this project include expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location?

Response. Yes. With the enhanced bus service alternatives (alternatives 1 and 2 in Section 1.0), the existing transfer points at the ski resorts would be expanded.

5.6 Projects in or Affecting PM_{10} or $PM_{2.5}$ Sites of Violation or Possible Violation

Definition. Is this project in or affecting locations, areas, or categories of sites that are identified in the PM_{10} or $PM_{2.5}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation?

Response. No. Sections IX.A and IX.A.21 of Utah's State Implementation Plan (SIP) address PM_{10} and $PM_{2.5}$ in Salt Lake County. This project type is not identified in either Section IX.A or Section IX.A.21 of the SIP as a POAQC or as a type of transportation project location having a potential to increase local emissions or worsen air quality and therefore requiring a hot-spot analysis (UDEQ 2015, 2018).

As a control strategy, Section IX.A.11 of the SIP (the PM_{10} maintenance plan for Salt Lake County) recommends synchronizing traffic signals and maintaining continuous traffic flows on interstate highways. The State of Utah submitted a maintenance plan to EPA demonstrating attainment of the PM_{10} NAAQS through 2030 and obtained EPA's approval of that plan, resulting in Salt Lake County being redesignated as an attainment (maintenance) area for PM_{10} effective March 27, 2020.

5.7 Project of Air Quality Concern Determination

Standard. State whether the project is a POAQC and summarize the support determination. Document the relevant agencies that require interagency consultation on any input for the determination from federal, state, and local transportation and air agencies as necessary for this project per 40 CFR 93.105. This information will be included in any subsequent air quality analysis and project-level conformity determination reports.

Response. The S.R. 210 Project qualifies as a POAQC because it would add at least one new bus terminal with diesel buses with all alternatives. Under various alternatives, the project would also either expand existing bus terminals at ski resort destinations or add a second new bus terminal if the gondola alternative is selected.

In summary, the S.R. 210 Project is a POAQC, so project-level quantitative (hot-spot) analyses for $PM_{2.5}$, and PM_{10} are required for conformity purposes under 40 CFR Section 93.123(b).

5.8 Approach to Air Quality Analysis

The design for the gondola alternative (alternative 3 in Section 1.0) includes the most buses departing from a single mobility hub (162 per day) and the most buses (162 per day) dropping off passengers at a single location (the gondola base station). Therefore, quantitative hot-spot analysis of PM_{10} and $PM_{2.5}$ is proposed for the gondola alternative mobility hub terminal and for the gondola station and terminal. For both of these terminals, the approach and departure roads to Wasatch Boulevard would be included in the quantitative analysis, which would use the EPA's latest version of the AERMOD model along with EPA's MOVES emissions model.

If the model results for the gondola alternative are found to be acceptable with respect to air quality standards, then further analysis of other alternatives would not be needed, since UDOT expects the gondola alternative to represent the worst case. If the gondola alternative's air quality impacts are not acceptable, mitigation measures would need to be considered for this alternative, and other alternatives might need to be analyzed as well to demonstrate acceptable levels of air quality impact.

6.0 Interagency Consultation Results

The following agencies are included in interagency consultation and provide input to this POAQC memorandum: EPA, UDOT, the Wasatch Front Regional Council (WFRC), the Utah Department of Environmental Quality (UDEQ), and the Utah Transit Authority (UTA).

7.0 References

Fehr & Peers

2019 SR-210 EIS Traffic Study, Fort Union to North Little Cottonwood Road. UDOT Project No. S-R299 (281), May.

Appendix A. SR-210 EIS Traffic Study

SR-210 EIS Traffic Study

Fort Union to North Little Cottonwood Road

UDOT Project No. S-R299(281)

May 2019 (revised July 2019)
Prepared for HDR
UT19-2093

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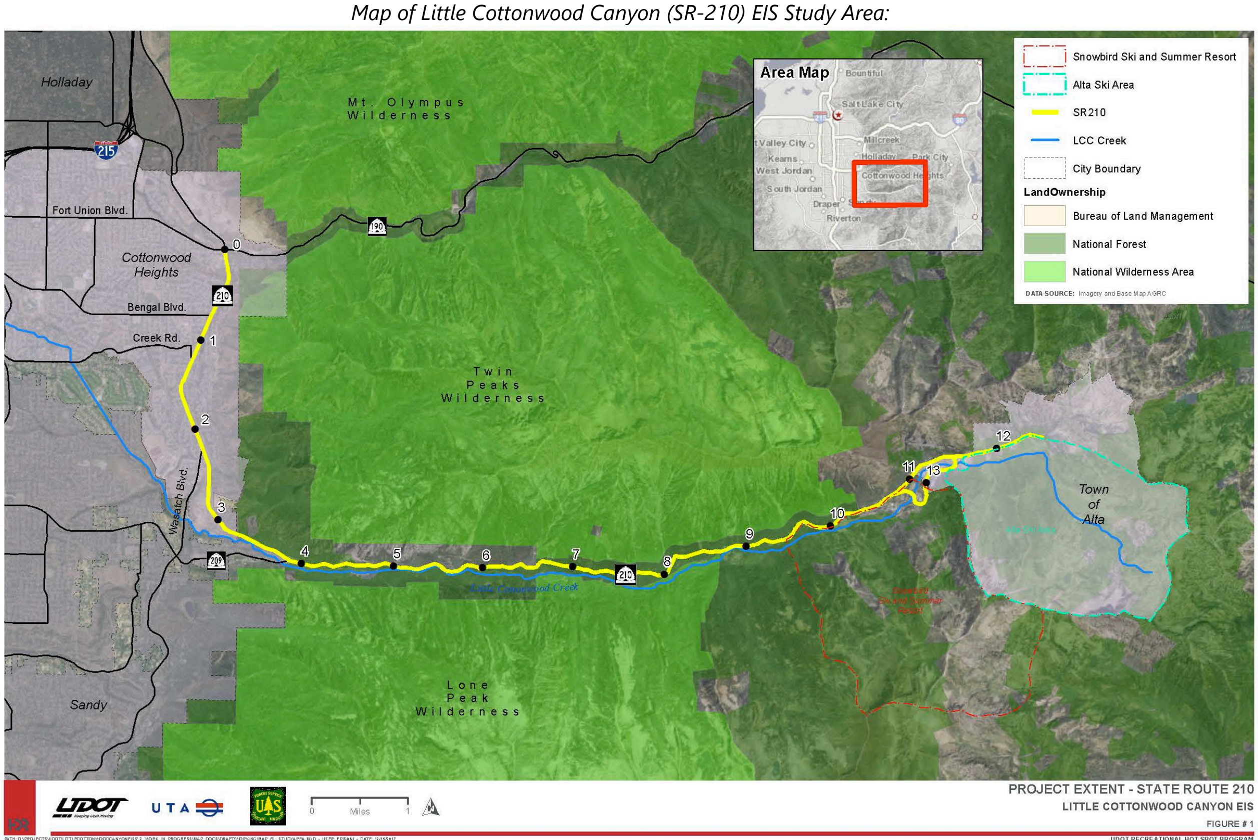
INTRODUCTION

This document describes the traffic analysis prepared for the Little Cottonwood Canyon (SR-210) Environmental Impact Statement (EIS) led by the Utah Department of Transportation (UDOT). The focus of this analysis is on the portion of SR-210 between Fort Union Boulevard and Wasatch Boulevard/North Little Cottonwood Road. In this segment SR-210 is most commonly referenced as Wasatch Boulevard. A detailed description of the study area is available in the Purpose and Need chapter of the Environmental Impact Statement.

Map of Little Cottonwood Canyon (SR-210) EIS Study Area:



EXISTING CONDITIONS

DATA COLLECTION

The project team analyzed traffic conditions on the SR-210 corridor for weekday AM and PM peak periods since these are the periods of the day with the highest traffic volumes and therefore provides a worst-case scenario for evaluation. Traffic data was collected on March 15, 2018 from 7:00AM-9:00AM and 4:00PM-6:00PM. The highest hourly volumes were observed during 8:00AM-9:00AM and 4:45PM-5:45PM. The data collection date represents a typical weekday wintertime condition and includes both commuter travel and trips associated with the ski areas.

1. The following intersections were included in the traffic analysis:
2. SR-210/Fort Union Blvd
3. SR-210/Bengal Blvd
4. SR-210/3500 East
5. SR-210/Kings Hill Drive
6. SR-210/Wasatch Blvd (North Little Cottonwood Road)

ANALYSIS METHODOLOGY

LEVEL OF SERVICE CRITERIA

The Highway Capacity Manual 2016 (HCM 2016) methodology was used in this study to remain consistent with “state of the practice” professional standards. As defined in the Highway Capacity Manual, Level of Service (LOS) is a concept that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best conditions and F the worst. Table 1 provides a brief description of each LOS letter designation. For signalized intersections, the LOS is provided for the overall intersection (weighted average of all approach delays). For intersections without traffic signals, the level of service is reported based on the approach with the worst delay.

In addition to intersection LOS, travel time is used to characterize segment-level LOS. This measure uses a ratio of the congested speed to the free flow speed.

UDOT’s primary object is to manage congestion on Wasatch Blvd (SR-210) to maintain LOS D traffic operations for the planning horizon (2050). This report flags scenarios and locations in which the LOS D threshold is exceeded.

MICRO-SIMULATION PLATFORM

Traffic conditions were analyzed using VISSIM traffic analysis software. VISSIM includes functionality to account for the effects of queuing at intersections and lane merge locations, which is common in during peak conditions in the study area. When calibrating the VISSIM model, Fehr & Peers used existing traffic data, signal timings, and geometric conditions data to ensure the model reflected field observations. Due to the inherent randomness of stochastic micro-simulation tools, ten VISSIM simulation runs were completed for each scenario and the results were averaged.

TABLE 1 LEVEL OF SERVICE DESCRIPTIONS

LOS	Description	Signalized Intersections	Unsignalized Intersections	Corridor Segments
		Avg. Delay (sec/veh)[1]	Avg. Delay (sec/veh)[2]	Ratio of Congested Speed to Free Flow Speed
A	*Free Flow / Insignificant Delay* Extremely favorable progression. Individual users are virtually unaffected by others in the traffic stream.	< 10.0	< 10.0	>80%
B	*Stable Operations / Minimum Delays* Good progression. The presence of other users in the traffic stream becomes noticeable.	> 10.0 to 20.0	> 10.0 to 15.0	67%-80%
C	*Stable Operations / Acceptable Delays* Fair progression. The operation of individual users is affected by interactions with others in the traffic stream	> 20.0 to 35.0	> 15.0 to 25.0	50%-67%
D	*Approaching Unstable Flows / Tolerable Delays* Marginal progression. Operating conditions are noticeably more constrained.	> 35.0 to 55.0	> 25.0 to 35.0	40%-50%
E	*Unstable Operations / Significant Delays Can Occur* Poor progression. Operating conditions are at or near capacity.	> 55.0 to 80.0	> 35.0 to 50.0	30%-40%
F	*Forced, Unpredictable Flows / Excessive Delays* Unacceptable progression with forced or breakdown of operating conditions.	> 80.0	> 50.0	<30%

1. Overall intersection LOS and average delay (seconds/vehicle) for all approaches.
2. Worst approach LOS and delay (seconds/vehicle) only.

Source: Fehr & Peers descriptions, based on *Highway Capacity Manual (6TH Ed.)*

SUMMARY OF EXISTING CONDITIONS

Traffic conditions operate acceptably for the existing AM peak period. Intersection LOS is summarized in Table 2, as well as the end-to-end corridor travel time. Northbound travel time during the AM is just over four minutes which equates to roughly 32 MPH average speed (posted speed is 50 MPH). There is some minor slowing in the northbound direction near 3500 E (Figure 1). Southbound travel time during the AM is slightly faster (30 sec) in the off-peak direction.

Under existing PM peak hour conditions, one intersection is performing at an unacceptable LOS. This is attributed to the lane reduction south of Bengal Blvd where SR-210 transitions from two southbound travel lanes to one. Table 2 reports travel time on the corridor increases by 26% in the PM southbound direction relative to AM southbound operation.

TABLE 2 EXISTING (2018) PEAK HOUR LOS

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]
1	SR-210/ Ft. Union Blvd.	Signal	AM	11 / B
			PM	16 / B
2	SR-210/ Bengal Blvd.	Signal	AM	15 / B
			PM	28 / C
3	SR-210/ 3500 E	Signal	AM	17 / B
			PM	**59 / E**
5	SR-210/ Kings Hill Dr.	Side Street Stop	AM	14 / B
			PM	24 /C
6	SR-210/ Wasatch Blvd.	Signal	AM	18 / B
			PM	14 / B
Travel Time Estimates (minutes : seconds)				
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 4m:08s | PM 4m:10s
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				AM 3m:38s | PM 4m:37s

Notes: [1]The intersection control delay is reported in seconds per vehicle.
[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.
Source: Fehr & Peers, 2019

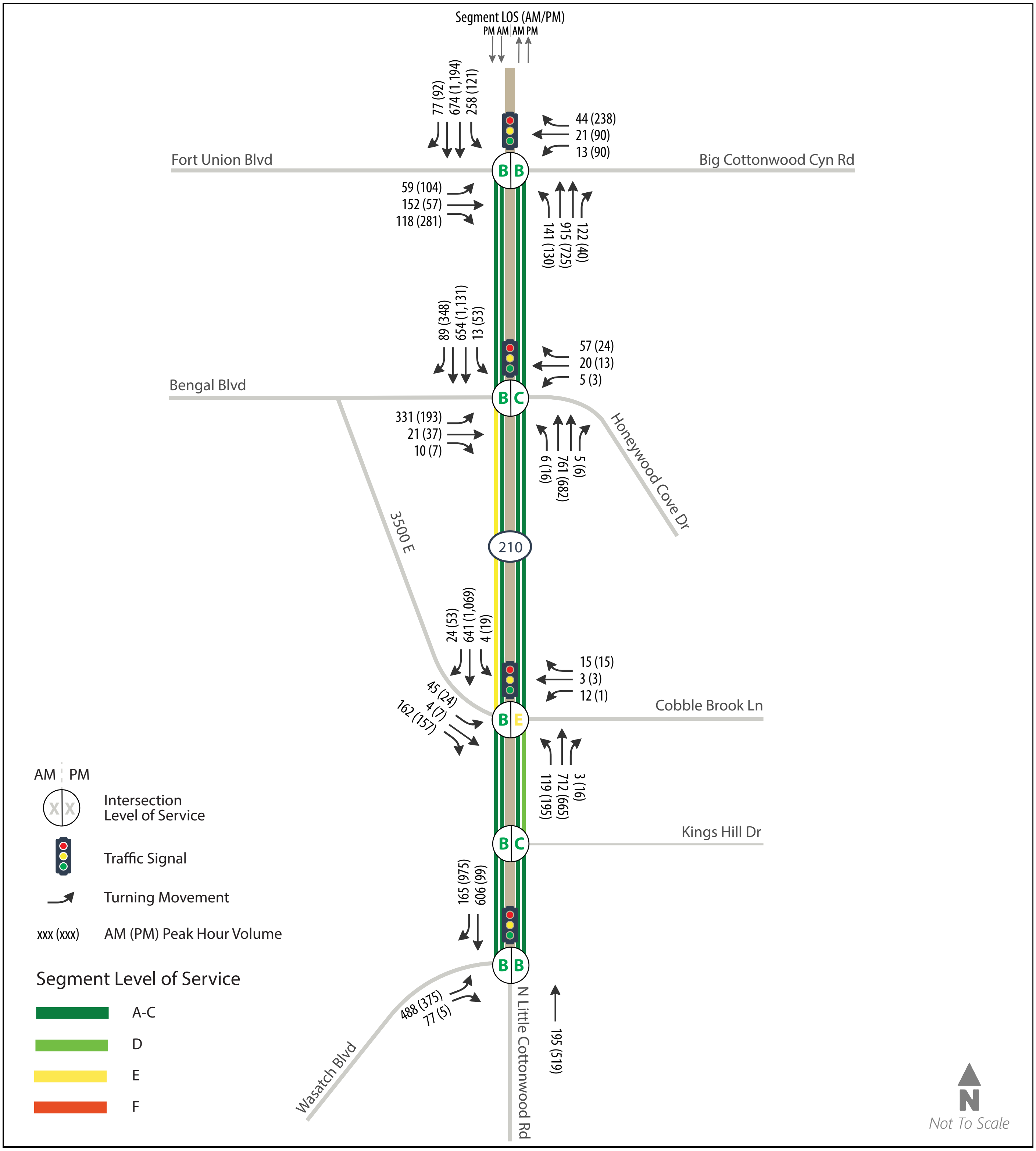


Figure 1

Corridor Operations - Existing (2018)

FUTURE CONDITIONS

ESTIMATES OF FUTURE TRAFFIC VOLUMES

Travel demand was forecasted to understand travel conditions for the planning horizon (2050). The project team used historic traffic counts published in Traffic on Utah Highways (UDOT) and the Version 6.3beta travel demand model maintained by the Wasatch Front Regional Council (WFRC). Version 6.3beta incorporates the best available projections for land use, demographic data, and planned roadway and transit improvements from WFRC's 2019–2050 Wasatch Front Regional Transportation Plan.

The travel model inputs were checked for reasonable land use growth assumptions, such as anticipated development at the nearby gravel pit on Wasatch Blvd near 6200 South. To improve traffic assignment onto the roadway network, traffic analysis zone (TAZ) connectors were adjusted to better reflect actual neighborhood circulation. Basic checks to the roadway network were done as well to verify number of lanes and functional type, which is important for capacity and speed assumptions.

Assuming no capacity improvements on SR-210 in the study area for No Action conditions, the travel model estimates annual growth on the corridor of 0.6-1.1% per year between 2015 and 2050. This estimated growth rate is consistent with historic average annual daily traffic (AADT) published in Traffic on Utah Highways (UDOT), which indicates an annual growth rate of 0.5%-1.1% per year between 2018 and 2050.

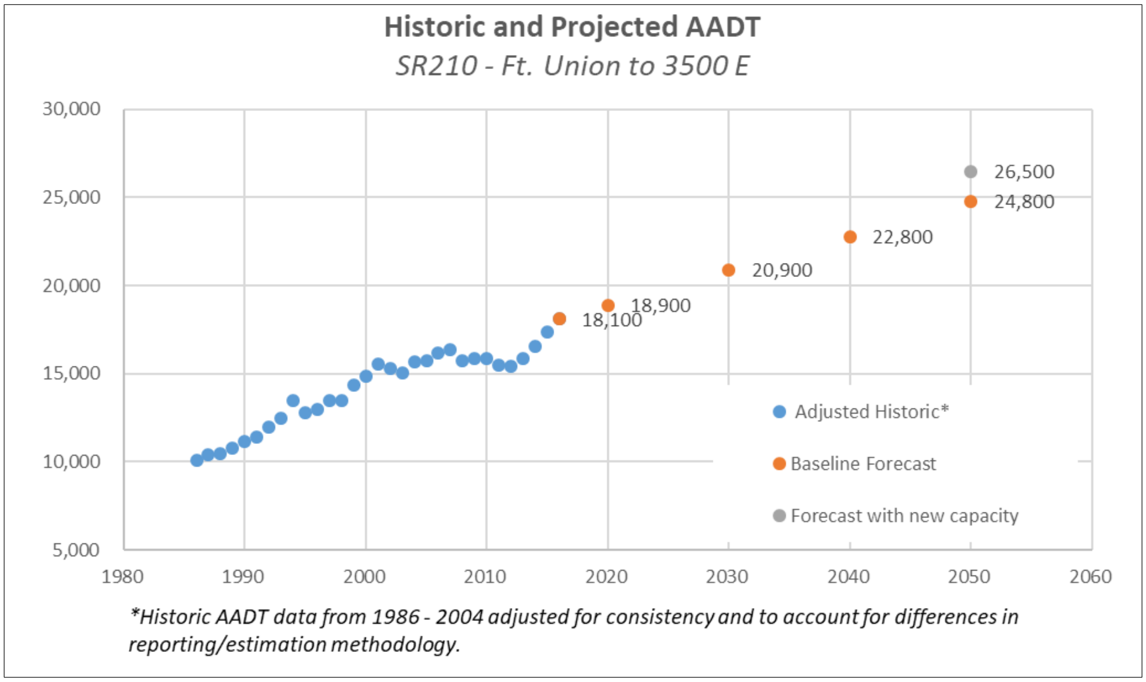
The project team assumed a 1.1% linear annual growth rate between Ft. Union Blvd and 3500 East, and a 0.5% growth rate on the southern end of the corridor near North Little Cottonwood Road. This equates to overall growth in traffic between 2018 to 2050 of 35% near Bengal Blvd and 16% near North Little Cottonwood Road. The magnitude of growth is reasonable considering the character of the land uses along corridor, which are generally built-out and have modest potential for more intense land use. As shown in Table 3, the annual average daily traffic (AADT) is expected to increase from:

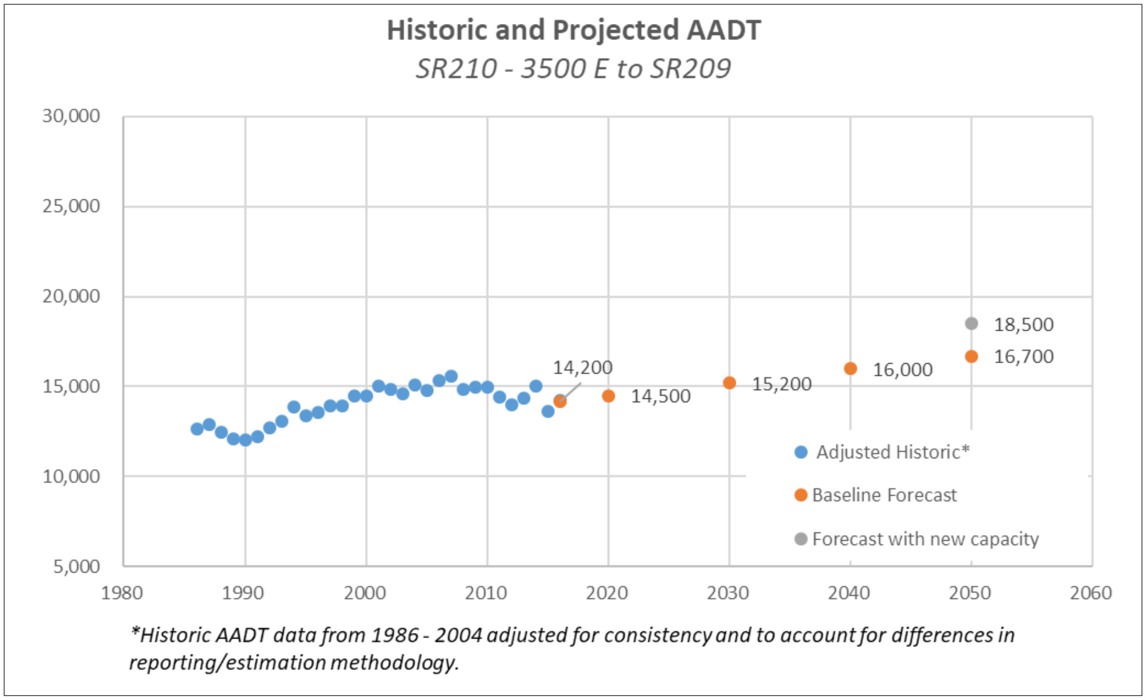
- 18,100 AADT (2018) to 24,800 AADT (2050) near Bengal Blvd.
- 14,200 AADT (2018) to 16,700 AADT (2050) near N. Little Cottonwood Rd.

When additional roadway capacity is assumed on SR-210 (one additional lane per direction), the 2050 travel demand on the corridor is 5-8% higher than No Action conditions. This increase in travel demand indicates that congestion in the No Action scenario is dampening demand for travel, particularly on the southern end of the corridor where there are only two travel lanes. Assuming additional roadway capacity on SR-210, estimated daily traffic in 2050 is 26,500 AADT near Bengal Blvd. and 18,500 AADT near N. Little Cottonwood Rd.

The growth rates were then applied to observed 2018 traffic counts. An iterative procedure was used to adjust future volumes to balance intersection approach and departure volumes. Intersection turning movement volumes are illustrated in Figure 2.

TABLE 3 HISTORIC AND PROJECTED ANNUAL AVERAGE DAILY TRAFFIC (AADT)





Source: UDOT Traffic on Utah Highways, summarized by Fehr & Peers, 2019

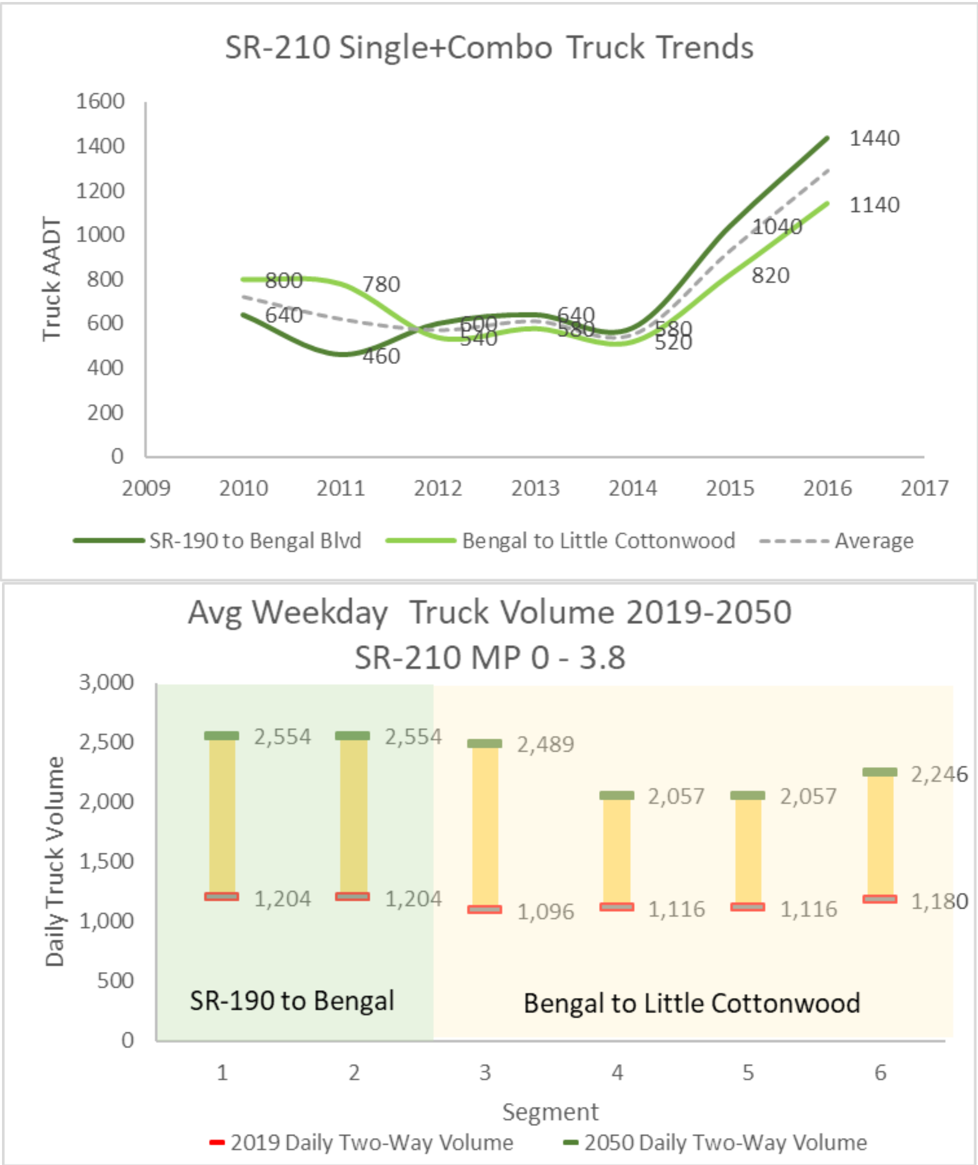
REGIONAL VEHICLE MILES TRAVELED (VMT)

Based on the results of travel demand modeling, an alternative that increases roadway capacity on SR-210 would increase the amount of VMT in the region by 0.03%.

COMMERCIAL TRUCK TRAFFIC

SR-210 is not a commercial freight corridor, and there are no land uses that generate significant freight activity. Using historic data from UDOT Truck Traffic on Utah Highways, and the WFRC regional travel model, existing truck traffic on SR-210 is estimated to be approximately 1,100 trucks per day, which constitutes 8% of total daily traffic. Based on projections from the WFRC travel model the amount of truck traffic is expected to grow over time, and by 2050 daily truck traffic is estimated to be approximately 2,500 trucks per day (9% of total traffic).

TABLE 4 HISTORIC AND PROJECTED TRUCK TRAFFIC



Source: UDOT Truck Traffic on Utah Highways, WFRC Travel Model, summarized by Fehr & Peers, 2019

FUTURE NO BUILD TRANSPORTATION OPERATIONS

As shown in Table 5, traffic operations during the AM peak are acceptable under No Build conditions. The estimated vehicle flow rate in the AM peak is about 75% of the PM peak, and the existing roadway configuration can handle volumes under 1,000 vehicles per hour per lane. There is some noticeable delay on the south end of the corridor at intersection of Wasatch Blvd. / SR-210 / N. Little Cottonwood Road, where the northbound approach from Wasatch Blvd. has about 80 seconds/vehicle delay. This intersection essentially limits northbound vehicles entering the study corridor, after which point delay is minimal traveling north on the corridor.

Without improvements on SR-210 between Bengal Blvd. and North Little Cottonwood Road, PM peak hour congestion is significant by 2050. The current roadway configuration is inadequate to handle future PM peak traffic demands, which exceed 1,000 vehicles per hour per lane. The southbound lane reduction between Bengal Blvd. and 3500 E. is a major bottleneck, and by 2050 will create queuing that extends to the north beyond Ft. Union Blvd, directly contributing the failing intersection operations at Ft. Union Blvd. and Bengal Blvd. Vehicle delays at intersections south of the lane merge are not as pronounced for the predominant southbound movement because the lane drop functions as a bottleneck and limits southbound traffic at a rate that a single lane can accommodate.

PM peak travel times increase to over 10 minutes for the southbound direction, which is a 182% increase over the analogous base year travel time.

Although unsignalized side streets and driveways were generally not analyzed, the unsignalized intersection of SR-210 at Kings Hill Drive was evaluated and illustrates a problem that many locations along the corridor will experience. With single directional travel lanes operating at saturated flow rates during the PM peak, it will be difficult for driveways and side streets to find gaps in the traffic stream during the PM peak, resulting in high delay for the side street approaches.

TABLE 5 FUTURE (2050) PEAK HOUR LOS

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]
1	SR-210/ Ft. Union Blvd.	Signal	AM	18 / B
			PM	**153 / F**
2	SR-210/ Bengal Blvd.	Signal	AM	25 / C
			PM	**100 / F**
3	SR-210/ 3500 E	Signal	AM	11 / B
			PM	**58 / E**
4	SR-210/ Kings Hill Dr.	Side Street Stop	AM	12 / B
			PM	**262 / F**
5	SR-210/ Wasatch Blvd.	Signal	AM	49 / D
			PM	25 / C
Travel Time Estimates (minutes : seconds)				
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 4m:22s | PM 4m:40s
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				AM 3m:53s | **PM 10m:15s**

Notes: [1]The intersection control delay is reported in seconds per vehicle.

[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.

Source: Fehr & Peers, 2019

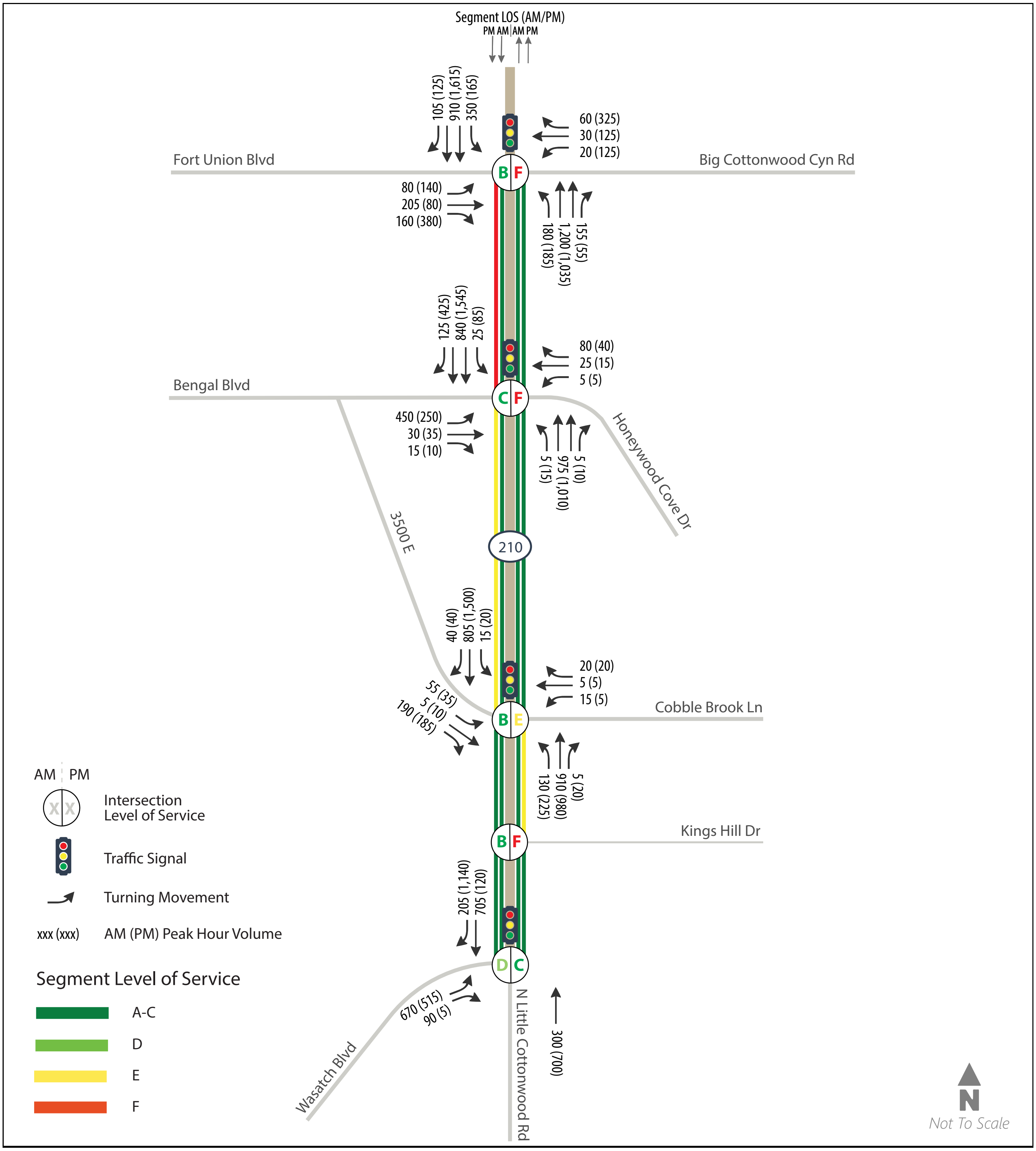


Figure 2

Corridor Operations - Future (2050) No Action

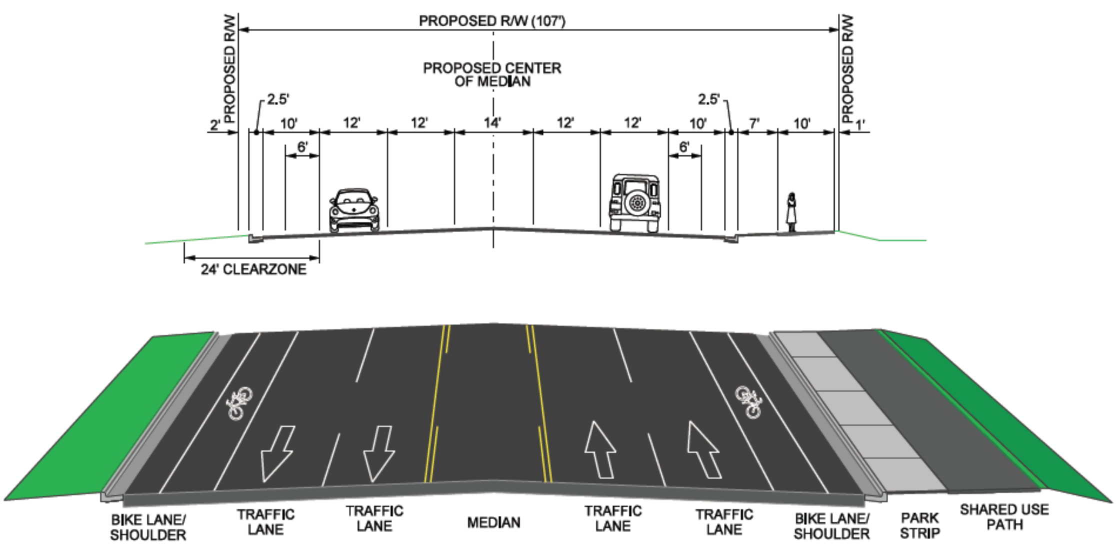
ALTERNATIVES ANALYSIS

This chapter describes the roadway alternatives evaluated for SR-210. Each section discusses the basic alternative and the variants that were developed through iterative analysis.

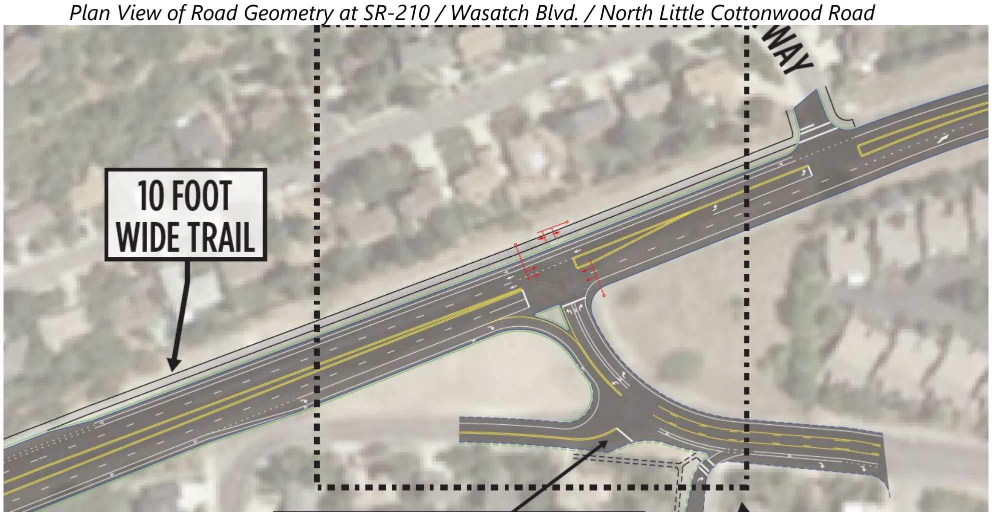
FIVE LANE ALTERNATIVE

This alternative adds one additional vehicle travel lane in each direction between Bengal Blvd. and Wasatch Blvd / SR-210 (N. Little Cottonwood Rd.). The concept also includes a two-way center turn lane, right turn deceleration lanes at major junctions, and a bike lane/shoulder. At the southern end of this study corridor, the existing High-T intersection would be modified to make the transition to the existing cross sections on SR-210 (N. Little Cottonwood Rd.) and Wasatch Blvd.

Cross Section of Five Lane Arterial with Shared Use Path, Striped Median, and Concrete Park Strip:



Plan View of Road Geometry at SR-210 / Wasatch Blvd. / North Little Cottonwood Road



The five lane alterative results in acceptable LOS at all study intersections and alleviates congestion relative to the No Action alternative. Travel times for both travel directions in the 2050 AM and PM peaks are comparable to existing travel times.

TABLE 6 FUTURE (2050) PEAK HOUR LOS – FIVE LANE ALTERNATIVE

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]
1	SR-210/ Ft. Union Blvd.	Signal	AM	22 / C
			PM	33 / C
2	SR-210/ Bengal Blvd.	Signal	AM	20 / B
			PM	16 / B
3	SR-210/ 3500 E	Signal	AM	8 / A
			PM	11 / B
4	SR-210/ Kings Hill Dr.	Side Street Stop	AM	12 / B
			PM	17 / C
5	SR-210/ Wasatch Blvd.	Signal	AM	24 / C
			PM	36 / D
Travel Time Estimates (minutes : seconds)				
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 3m:51s | PM 4m:00s
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				AM 3m:32s | PM 4m:12s

Notes: [1]The intersection control delay is reported in seconds per vehicle.
[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.
Source: Fehr & Peers, 2019

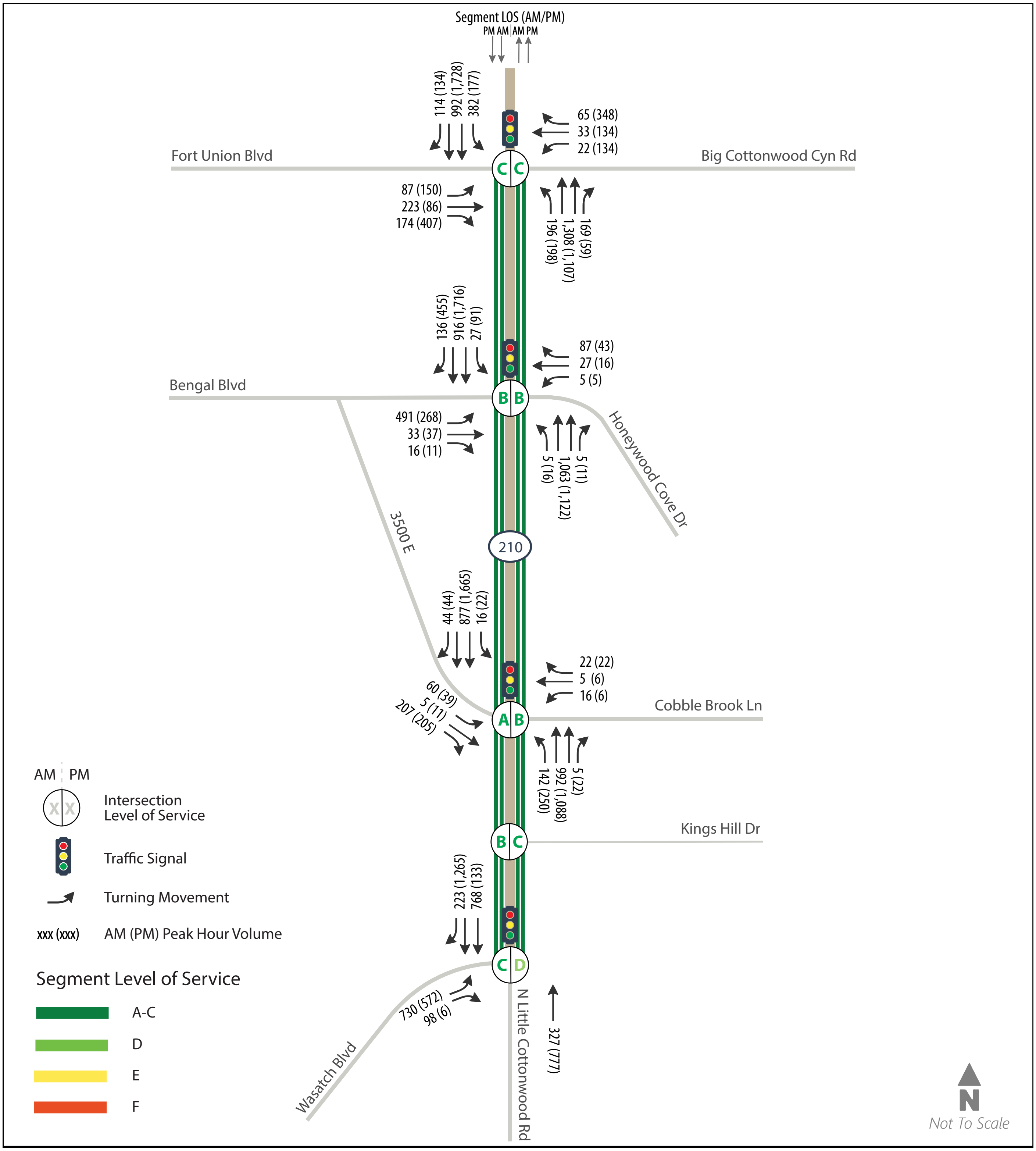


Figure 3

Corridor Operations - Future (2050) Five Lane Alternative

FIVE LANE ALTERNATIVE WITH KINGS HILL DRIVE SIGNAL

A traffic signal at the intersection of SR-210 / Kings Hill Drive is being considered; this alternative is evaluated as a variant to all Action Alternatives. UDOT performed a signal warrant study in January 2018, concluding that a new traffic signal is technically warranted, but with minor pavement marking modifications the warrants would not be met. The signal warrant study is included in the appendix.

The addition of a traffic signal at Kings Hill Drive does not significantly impact the corridor traffic operations. Technically the LOS changes from D to C at SR-210 / Wasatch Blvd, but this is negligible; it is only a minor difference in vehicle delay (1 sec) that tips it to the other side of the LOS threshold.

The biggest impact of a new traffic signal is at Kings Hill Drive, where the new signal increases delay for the side street approaches. Based on standard LOS reporting guidance, overall delay is reported for signalized intersections, and worst approach for unsignalized intersections. So, although LOS technically improves by a letter grade for each analysis period, the eastbound and westbound approach delay actually increases. This is because the volume of side street traffic is relatively low compared to the predominant north-south movements, so an optimum signal timing plan allocates proportionally less time to the side streets, resulting in delay that is higher that would likely occur without the signal.

TABLE 7 FUTURE (2050) PEAK HOUR LOS – FIVE LANE ALTERNATIVE W/ KINGS HILL DRIVE SIGNAL

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]
1	SR-210/ Ft. Union Blvd.	Signal	AM	21 / C
			PM	33 / C
2	SR-210/ Bengal Blvd.	Signal	AM	20 / B
			PM	19 / B
3	SR-210/ 3500 E	Signal	AM	8 / A
			PM	11 / B
4	SR-210/ Kings Hill Dr.	Signal	AM	7 / A
			PM	11 / B
5	SR-210/ Wasatch Blvd.	Signal	AM	26 / C
			PM	35 / C
Travel Time Estimates (minutes : seconds)				
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 3m:54s | PM 4m:22s
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				AM 3m:36s | PM 4m:10s

Notes: [1]The intersection control delay is reported in seconds per vehicle.

[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.

Source: Fehr & Peers, 2019

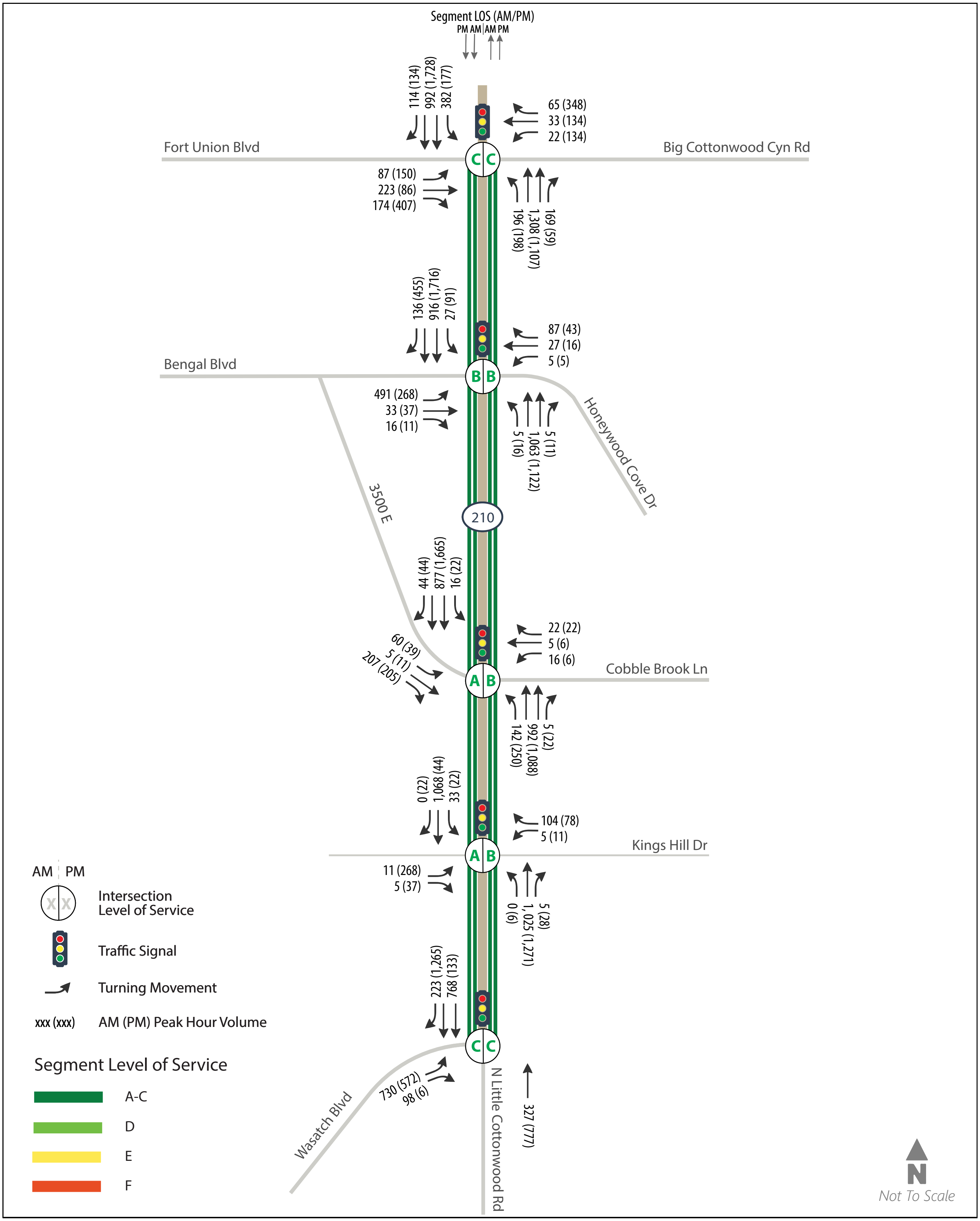


Figure 4

Corridor Operations - Future (2050) Five Lane Alternative w/ Kings Hill Drive Signal

IMBALANCED LANES ALTERNATIVE

Analysis of the traffic data and results of the five lane alternative suggest that while an additional southbound lane is needed to accommodate PM peak demand, a second northbound travel lane may not be necessary. By 2050 northbound travel demand near Bengal Blvd. is approximately 1,000 vehicles per hour, which a single through travel lane can accommodate (in the context of the study corridor).

Accordingly, an analysis was conducted to evaluate traffic operations for an alternative that adds one conventional southbound travel lane between Bengal Blvd. and Wasatch Blvd / SR-210 (N. Little Cottonwood Rd.). As summarized in Table 8 and Figure 5, the imbalanced lane alternative provides acceptable traffic operations in terms of intersection delay and travel time.

TABLE 8 FUTURE (2050) PEAK HOUR LOS – IMBALANCED LANES ALTERNATIVE

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]
1	SR-210/ Ft. Union Blvd.	Signal	AM	22 / C
			PM	36 / D
2	SR-210/ Bengal Blvd.	Signal	AM	29 / C
			PM	24 / C
3	SR-210/ 3500 E	Signal	AM	9 / A
			PM	17 / B
4	SR-210/ Kings Hill Dr.	Side Street Stop	AM	16 / C
			PM	26 / D
5	SR-210/ Wasatch Blvd.	Signal	AM	25 / C
			PM	41 / D
Travel Time Estimates (minutes : seconds)				
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 4m:05s | PM 4m:37s
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				AM 3m:32s | PM 4m:21s

Notes: [1]The intersection control delay is reported in seconds per vehicle.
[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.
Source: Fehr & Peers, 2019

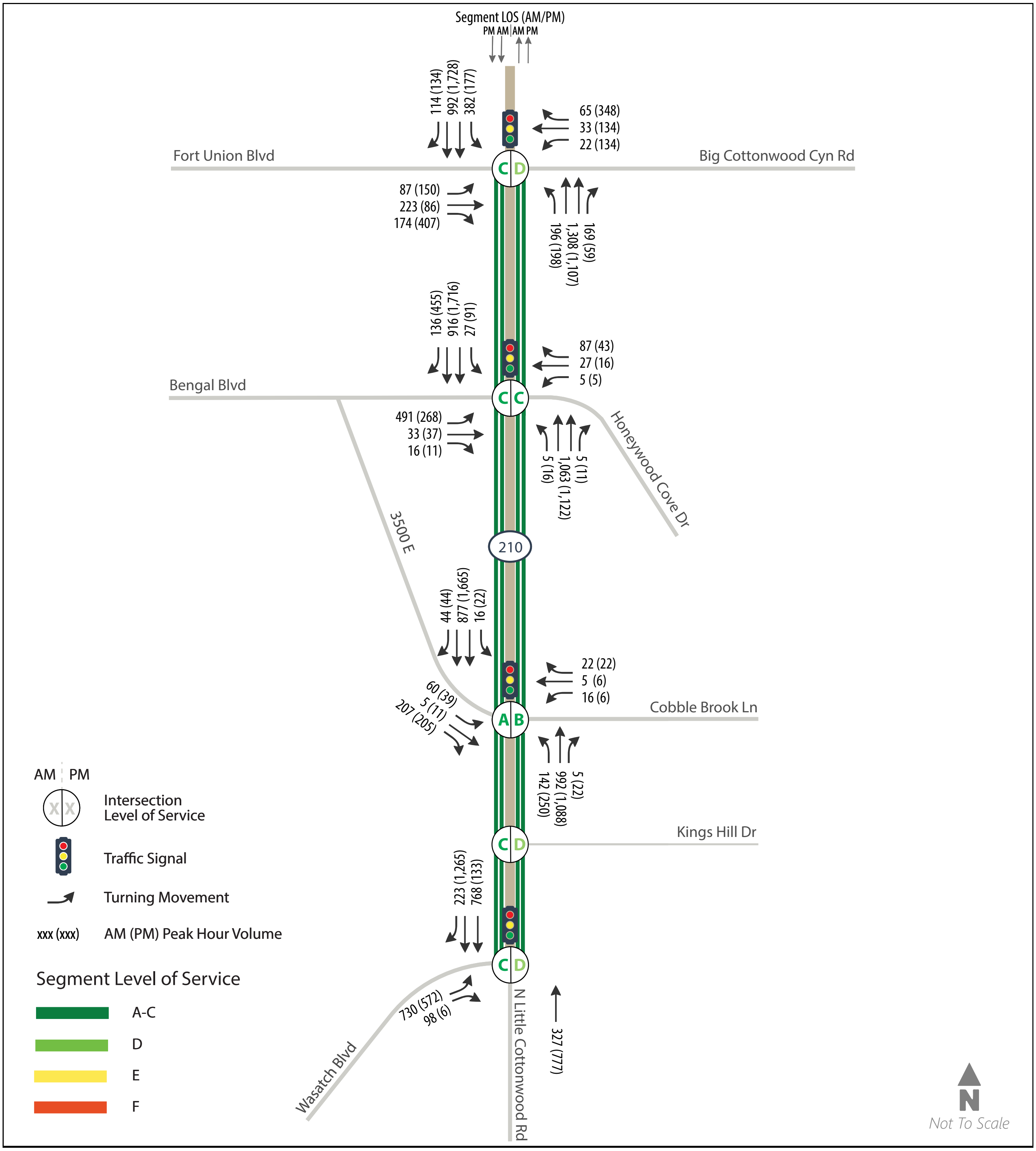


Figure 5

Corridor Operations - Future (2050) Imbalanced Lanes Alternative

IMBALANCED LANES ALTERNATIVE WITH KINGS HILL DRIVE SIGNAL

The addition of a traffic signal at Kings Hill Drive was evaluated for the imbalanced lanes alternative (two southbound through lanes, one northbound through lane), as shown in Table 9 and Figure 6. At the Kings Hill Drive intersection, overall delay increases slightly but is within acceptable LOS.

TABLE 9 FUTURE (2050) PEAK HOUR LOS – IMBALANCED LANES ALTERNATIVE W/ KINGS HILL DRIVE SIGNAL

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]	Impact of Kings Hill Drive Signal
1	SR-210/ Ft. Union Blvd.	Signal	AM	22 / C	Negligible
			PM	36 / D	Negligible
2	SR-210/ Bengal Blvd.	Signal	AM	26 / C	Negligible
			PM	24 / C	Negligible
3	SR-210/ 3500 E	Signal	AM	9 / A	Negligible
			PM	19 / B	Negligible
4	SR-210/ Kings Hill Dr.	Signal	AM	3 / A	Increases delay for side street left turns
			PM	10 / B	Overall delay slightly increases (7 sec/veh)
5	SR-210/ Wasatch Blvd.	Signal	AM	25 / C	Negligible
			PM	41 / D	Negligible
Travel Time Estimates (minutes : seconds)					
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 4m:04s | PM 4m:39s	Negligible
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				AM 3m:33s | PM 4m:30s	Negligible

Notes: [1]The intersection control delay is reported in seconds per vehicle.

[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.

Source: Fehr & Peers, 2019

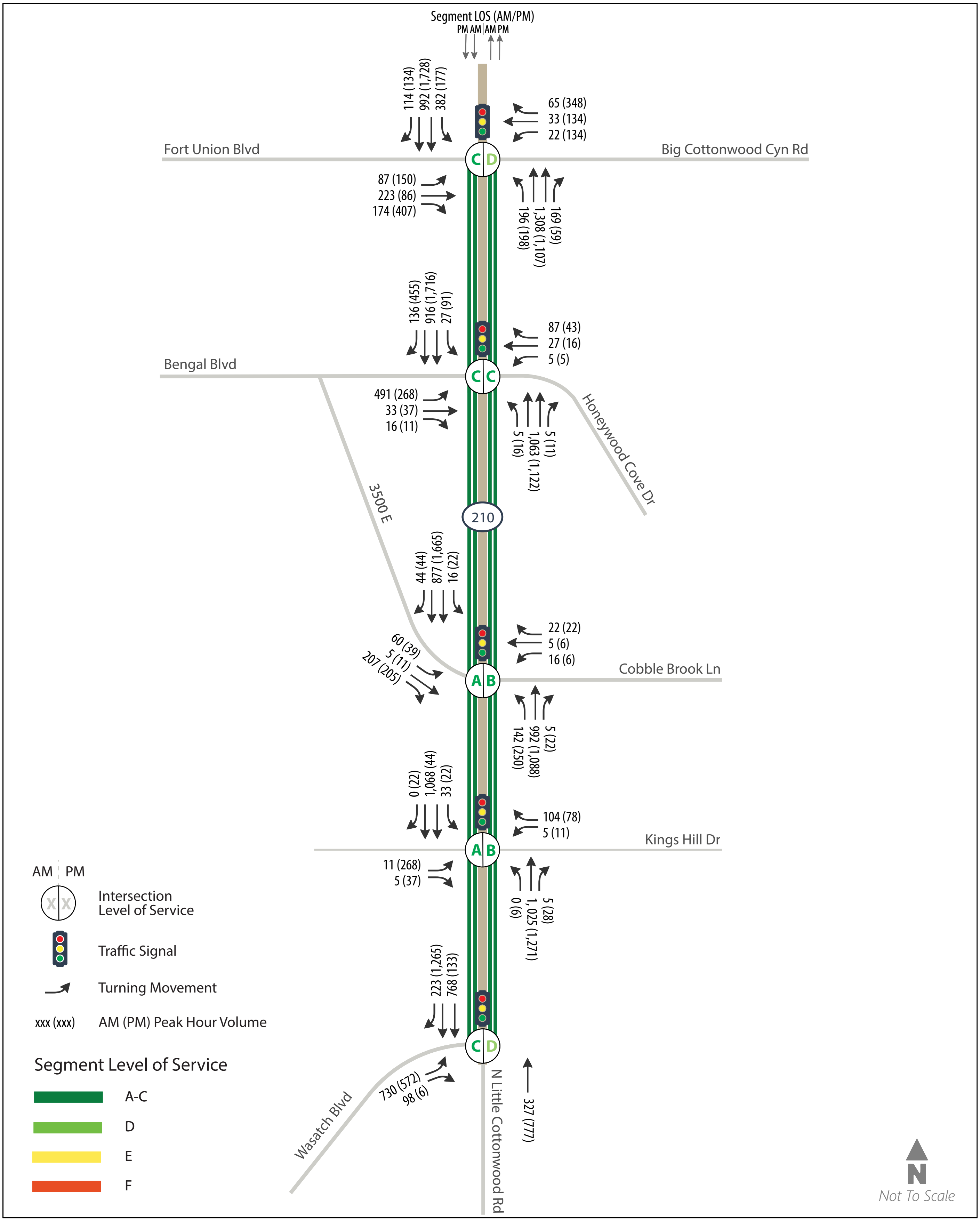


Figure 6

Corridor Operations - Future (2050) Imbalanced Lanes Alternative w/ Kings Hill Drive Signal

REVERSIBLE LANE ALTERNATIVE

This alternative adds one additional travel lane in the peak direction between Bengal Blvd. and Wasatch Blvd / SR-210 /N. Little Cottonwood Rd. It is assumed this “flex lane” operation provides two southbound travel lanes in the PM peak, and two northbound travel lanes in the AM peak. The off-peak direction provides a single travel lane. This alternative was considered because directional traffic flows are roughly 60% peak direction, 40% off-peak direction which indicates the potential to apply a reversible lane solution.

Note that the Imbalanced Lane alternative is effectively the same as the Reversible Lane alternative for PM peak conditions, in which both alternatives provide two southbound lanes and one northbound lane.

The Reversible Lane alternative generally results in acceptable traffic operations, however during the AM peak there is significant delay for the southbound movement at the south end of the study corridor which results in increased southbound travel times (8 minutes). Results of this scenario are detailed in Table 10 and Figure 7. This deserves additional explanation because traffic operations are better in alternatives for No Action and Imbalanced Lanes, however the road geometry is similar for the AM condition.

- **Growth Assumptions:** All alternative scenarios that increase capacity of SR-210 are assumed to attract 5-8% more traffic relative to No Action. As such, the Reversible Lane alternative was evaluated with higher traffic volumes than the No Action. A nuance to this assumption is that off-peak direction travel demand grows commensurately, although no additional capacity is provided in the off-peak direction.

  The intersection of Wasatch Blvd / SR-210 /N. Little Cottonwood Rd. operates in the 2050 No Action scenario essentially at capacity, so even small increases to traffic volumes upset the delicate tipping point into congestion and queue spill back. Hence, the reason the Reversible Lane alternative performs worse in the AM peak relative to the No Action alternative.

- **Intersection Lane Geometry:** In the Reversible Lane alternative, it is assumed the “flex lane” providing the second northbound lane is taken from the southbound through movement at SR-210/Wasatch Blvd/N. Little Cottonwood Rd. The southbound travel demand towards N. Little Cottonwood Rd. conflicts with the northbound travel demand from Wasatch Blvd, exceeding the intersection capacity. Hence, the reason the Reversible Lane alternative performs worse in the AM peak relative to the Imbalanced Lane alternative.

TABLE 10 FUTURE (2050) PEAK HOUR LOS – REVERSIBLE LANE ALTERNATIVE

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]
1	SR-210/ Ft. Union Blvd.	Signal	AM	23 / C
			PM	36 / D
2	SR-210/ Bengal Blvd.	Signal	AM	22 / C
			PM	24 / C
3	SR-210/ 3500 E	Signal	AM	36 / D
			PM	17 / B
4	SR-210/ Kings Hill Dr.	Side Street Stop	AM	26 / D
			PM	26 / D
5	SR-210/ Wasatch Blvd.	Signal	AM	**117 / F**
			PM	41 / D
Travel Time Estimates (minutes : seconds)				
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 4m:09s | PM 4m:37s
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				**AM 8m:00s** | PM 4m:21s

Notes: [1]The intersection control delay is reported in seconds per vehicle.
[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.
Source: Fehr & Peers, 2019

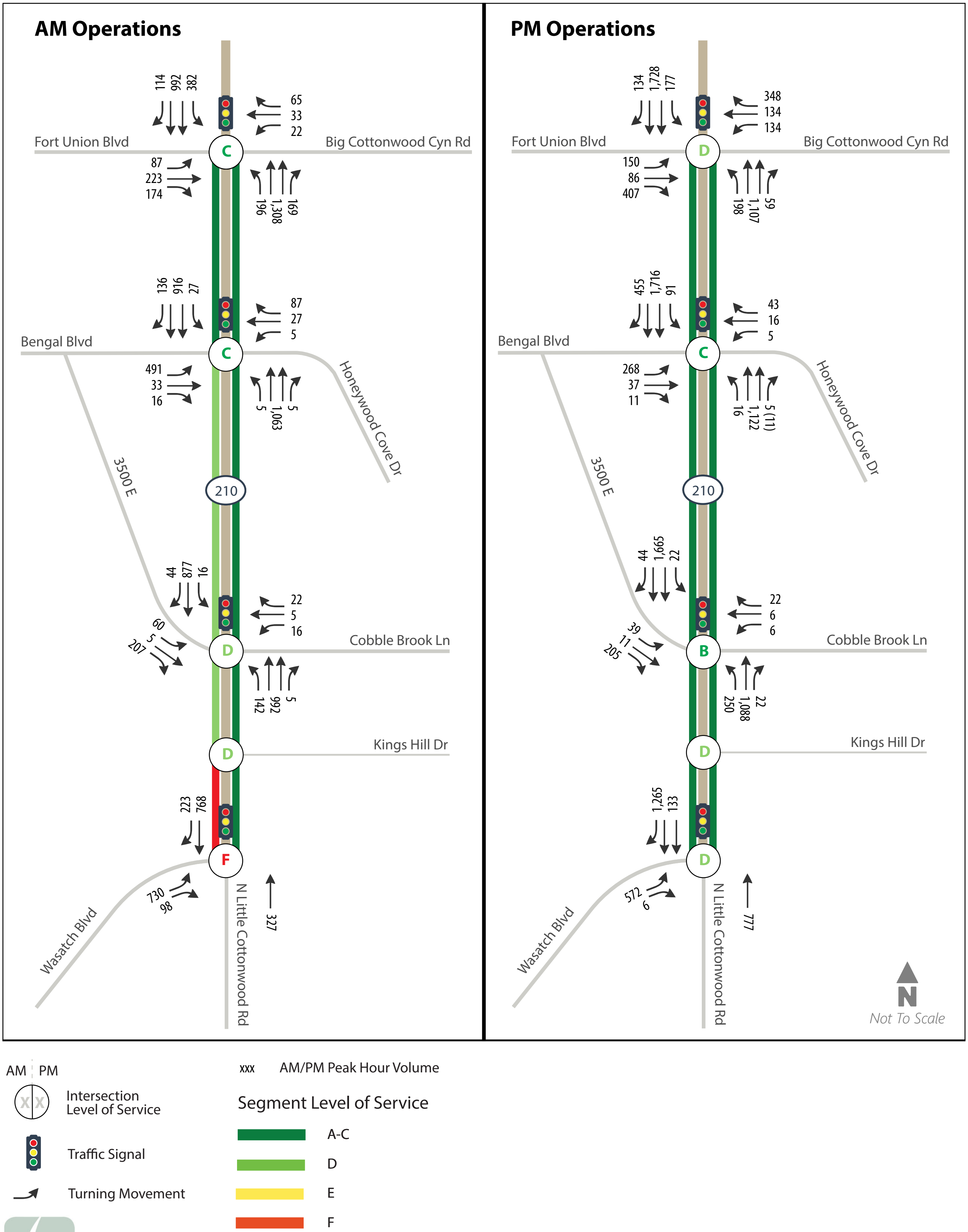


Figure 7

Corridor Operations - Future (2050) Reversible Lane Alternative

REVERSIBLE LANE ALTERNATIVE WITH KINGS HILL DRIVE SIGNAL

The addition of a traffic signal at Kings Hill Drive does not significantly influence the operational results of the reversible lane alternative, as shown in Table 11 and Figure 8. There is still congestion at the south end of the corridor due to the loss of the southbound through lane serving demand headed to N. Little Cottonwood Road during the AM peak.

TABLE 11 FUTURE (2050) PEAK HOUR LOS – REVERSIBLE LANE ALTERNATIVE W/ KINGS HILL DRIVE SIGNAL

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]	Impact of Kings Hill Drive Signal
1	SR-210/ Ft. Union Blvd.	Signal	AM	22 / C	Negligible
			PM	36 / D	Negligible
2	SR-210/ Bengal Blvd.	Signal	AM	27 / C	Negligible
			PM	24 / C	Negligible
3	SR-210/ 3500 E	Signal	AM	50 / D	Negligible
			PM	19 / B	Negligible
4	SR-210/ Kings Hill Dr.	Signal	AM	19 / B	Increases delay for side street left turns
			PM	10 / B	Overall delay slightly increases (7 sec/veh)
5	SR-210/ Wasatch Blvd.	Signal	AM	**110 / F**	Negligible
			PM	41 / D	Negligible
Travel Time Estimates (minutes : seconds)					
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 4m:09s | PM 4m:39s	Negligible
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				**AM 7m:42s** | PM 4m:30s	Negligible

Notes: [1]The intersection control delay is reported in seconds per vehicle.
[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.
Source: Fehr & Peers, 2019

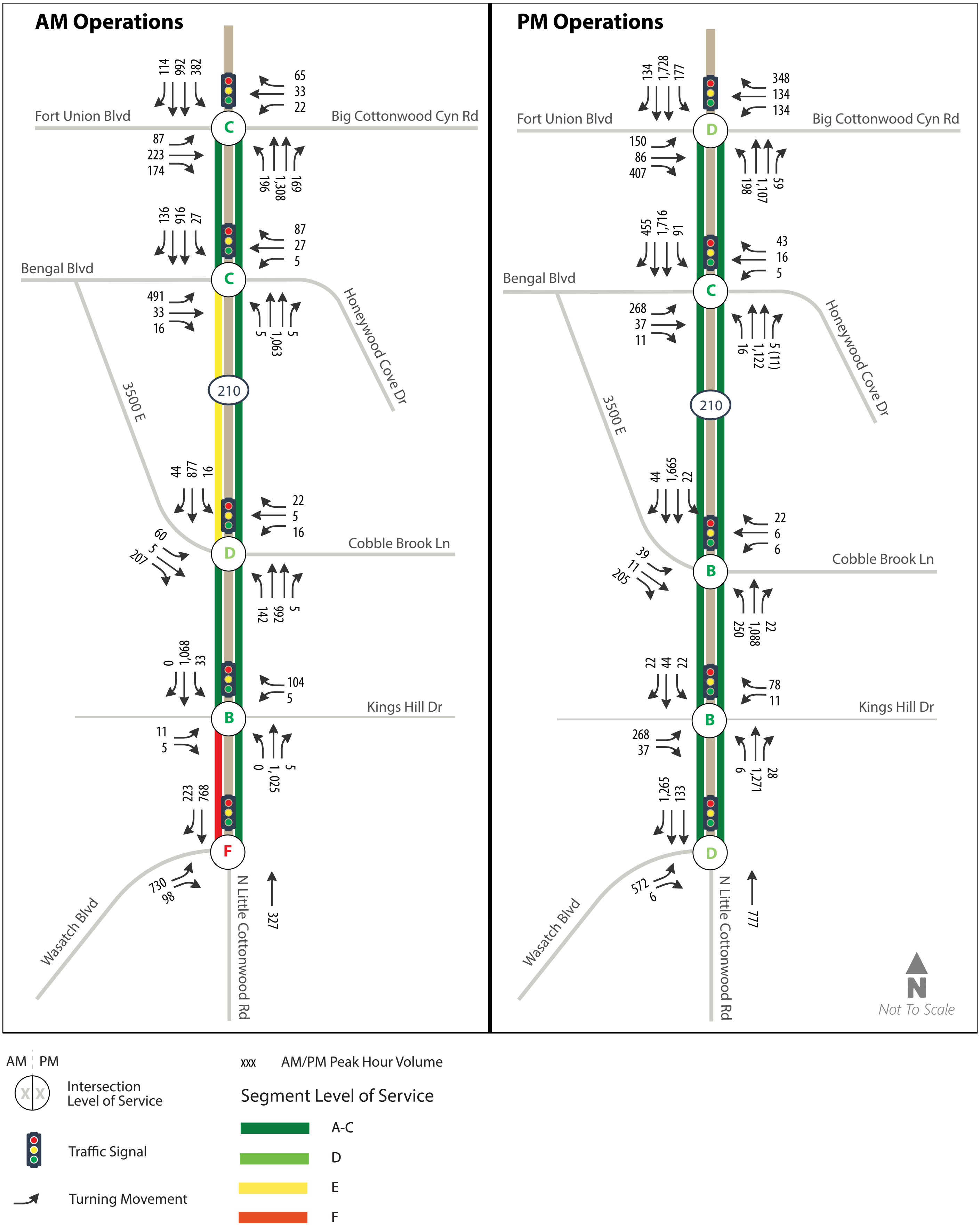


Figure 8

Corridor Operations - Future (2050) Reversible Lane Alternative w/ Kings Hill Drive Signal

ROUNDABOUT INTERSECTIONS ALTERNATIVE

Roundabout intersections along SR-210 were considered as an alternative roadway configuration in conjunction with widening to provide two northbound travel lanes and two southbound travel lanes. The analysis assumed roundabout intersections on SR-210 at Bengal Blvd, 3500 East, Kings Hill Drive, and SR-210/Wasatch Blvd/N. Little Cottonwood Road. The intersection at SR-210/Wasatch Blvd/N. Little Cottonwood Road was assumed to include a southbound right turn bypass lane based on traffic volumes and engineering judgement.

As shown in Table 12, the VISSIM simulation indicates failing intersection operations at SR-210/Wasatch Blvd/N. Little Cottonwood Road. Detailed operations summaries included in the Appendix show how the northbound approach from Wasatch Blvd. experiences severe delay (270 sec/veh) and only about a third of the actual travel demand can get through the intersection. The major bottleneck at entry into the system creates misleading results at the downstream intersections, which can adequately handle the artificially reduced vehicle arrival rate.

During the PM peak most intersections operate with unacceptable LOS. Similar to the AM peak bottleneck at the south end of the corridor, Bengal Blvd. functions as bottleneck location during the PM peak, causing queue spill back that impacts operations at Ft Union. This analysis indicates that roundabouts are not an appropriate intersection control solution to serve 2050 travel demand on the SR-210 corridor.

TABLE 12 FUTURE (2050) PEAK HOUR LOS – ROUNDABOUTS ALTERNATIVE

ID	Intersection	Control	Peak Hour	Delay[1] / LOS[2]
1	SR-210/ Ft. Union Blvd.	Signal	AM	17 / B
			PM	**199 / F**
2	SR-210/ Bengal Blvd.	Roundabout	AM	**79 / F**
			PM	**149 / F**
3	SR-210/ 3500 E	Roundabout	AM	16 / C
			PM	**80 / F**
4	SR-210/ Kings Hill Dr.	Roundabout	AM	3 / A
			PM	6 / A
5	SR-210/ Wasatch Blvd.	Roundabout	AM	**59 / F**
			PM	**178 / F**
Travel Time Estimates (minutes : seconds)				
Northbound (SR-210/Wasatch Blvd. to Ft. Union Blvd.)				AM 6m:25s | PM 4m:43s
Southbound (Ft. Union Blvd. to SR-210/Wasatch Blvd.)				AM 4m:32s | **PM 10m:21s**

Notes: [1]The intersection control delay is reported in seconds per vehicle.

[2]Level of Service based on *Highway Capacity Manual ver. 6* (Transportation Research Board, 2016). Overall delay is reported for signalized intersections, and worst approach for unsignalized intersections.

Source: Fehr & Peers, 2019

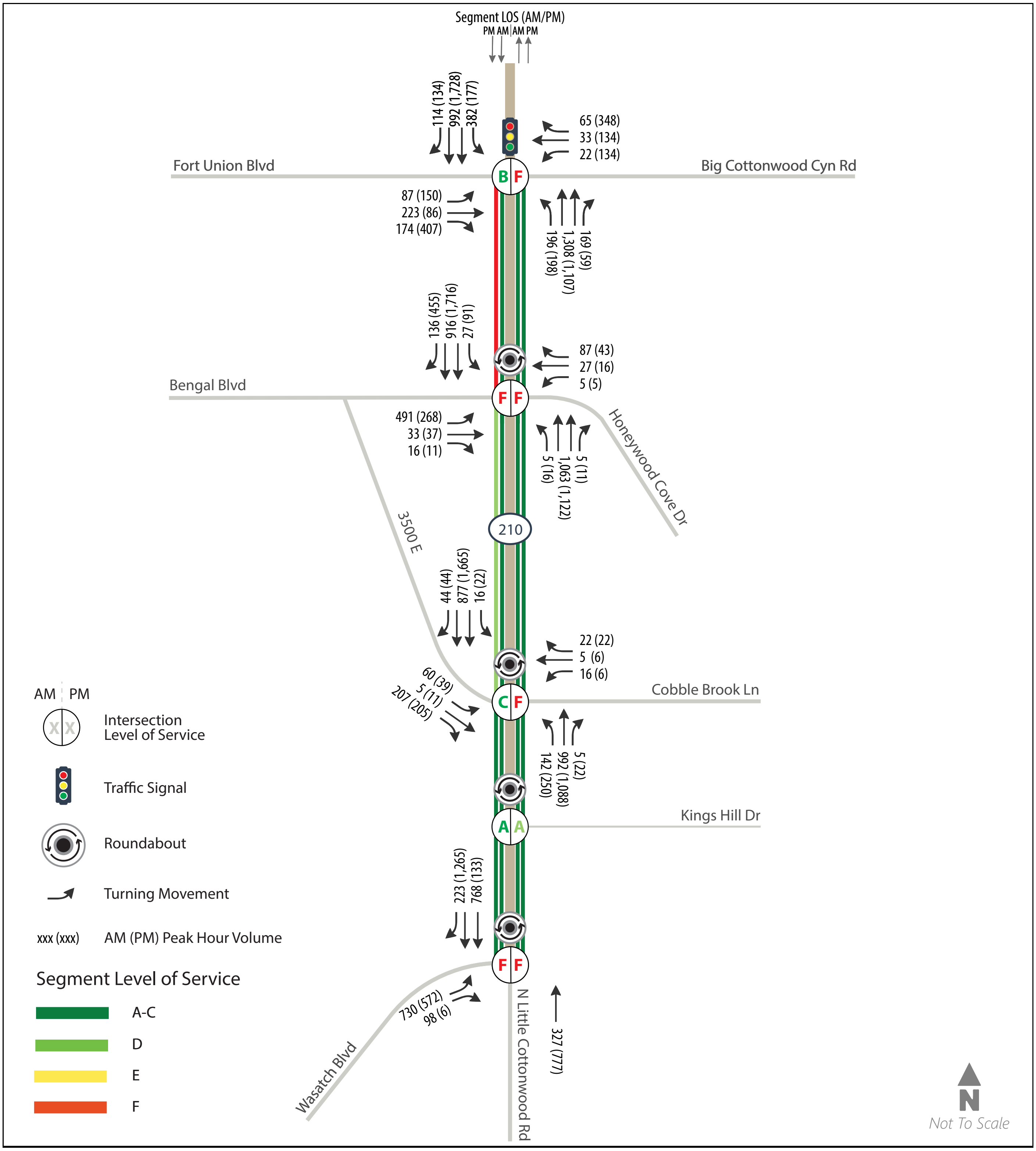


Figure 9

Corridor Operations - Future (2050) Roundabouts Alternative

APPENDIX – Detailed Traffic Operations Reports

Existing (2018) Peak Hour LOS

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Existing Weekday (Ski Season)**
Volume and Delay by Movement | **AM Peak**

Intersection 1 | **SR-210/Ft Union** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	141	139	98.5%	14.5	2.3	B
	Through	915	901	98.5%	7.6	2.9	A
	Right Turn	122	115	94.0%	4.8	1.6	A
	Subtotal	1,178	1,154	98.0%	8.2	2.4	A
SB	Left Turn	258	255	98.8%	15.4	1.7	B
	Through	674	681	101.0%	6.4	1.4	A
	Right Turn	77	76	98.3%	4.0	1.4	A
	Subtotal	1,009	1,011	100.2%	8.5	1.3	A
EB	Left Turn	59	65	110.4%	36.8	6.8	D
	Through	152	146	96.1%	41.1	4.2	D
	Right Turn	118	118	99.8%	6.3	0.9	A
	Subtotal	329	329	100.0%	27.3	3.3	C
WB	Left Turn	13	12	94.9%	31.9	30.3	C
	Through	21	22	106.3%	35.9	14.1	D
	Right Turn	44	44	99.0%	5.3	0.5	A
	Subtotal	78	78	100.3%	19.1	6.1	B
Total		2,594	2,573	99.2%	11.2	1.9	B

Intersection 4 | **SR-210/Bengal Blvd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	6	5	85.2%	17.1	15.9	B
	Through	761	740	97.2%	10.7	3.4	B
	Right Turn	5	5	91.1%	7.6	10.1	A
	Subtotal	772	750	97.1%	10.7	3.5	B
SB	Left Turn	13	11	82.1%	15.4	9.3	B
	Through	654	659	100.7%	11.6	2.0	B
	Right Turn	89	93	104.9%	3.4	1.5	A
	Subtotal	756	763	100.9%	10.6	1.8	B
EB	Left Turn	331	329	99.3%	32.7	4.3	C
	Through	21	20	95.8%	31.5	15.0	C
	Right Turn	10	12	116.7%	3.7	0.8	A
	Subtotal	362	360	99.5%	31.6	4.5	C
WB	Left Turn	5	5	95.6%	38.4	36.2	D
	Through	20	22	112.2%	42.9	15.6	D
	Right Turn	57	54	94.5%	5.4	0.8	A
	Subtotal	82	81	98.9%	18.5	3.4	B
Total		1,972	1,954	99.1%	14.8	1.8	B

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	119	117	98.5%	26.4	4.1	C
	Through	712	695	97.6%	18.3	3.1	B
	Right Turn	3	2	63.0%	3.3	7.3	A
	Subtotal	834	814	97.6%	19.4	2.7	B
SB	Left Turn	4	6	138.9%	13.0	12.1	B
	Through	641	646	100.7%	16.5	3.9	B
	Right Turn	24	24	101.4%	6.0	3.8	A
	Subtotal	669	676	101.0%	16.1	3.8	B
EB	Left Turn	45	42	93.8%	24.7	4.0	C
	Through	4	4	91.7%	19.8	25.1	B
	Right Turn	162	164	101.4%	8.4	1.1	A
	Subtotal	211	210	99.6%	11.9	1.2	B
WB	Left Turn	12	12	100.9%	21.4	13.8	C
	Through	3	3	88.9%	20.9	23.3	C
	Right Turn	15	13	88.1%	8.5	5.9	A
	Subtotal	30	28	93.3%	15.3	5.5	B
Total		1,744	1,728	99.1%	17.2	1.3	B

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	195	175	89.6%	10.9	2.1	B
	Right Turn						
	Subtotal	195	175	89.6%	10.9	2.1	B
SB	Left Turn						
	Through	606	607	100.2%	17.9	3.8	B
	Right Turn	165	174	105.7%	4.9	1.3	A
	Subtotal	771	782	101.4%	15.0	3.1	B
EB	Left Turn	488	494	101.3%	26.8	3.2	C
	Through						
	Right Turn	77	78	101.0%	12.2	3.4	B
	Subtotal	565	572	101.2%	24.8	3.3	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,531	1,528	99.8%	18.4	2.3	B

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	73	71	97.7%	11.6	2.9	B
	Through	382	380	99.6%	12.1	1.2	B
	Right Turn	180	179	99.5%	5.0	0.6	A
	Subtotal	635	631	99.3%	10.0	0.8	B
SB	Left Turn	8	8	105.6%	15.1	10.5	B
	Through	29	32	110.7%	13.1	4.1	B
	Right Turn	34	36	105.6%	5.2	1.6	A
	Subtotal	71	76	107.7%	10.3	2.6	B
EB	Left Turn	90	91	100.9%	20.6	5.5	C
	Through	248	252	101.6%	19.5	3.6	B
	Right Turn	82	79	96.5%	5.3	0.7	A
	Subtotal	420	422	100.4%	17.0	2.5	B
WB	Left Turn	44	47	107.8%	24.9	6.6	C
	Through	73	66	90.6%	18.6	5.0	B
	Right Turn	47	53	111.8%	11.5	4.1	B
	Subtotal	164	166	101.3%	17.8	2.8	B
Total		1,290	1,295	100.4%	13.3	1.0	B

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	2	2	111.1%	1.9	2.9	A
	Through	743	722	97.2%	8.8	1.7	A
	Right Turn	4	4	108.3%	5.0	9.5	A
	Subtotal	749	729	97.3%	8.8	1.7	A
SB	Left Turn	25	26	103.6%	6.0	2.6	A
	Through	789	796	100.9%	2.1	0.4	A
	Right Turn	1	1	111.1%	0.8	1.7	A
	Subtotal	815	823	101.0%	2.2	0.4	A
EB	Left Turn	10	9	92.2%	14.7	7.0	B
	Through						
	Right Turn	3	3	92.6%	5.4	6.2	A
	Subtotal	13	12	92.3%	13.7	6.8	B
WB	Left Turn	3	3	111.1%	7.3	5.8	A
	Through						
	Right Turn	81	80	98.9%	7.7	1.3	A
	Subtotal	84	83	99.3%	7.8	1.3	A
Total		1,661	1,648	99.2%	5.4	0.9	A

Vissim Post-Processor **SR-210**
Average Results from 10 Runs **Existing Weekday (Ski Season)**
Volume and Delay by Movement **PM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	130	127	97.5%	37.5	9.3	D
	Through	725	718	99.0%	9.7	1.6	A
	Right Turn	40	41	102.5%	3.4	1.2	A
	Subtotal	895	886	98.9%	13.3	2.1	B
SB	Left Turn	121	123	101.5%	14.0	2.7	B
	Through	1,194	1,198	100.3%	12.9	3.0	B
	Right Turn	92	90	97.7%	4.6	0.9	A
	Subtotal	1,407	1,411	100.3%	12.5	2.6	B
EB	Left Turn	104	106	102.4%	45.2	5.4	D
	Through	57	61	106.2%	35.1	5.4	D
	Right Turn	281	276	98.1%	13.6	2.2	B
	Subtotal	442	443	100.1%	24.7	2.8	C
WB	Left Turn	90	89	99.4%	40.2	5.9	D
	Through	90	90	99.8%	37.0	4.1	D
	Right Turn	238	238	100.1%	6.8	1.2	A
	Subtotal	418	417	99.9%	20.6	1.9	C
Total		3,162	3,156	99.8%	15.6	2.1	B

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	16	14	87.5%	98.1	102.6	F
	Through	682	678	99.3%	14.7	2.5	B
	Right Turn	6	6	100.0%	10.1	7.1	B
	Subtotal	704	698	99.1%	16.8	3.6	B
SB	Left Turn	53	55	102.9%	41.4	45.8	D
	Through	1,131	1,129	99.9%	34.6	40.3	C
	Right Turn	348	348	100.0%	10.8	14.6	B
	Subtotal	1,532	1,532	100.0%	29.9	35.2	C
EB	Left Turn	193	191	98.7%	49.6	6.3	D
	Through	37	37	100.0%	43.5	7.8	D
	Right Turn	7	7	106.3%	3.6	2.7	A
	Subtotal	237	235	99.2%	47.3	5.2	D
WB	Left Turn	3	3	114.8%	29.0	39.7	C
	Through	13	12	94.0%	71.1	38.7	E
	Right Turn	24	21	89.4%	4.9	0.9	A
	Subtotal	40	37	92.8%	24.1	12.5	C
Total		2,513	2,502	99.5%	27.7	22.3	C

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	195	200	102.5%	68.4	18.5	E
	Through	665	662	99.5%	21.8	8.4	C
	Right Turn	16	16	98.6%	10.5	7.5	B
	Subtotal	876	877	100.1%	32.3	10.2	C
SB	Left Turn	19	19	101.8%	103.8	32.5	F
	Through	1,069	1,073	100.4%	87.9	37.3	F
	Right Turn	53	56	106.5%	68.8	37.8	E
	Subtotal	1,141	1,149	100.7%	87.2	37.2	F
EB	Left Turn	24	23	94.9%	31.2	17.5	C
	Through	7	6	92.1%	38.1	24.8	D
	Right Turn	157	158	100.5%	16.0	4.8	B
	Subtotal	188	187	99.5%	19.6	4.2	B
WB	Left Turn	1	1	88.9%	9.3	18.6	A
	Through	3	3	92.6%	10.0	21.2	A
	Right Turn	15	13	89.6%	9.9	5.6	A
	Subtotal	19	17	90.1%	14.3	10.7	B
Total		2,224	2,230	100.3%	59.0	22.0	E

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through	519	518	99.7%	14.1	2.2	B
	Right Turn						
	Subtotal	519	518	99.7%	14.1	2.2	B
SB	Left Turn						
	Through	99	95	96.1%	13.4	2.3	B
	Right Turn	975	990	101.5%	8.1	0.5	A
	Subtotal	1,074	1,085	101.0%	8.5	0.6	A
EB	Left Turn	375	382	101.8%	26.6	1.6	C
	Through						
	Right Turn	5	4	88.9%	3.0	2.3	A
	Subtotal	380	386	101.6%	26.3	1.5	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,973	1,989	100.8%	13.5	0.7	B

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Existing Weekday (Ski Season)**
Volume and Delay by Movement | **PM Peak**

Intersection 7 | **Wasatch Blvd/Little Cottonwood Rd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	49	48	97.1%	25.8	5.7	C
	Through	209	213	101.7%	10.9	1.6	B
	Right Turn	25	24	94.2%	3.7	0.8	A
	Subtotal	283	284	100.2%	13.0	2.3	B
SB	Left Turn	32	33	102.8%	20.2	8.7	C
	Through	642	653	101.6%	20.4	2.2	C
	Right Turn	327	330	101.0%	14.4	2.0	B
	Subtotal	1,001	1,016	101.5%	18.5	1.9	B
EB	Left Turn	170	169	99.7%	34.0	11.0	C
	Through	62	66	107.0%	21.1	3.4	C
	Right Turn	64	62	96.5%	8.9	1.6	A
	Subtotal	296	298	100.5%	25.1	4.7	C
WB	Left Turn	89	91	102.1%	24.5	3.3	C
	Through	166	157	94.8%	22.9	1.8	C
	Right Turn	14	13	95.2%	16.3	6.5	B
	Subtotal	269	262	97.2%	23.1	1.7	C
Total		1,849	1,858	100.5%	19.4	1.3	B

Intersection 14 | **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** | **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	1	1	111.1%	0.5	1.4	A
	Through	820	825	100.7%	2.6	0.6	A
	Right Turn	17	17	101.3%	1.7	1.1	A
	Subtotal	838	844	100.7%	2.6	0.6	A
SB	Left Turn	82	79	95.9%	6.3	1.6	A
	Through	1,131	1,138	100.6%	3.4	0.7	A
	Right Turn	14	14	103.2%	4.7	2.1	A
	Subtotal	1,227	1,231	100.3%	3.5	0.7	A
EB	Left Turn	7	6	87.3%	27.2	13.5	D
	Through						
	Right Turn	6	6	96.3%	16.9	18.4	C
	Subtotal	13	12	91.5%	24.2	9.7	C
WB	Left Turn	8	7	83.3%	8.9	8.1	A
	Through						
	Right Turn	49	49	99.8%	8.6	2.1	A
	Subtotal	57	56	97.5%	9.0	2.4	A
Total		2,135	2,142	100.3%	3.5	0.6	A

Future (2050) Peak Hour LOS

No Action

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	180	169	93.8%	24.4	6.2	C
	Through	1,200	1,166	97.2%	15.9	3.7	B
	Right Turn	155	142	91.8%	6.5	1.5	A
	Subtotal	1,535	1,477	96.2%	15.8	3.3	B
SB	Left Turn	350	344	98.3%	30.2	6.4	C
	Through	910	919	101.0%	9.7	1.5	A
	Right Turn	105	103	98.2%	3.6	0.8	A
	Subtotal	1,365	1,366	100.1%	14.2	2.2	B
EB	Left Turn	80	83	103.5%	47.3	5.2	D
	Through	205	204	99.5%	48.9	3.7	D
	Right Turn	160	157	98.3%	7.0	1.0	A
	Subtotal	445	444	99.8%	34.4	2.8	C
WB	Left Turn	20	21	105.0%	47.6	20.0	D
	Through	30	31	102.2%	40.5	12.0	D
	Right Turn	60	57	94.4%	5.2	0.8	A
	Subtotal	110	108	98.5%	23.6	4.0	C
Total		3,455	3,396	98.3%	18.0	2.2	B

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	5	4	80.0%	30.2	36.6	C
	Through	975	924	94.8%	24.5	4.8	C
	Right Turn	5	5	100.0%	13.5	12.6	B
	Subtotal	985	933	94.7%	24.5	4.8	C
SB	Left Turn	25	23	92.4%	44.7	20.6	D
	Through	840	848	101.0%	17.9	2.3	B
	Right Turn	125	124	99.5%	3.1	1.0	A
	Subtotal	990	996	100.6%	16.6	2.4	B
EB	Left Turn	450	446	99.1%	45.6	4.5	D
	Through	30	29	97.0%	34.2	5.3	C
	Right Turn	15	18	120.0%	3.7	1.8	A
	Subtotal	495	493	99.6%	43.0	4.1	D
WB	Left Turn	5	6	111.1%	38.5	40.6	D
	Through	25	26	105.3%	56.8	11.9	E
	Right Turn	80	78	97.6%	6.2	1.6	A
	Subtotal	110	110	100.0%	22.6	5.6	C
Total		2,580	2,532	98.1%	25.2	1.3	C

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **2050 Weekday (Ski Season)**
Volume and Delay by Movement | **AM Peak**

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	130	122	94.1%	14.0	5.6	B
	Through	910	864	94.9%	6.2	1.0	A
	Right Turn	5	4	75.6%	2.4	2.7	A
	Subtotal	1,045	990	94.7%	7.2	1.4	A
SB	Left Turn	15	16	107.4%	13.1	4.0	B
	Through	805	813	101.0%	11.0	2.5	B
	Right Turn	40	43	107.2%	8.1	3.3	A
	Subtotal	860	872	101.4%	10.9	2.4	B
EB	Left Turn	55	53	96.2%	38.7	5.7	D
	Through	5	5	97.8%	36.7	33.1	D
	Right Turn	190	192	101.2%	13.6	3.5	B
	Subtotal	250	250	100.0%	20.4	3.7	C
WB	Left Turn	15	16	103.7%	38.8	6.7	D
	Through	5	5	100.0%	25.9	21.1	C
	Right Turn	20	18	88.9%	14.5	8.1	B
	Subtotal	40	38	95.8%	28.0	5.3	C
Total		2,195	2,150	98.0%	10.8	1.6	B

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through	300	280	93.4%	20.8	2.9	C
	Right Turn						
	Subtotal	300	280	93.4%	20.8	2.9	C
SB	Left Turn						
	Through	705	712	101.0%	37.6	8.6	D
	Right Turn	205	214	104.3%	16.5	5.7	B
	Subtotal	910	926	101.7%	33.0	7.8	C
EB	Left Turn	670	631	94.2%	84.8	6.3	F
	Through						
	Right Turn	90	90	100.1%	60.8	9.4	E
	Subtotal	760	721	94.9%	81.6	6.0	F
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,970	1,927	97.8%	49.1	3.0	D

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	85	87	102.1%	14.3	2.9	B
	Through	525	520	99.0%	16.5	2.8	B
	Right Turn	240	241	100.3%	10.1	1.3	B
	Subtotal	850	848	99.7%	14.5	2.2	B
SB	Left Turn	10	9	91.1%	32.7	22.6	C
	Through	40	45	113.6%	13.3	6.8	B
	Right Turn	40	41	102.2%	4.4	1.3	A
	Subtotal	90	95	106.0%	11.2	4.3	B
EB	Left Turn	120	121	100.7%	47.3	5.9	D
	Through	325	330	101.6%	45.0	4.1	D
	Right Turn	95	94	99.4%	9.4	3.2	A
	Subtotal	540	545	101.0%	40.0	4.2	D
WB	Left Turn	50	54	108.9%	61.3	13.4	E
	Through	85	78	92.3%	37.9	10.6	D
	Right Turn	55	60	109.7%	26.3	7.6	C
	Subtotal	190	193	101.7%	40.5	8.8	D
Total		1,670	1,682	100.7%	25.7	2.6	C

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	940	884	94.1%	2.2	0.2	A
	Right Turn	5	4	82.2%	2.6	2.2	A
	Subtotal	945	888	94.0%	2.2	0.2	A
SB	Left Turn	30	30	100.0%	7.0	3.6	A
	Through	980	994	101.4%	2.8	0.7	A
	Right Turn						
	Subtotal	1,010	1,024	101.4%	2.9	0.8	A
EB	Left Turn	10	8	80.0%	21.6	13.2	C
	Through						
	Right Turn	5	4	80.0%	5.0	3.5	A
	Subtotal	15	12	80.0%	14.1	4.4	B
WB	Left Turn	5	6	117.8%	10.2	7.7	B
	Through						
	Right Turn	95	94	98.7%	9.3	1.6	A
	Subtotal	100	100	99.7%	9.6	1.4	A
Total		2,070	2,024	97.8%	3.0	0.3	A

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	185	169	91.6%	106.1	29.2	F
	Through	1,035	1,029	99.4%	18.7	5.2	B
	Right Turn	55	49	88.3%	4.4	1.5	A
	Subtotal	1,275	1,247	97.8%	30.3	9.6	C
SB	Left Turn	165	156	94.4%	274.3	83.7	F
	Through	1,615	1,473	91.2%	330.6	83.3	F
	Right Turn	125	114	91.5%	262.4	82.4	F
	Subtotal	1,905	1,743	91.5%	321.0	82.6	F
EB	Left Turn	140	140	100.3%	62.1	11.4	E
	Through	80	81	100.7%	47.3	10.1	D
	Right Turn	380	376	99.1%	30.8	9.8	C
	Subtotal	600	597	99.6%	40.4	6.0	D
WB	Left Turn	125	119	95.1%	50.5	5.9	D
	Through	125	125	99.7%	44.6	6.8	D
	Right Turn	325	329	101.2%	7.9	1.0	A
	Subtotal	575	573	99.6%	25.3	2.4	C
Total		4,355	4,160	95.5%	152.9	33.5	F

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	15	13	85.9%	155.8	212.9	F
	Through	1,010	998	98.9%	13.1	4.2	B
	Right Turn	10	9	93.3%	8.0	8.4	A
	Subtotal	1,035	1,021	98.6%	15.9	5.9	B
SB	Left Turn	85	76	88.9%	196.6	28.8	F
	Through	1,545	1,411	91.3%	167.8	14.4	F
	Right Turn	425	388	91.3%	108.1	9.1	F
	Subtotal	2,055	1,875	91.2%	156.9	14.7	F
EB	Left Turn	250	251	100.3%	49.5	9.2	D
	Through	35	32	90.5%	41.8	17.4	D
	Right Turn	10	10	101.1%	20.0	30.3	B
	Subtotal	295	293	99.2%	47.8	8.3	D
WB	Left Turn	5	6	111.1%	52.2	34.0	D
	Through	15	15	103.0%	54.6	13.3	D
	Right Turn	40	37	93.1%	6.6	2.0	A
	Subtotal	60	58	97.0%	27.8	7.1	C
Total		3,445	3,246	94.2%	99.5	6.4	F

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	225	224	99.6%	100.8	27.1	F
	Through	980	970	99.0%	41.9	23.2	D
	Right Turn	20	20	99.4%	25.3	16.6	C
	Subtotal	1,225	1,214	99.1%	52.6	24.8	D
SB	Left Turn	20	17	85.0%	89.1	24.9	F
	Through	1,500	1,364	90.9%	66.6	5.4	E
	Right Turn	40	41	102.5%	57.5	5.4	E
	Subtotal	1,560	1,422	91.1%	66.5	5.2	E
EB	Left Turn	35	32	90.8%	71.9	9.0	E
	Through	10	11	113.3%	65.6	29.1	E
	Right Turn	185	188	101.6%	29.3	10.7	C
	Subtotal	230	231	100.4%	37.8	9.2	D
WB	Left Turn	5	6	111.1%	79.5	20.4	E
	Through	5	5	102.2%	68.9	39.7	E
	Right Turn	20	18	91.1%	17.4	8.9	B
	Subtotal	30	29	96.3%	44.2	10.6	D
Total		3,045	2,895	95.1%	58.2	12.6	E

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	700	699	99.8%	47.0	15.8	D
	Right Turn						
	Subtotal	700	699	99.8%	47.0	15.8	D
SB	Left Turn						
	Through	120	114	94.7%	20.8	3.0	C
	Right Turn	1,140	1,097	96.3%	11.4	2.3	B
	Subtotal	1,260	1,211	96.1%	12.3	2.2	B
EB	Left Turn	515	522	101.4%	23.9	2.6	C
	Through						
	Right Turn	5	4	80.0%	4.2	3.9	A
	Subtotal	520	526	101.2%	23.8	2.5	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,480	2,436	98.2%	25.1	5.2	C

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	55	52	94.1%	46.0	17.5	D
	Through	245	246	100.6%	11.5	2.2	B
	Right Turn	30	29	96.7%	4.9	2.5	A
	Subtotal	330	327	99.2%	16.4	5.8	B
SB	Left Turn	35	35	100.6%	18.5	6.1	B
	Through	745	718	96.4%	31.1	16.8	C
	Right Turn	380	364	95.7%	26.4	22.1	C
	Subtotal	1,160	1,117	96.3%	29.2	18.2	C
EB	Left Turn	195	197	100.9%	32.5	9.9	C
	Through	70	73	104.4%	15.7	2.5	B
	Right Turn	75	72	96.0%	9.9	2.2	A
	Subtotal	340	342	100.6%	24.2	6.3	C
WB	Left Turn	105	110	104.9%	16.1	3.8	B
	Through	195	191	97.8%	16.9	1.9	B
	Right Turn	15	15	103.0%	10.0	5.0	A
	Subtotal	315	316	100.4%	16.5	2.1	B
Total		2,145	2,103	98.0%	24.5	10.9	C

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	5	5	97.8%	13.1	23.2	B
	Through	1,145	1,144	99.9%	33.2	39.3	D
	Right Turn	25	28	110.2%	29.6	36.3	D
	Subtotal	1,175	1,176	100.1%	33.1	39.2	D
SB	Left Turn	115	108	94.3%	21.8	12.0	C
	Through	1,555	1,434	92.2%	5.4	2.6	A
	Right Turn	20	17	83.9%	3.1	2.1	A
	Subtotal	1,690	1,559	92.3%	6.5	2.9	A
EB	Left Turn	10	10	101.1%	63.9	75.2	F
	Through						
	Right Turn	10	10	97.8%	14.5	5.6	B
	Subtotal	20	20	99.4%	41.4	45.3	E
WB	Left Turn	10	9	93.3%	96.4	145.7	F
	Through						
	Right Turn	70	67	95.4%	263.2	294.9	F
	Subtotal	80	76	95.1%	262.3	294.1	F
Total		2,965	2,831	95.5%	23.0	19.5	C

Future (2050) Peak Hour LOS

Five Lane Alternative

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 5 Lane**
Volume and Delay by Movement | **AM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	196	185	94.3%	27.6	3.1	C
	Through	1,308	1,282	98.0%	23.7	5.4	C
	Right Turn	169	157	92.6%	8.8	1.8	A
	Subtotal	1,673	1,623	97.0%	22.7	4.5	C
SB	Left Turn	382	373	97.6%	33.1	4.0	C
	Through	992	1,003	101.1%	11.4	3.0	B
	Right Turn	114	111	97.2%	4.0	1.3	A
	Subtotal	1,488	1,487	99.9%	16.4	3.0	B
EB	Left Turn	87	92	105.5%	48.4	9.3	D
	Through	223	219	98.3%	45.0	5.4	D
	Right Turn	174	173	99.6%	8.1	1.0	A
	Subtotal	484	484	100.1%	33.0	3.3	C
WB	Left Turn	22	25	111.6%	59.2	14.5	E
	Through	33	32	97.0%	42.9	11.7	D
	Right Turn	65	62	95.9%	6.2	0.4	A
	Subtotal	120	119	99.1%	27.1	6.2	C
Total		3,765	3,713	98.6%	21.8	3.0	C

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	5	5	95.6%	21.7	30.7	C
	Through	1,063	1,021	96.0%	16.6	3.1	B
	Right Turn	5	6	120.0%	6.3	6.1	A
	Subtotal	1,073	1,031	96.1%	16.6	3.1	B
SB	Left Turn	27	27	98.8%	24.4	8.4	C
	Through	916	928	101.3%	9.7	2.8	A
	Right Turn	136	136	100.3%	3.5	1.6	A
	Subtotal	1,079	1,091	101.2%	9.3	2.7	A
EB	Left Turn	491	486	99.0%	46.1	6.1	D
	Through	33	33	100.3%	32.7	6.4	C
	Right Turn	16	19	116.7%	4.0	1.6	A
	Subtotal	540	538	99.6%	43.4	5.8	D
WB	Left Turn	5	7	135.6%	36.1	35.2	D
	Through	27	30	110.7%	63.6	9.0	E
	Right Turn	87	82	94.3%	8.1	2.0	A
	Subtotal	119	119	99.7%	25.3	6.9	C
Total		2,811	2,780	98.9%	19.9	2.7	B

Vissim Post-Processor **SR-210**
Average Results from 10 Runs **Weekday 2050 + 5 Lane**
Volume and Delay by Movement **AM Peak**

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	142	139	98.0%	10.7	1.4	B
	Through	992	955	96.2%	4.3	0.6	A
	Right Turn	5	4	88.9%	2.1	2.2	A
	Subtotal	1,139	1,098	96.4%	5.1	0.8	A
SB	Left Turn	16	17	109.0%	13.4	11.0	B
	Through	877	887	101.1%	8.5	2.4	A
	Right Turn	44	47	107.1%	5.3	3.3	A
	Subtotal	937	951	101.5%	8.5	2.4	A
EB	Left Turn	60	58	96.3%	30.0	5.5	C
	Through	5	5	97.8%	20.2	19.0	C
	Right Turn	207	209	101.1%	9.2	1.9	A
	Subtotal	272	272	100.0%	14.4	1.8	B
WB	Left Turn	16	17	109.0%	26.2	6.2	C
	Through	5	5	104.4%	18.0	15.6	B
	Right Turn	22	19	87.4%	8.5	2.9	A
	Subtotal	43	42	97.4%	17.5	5.1	B
Total		2,391	2,363	98.8%	7.8	1.1	A

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	327	289	88.5%	24.8	2.2	C
	Right Turn						
	Subtotal	327	289	88.5%	24.8	2.2	C
SB	Left Turn						
	Through	768	780	101.6%	33.5	6.4	C
	Right Turn	223	234	104.8%	5.0	1.3	A
	Subtotal	991	1,014	102.3%	26.7	5.3	C
EB	Left Turn	730	731	100.1%	22.1	2.7	C
	Through						
	Right Turn	98	102	104.1%	14.4	2.8	B
	Subtotal	828	833	100.6%	21.1	2.6	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,146	2,136	99.5%	24.2	3.1	C

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 5 Lane**
Volume and Delay by Movement | **AM Peak**

Intersection 7 | **Wasatch Blvd/Little Cottonwood Rd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	93	93	99.9%	20.4	2.7	C
	Through	572	570	99.6%	19.1	2.9	B
	Right Turn	262	260	99.4%	14.1	2.5	B
	Subtotal	927	923	99.6%	17.8	2.5	B
SB	Left Turn	11	11	99.0%	34.7	24.9	C
	Through	44	48	109.3%	13.7	5.3	B
	Right Turn	44	45	103.0%	5.5	1.1	A
	Subtotal	99	104	105.4%	13.2	5.6	B
EB	Left Turn	131	129	98.1%	43.7	5.3	D
	Through	354	358	101.2%	42.5	2.6	D
	Right Turn	104	106	101.8%	9.1	1.8	A
	Subtotal	589	593	100.6%	37.3	2.7	D
WB	Left Turn	55	57	104.2%	57.9	11.5	E
	Through	93	86	92.8%	35.7	7.6	D
	Right Turn	60	62	103.5%	25.1	7.9	C
	Subtotal	208	206	98.9%	39.5	4.0	D
Total		1,823	1,826	100.1%	26.4	1.6	C

Intersection 14 | **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** | **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	1,025	982	95.8%	0.5	0.1	A
	Right Turn	5	5	100.0%	1.4	1.7	A
	Subtotal	1,030	987	95.8%	0.5	0.1	A
SB	Left Turn	33	33	99.7%	4.5	2.0	A
	Through	1,068	1,082	101.3%	1.1	0.2	A
	Right Turn						
	Subtotal	1,101	1,115	101.2%	1.2	0.2	A
EB	Left Turn	11	11	100.0%	13.3	6.3	B
	Through						
	Right Turn	5	5	100.0%	2.9	4.4	A
	Subtotal	16	16	100.0%	12.0	5.4	B
WB	Left Turn	5	7	131.1%	10.7	4.1	B
	Through						
	Right Turn	104	101	96.9%	6.6	0.6	A
	Subtotal	109	107	98.5%	6.9	0.7	A
Total		2,256	2,225	98.6%	1.3	0.1	A

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	198	191	96.6%	69.0	11.7	E
	Through	1,107	1,101	99.5%	12.6	2.9	B
	Right Turn	59	52	88.1%	4.0	0.7	A
	Subtotal	1,364	1,344	98.6%	20.0	1.7	B
SB	Left Turn	177	173	97.9%	25.8	2.2	C
	Through	1,728	1,736	100.5%	35.5	6.3	D
	Right Turn	134	135	100.5%	16.0	5.8	B
	Subtotal	2,039	2,044	100.2%	33.5	5.8	C
EB	Left Turn	150	150	100.1%	118.5	49.3	F
	Through	86	89	103.0%	51.1	16.9	D
	Right Turn	407	401	98.5%	39.4	20.0	D
	Subtotal	643	640	99.5%	58.5	16.8	E
WB	Left Turn	134	127	94.9%	62.4	14.1	E
	Through	134	134	100.0%	39.2	6.9	D
	Right Turn	348	353	101.5%	15.2	2.7	B
	Subtotal	616	615	99.8%	30.0	6.1	C
Total		4,662	4,642	99.6%	32.6	3.5	C

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	16	14	89.6%	42.7	18.5	D
	Through	1,122	1,109	98.9%	11.1	1.4	B
	Right Turn	11	11	101.0%	4.0	2.0	A
	Subtotal	1,149	1,135	98.8%	11.5	1.5	B
SB	Left Turn	91	89	97.8%	23.3	5.0	C
	Through	1,716	1,716	100.0%	13.9	3.9	B
	Right Turn	455	457	100.4%	11.3	3.6	B
	Subtotal	2,262	2,262	100.0%	13.7	3.8	B
EB	Left Turn	268	268	100.0%	49.9	5.7	D
	Through	37	33	90.1%	39.3	10.6	D
	Right Turn	11	11	99.0%	13.7	10.3	B
	Subtotal	316	312	98.8%	47.7	5.0	D
WB	Left Turn	5	5	104.4%	58.0	33.6	E
	Through	16	16	102.8%	63.2	18.4	E
	Right Turn	43	40	93.0%	7.2	1.9	A
	Subtotal	64	62	96.4%	26.9	6.5	C
Total		3,791	3,771	99.5%	16.4	2.7	B

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	250	254	101.5%	24.7	4.5	C
	Through	1,088	1,080	99.2%	3.1	0.8	A
	Right Turn	22	21	96.0%	1.6	1.0	A
	Subtotal	1,360	1,355	99.6%	7.3	1.5	A
SB	Left Turn	22	20	90.9%	29.6	22.2	C
	Through	1,665	1,664	99.9%	12.8	4.4	B
	Right Turn	44	49	110.6%	7.3	3.3	A
	Subtotal	1,731	1,732	100.1%	12.9	4.5	B
EB	Left Turn	39	36	92.3%	48.4	16.2	D
	Through	11	12	107.1%	40.5	13.4	D
	Right Turn	205	206	100.4%	15.7	3.1	B
	Subtotal	255	254	99.4%	21.3	4.2	C
WB	Left Turn	6	6	103.7%	51.0	15.4	D
	Through	6	6	94.4%	40.2	17.2	D
	Right Turn	22	20	91.4%	15.3	19.8	B
	Subtotal	34	32	94.1%	28.0	14.4	C
Total		3,380	3,373	99.8%	11.4	2.8	B

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	777	773	99.5%	26.3	5.3	C
	Right Turn						
	Subtotal	777	773	99.5%	26.3	5.3	C
SB	Left Turn						
	Through	133	141	106.0%	26.9	4.0	C
	Right Turn	1,265	1,318	104.2%	36.6	15.3	D
	Subtotal	1,398	1,459	104.4%	35.8	14.2	D
EB	Left Turn	572	576	100.8%	51.6	12.6	D
	Through						
	Right Turn	6	4	74.1%	15.9	19.5	B
	Subtotal	578	581	100.5%	51.3	12.6	D
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,753	2,813	102.2%	36.4	7.5	D

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	61	59	96.2%	81.3	33.1	F
	Through	272	273	100.4%	11.3	2.2	B
	Right Turn	33	33	99.3%	3.4	0.9	A
	Subtotal	366	365	99.6%	21.3	5.6	C
SB	Left Turn	39	40	102.0%	42.7	33.7	D
	Through	827	864	104.4%	65.8	21.6	E
	Right Turn	422	445	105.4%	91.9	45.7	F
	Subtotal	1,288	1,348	104.7%	73.1	28.4	E
EB	Left Turn	216	214	99.0%	53.1	8.3	D
	Through	78	83	106.4%	37.6	24.9	D
	Right Turn	83	81	98.0%	14.4	2.6	B
	Subtotal	377	378	100.3%	40.5	9.5	D
WB	Left Turn	117	125	106.6%	28.1	4.1	C
	Through	216	215	99.5%	29.1	4.7	C
	Right Turn	17	16	96.1%	23.1	17.2	C
	Subtotal	350	356	101.7%	28.3	3.2	C
Total		2,381	2,447	102.8%	54.3	15.6	D

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	6	4	74.1%	10.3	10.8	B
	Through	1,271	1,267	99.7%	0.6	0.1	A
	Right Turn	28	28	101.6%	1.3	0.9	A
	Subtotal	1,305	1,300	99.6%	0.7	0.1	A
SB	Left Turn	128	129	100.7%	8.2	2.0	A
	Through	1,726	1,729	100.2%	1.7	0.3	A
	Right Turn	22	20	89.4%	2.0	0.9	A
	Subtotal	1,876	1,877	100.1%	2.2	0.3	A
EB	Left Turn	11	11	97.0%	27.5	15.7	D
	Through						
	Right Turn	11	9	84.8%	10.6	6.3	B
	Subtotal	22	20	90.9%	17.0	5.9	C
WB	Left Turn	11	11	102.0%	19.3	11.6	C
	Through						
	Right Turn	78	76	97.3%	7.1	0.8	A
	Subtotal	89	87	97.9%	8.6	2.0	A
Total		3,292	3,284	99.8%	1.8	0.2	A

Future (2050) Peak Hour LOS

Five Lane Alternative

With Traffic Signal at Kings Hill Drive

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	196	184	94.0%	27.3	2.8	C
	Through	1,308	1,284	98.2%	22.4	3.9	C
	Right Turn	169	156	92.6%	8.4	1.2	A
	Subtotal	1,673	1,625	97.1%	21.5	3.2	C
SB	Left Turn	382	373	97.7%	32.2	4.5	C
	Through	992	1,003	101.1%	11.2	2.2	B
	Right Turn	114	111	97.0%	3.8	1.3	A
	Subtotal	1,488	1,487	99.9%	16.0	2.4	B
EB	Left Turn	87	92	105.5%	48.7	7.7	D
	Through	223	219	98.4%	45.0	5.4	D
	Right Turn	174	173	99.6%	8.3	1.1	A
	Subtotal	484	484	100.1%	33.1	3.2	C
WB	Left Turn	22	25	111.6%	59.3	14.3	E
	Through	33	32	97.0%	42.9	11.7	D
	Right Turn	65	62	95.9%	6.2	0.4	A
	Subtotal	120	119	99.1%	27.2	6.2	C
Total		3,765	3,715	98.7%	21.1	2.4	C

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	5	5	97.8%	33.0	34.8	C
	Through	1,063	1,024	96.3%	16.6	2.3	B
	Right Turn	5	6	122.2%	3.7	3.4	A
	Subtotal	1,073	1,035	96.4%	16.6	2.3	B
SB	Left Turn	27	27	98.8%	21.8	13.0	C
	Through	916	928	101.4%	10.3	1.6	B
	Right Turn	136	136	100.2%	3.1	0.3	A
	Subtotal	1,079	1,091	101.2%	9.7	1.5	A
EB	Left Turn	491	486	99.0%	45.0	4.0	D
	Through	33	33	100.3%	27.1	8.5	C
	Right Turn	16	19	116.7%	3.8	2.4	A
	Subtotal	540	538	99.6%	42.9	4.0	D
WB	Left Turn	5	7	135.6%	65.8	22.4	E
	Through	27	30	110.7%	60.8	15.7	E
	Right Turn	87	82	94.3%	6.6	1.5	A
	Subtotal	119	119	99.7%	27.0	4.0	C
Total		2,811	2,783	99.0%	19.9	2.0	B

Vissim Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

SR-210
Weekday 2050 + 5 Lane + KHD Signal
AM Peak

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	142	140	98.4%	12.3	2.7	B
	Through	992	957	96.4%	4.5	0.7	A
	Right Turn	5	4	86.7%	1.7	1.2	A
	Subtotal	1,139	1,101	96.6%	5.5	0.9	A
SB	Left Turn	16	18	110.4%	12.5	9.2	B
	Through	877	888	101.2%	9.4	3.9	A
	Right Turn	44	47	107.1%	5.2	2.6	A
	Subtotal	937	952	101.6%	9.4	4.0	A
EB	Left Turn	60	58	96.9%	27.3	5.2	C
	Through	5	5	97.8%	25.7	20.9	C
	Right Turn	207	209	101.1%	9.3	1.0	A
	Subtotal	272	272	100.1%	13.9	2.1	B
WB	Left Turn	16	17	109.0%	21.6	13.9	C
	Through	5	5	104.4%	25.7	20.0	C
	Right Turn	22	19	87.4%	8.7	3.5	A
	Subtotal	43	42	97.4%	16.2	6.8	B
Total		2,391	2,367	99.0%	8.2	1.8	A

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	327	293	89.5%	24.5	2.8	C
	Right Turn						
	Subtotal	327	293	89.5%	24.5	2.8	C
SB	Left Turn						
	Through	768	781	101.7%	36.4	9.5	D
	Right Turn	223	234	104.8%	5.1	2.8	A
	Subtotal	991	1,015	102.4%	29.0	7.9	C
EB	Left Turn	730	731	100.1%	23.7	3.1	C
	Through						
	Right Turn	98	102	104.1%	15.4	3.1	B
	Subtotal	828	833	100.6%	22.7	3.0	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,146	2,140	99.7%	26.0	4.7	C

Vissim Post-Processor — **SR-210**

Average Results from 10 Runs — **Weekday 2050 + 5 Lane + KHD Signal**

Volume and Delay by Movement — **AM Peak**

Intersection 7 — **Wasatch Blvd/Little Cottonwood Rd** — **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	93	93	99.9%	20.4	3.0	C
	Through	572	570	99.7%	19.6	3.1	B
	Right Turn	262	260	99.3%	14.2	2.8	B
	Subtotal	927	923	99.6%	18.1	2.7	B
SB	Left Turn	11	11	99.0%	34.5	23.8	C
	Through	44	48	109.3%	12.8	7.4	B
	Right Turn	44	45	102.8%	5.1	1.2	A
	Subtotal	99	104	105.3%	12.2	5.7	B
EB	Left Turn	131	129	98.1%	44.5	5.0	D
	Through	354	358	101.3%	42.0	3.8	D
	Right Turn	104	106	101.8%	8.9	2.2	A
	Subtotal	589	593	100.7%	37.2	3.5	D
WB	Left Turn	55	57	103.0%	59.0	15.9	E
	Through	93	86	92.2%	36.7	2.9	D
	Right Turn	60	62	103.0%	26.3	4.8	C
	Subtotal	208	204	98.2%	39.9	5.8	D
Total		1,823	1,824	100.1%	26.5	1.8	C

Intersection 14 — **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** — **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	1,025	985	96.1%	8.0	1.0	A
	Right Turn	5	5	102.2%	2.0	2.3	A
	Subtotal	1,030	990	96.2%	8.0	1.0	A
SB	Left Turn	33	33	99.7%	44.7	11.0	D
	Through	1,068	1,082	101.3%	3.4	0.6	A
	Right Turn						
	Subtotal	1,101	1,115	101.3%	4.7	0.8	A
EB	Left Turn	11	11	100.0%	63.9	17.0	E
	Through						
	Right Turn	5	5	100.0%	4.1	4.2	A
	Subtotal	16	16	100.0%	46.2	18.1	D
WB	Left Turn	5	7	133.3%	35.4	29.0	D
	Through						
	Right Turn	104	101	97.1%	7.2	0.9	A
	Subtotal	109	108	98.8%	9.4	2.5	A
Total		2,256	2,229	98.8%	6.7	0.8	A

Vissim Post-Processor **SR-210**
Average Results from 10 Runs **Weekday 2050 + 5 Lane + KHD Signal**
Volume and Delay by Movement **PM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	198	192	97.1%	75.0	11.8	E
	Through	1,107	1,103	99.6%	10.1	3.5	B
	Right Turn	59	52	88.7%	3.3	1.5	A
	Subtotal	1,364	1,347	98.8%	18.7	3.4	B
SB	Left Turn	177	173	97.6%	32.7	7.9	C
	Through	1,728	1,733	100.3%	37.6	5.5	D
	Right Turn	134	135	100.4%	17.0	4.9	B
	Subtotal	2,039	2,040	100.1%	36.0	5.1	D
EB	Left Turn	150	151	100.4%	120.3	51.6	F
	Through	86	89	103.0%	45.2	8.9	D
	Right Turn	407	401	98.6%	35.4	10.8	D
	Subtotal	643	640	99.6%	55.6	11.7	E
WB	Left Turn	134	127	94.9%	63.5	16.1	E
	Through	134	134	100.0%	39.7	7.5	D
	Right Turn	348	353	101.5%	15.4	2.7	B
	Subtotal	616	614	99.7%	30.4	6.7	C
Total		4,662	4,642	99.6%	33.1	1.5	C

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	16	14	88.9%	46.2	19.6	D
	Through	1,122	1,110	98.9%	21.0	3.1	C
	Right Turn	11	11	101.0%	14.6	11.8	B
	Subtotal	1,149	1,135	98.8%	21.3	2.9	C
SB	Left Turn	91	89	97.7%	23.7	3.9	C
	Through	1,716	1,714	99.9%	13.1	4.0	B
	Right Turn	455	457	100.4%	10.8	3.4	B
	Subtotal	2,262	2,259	99.9%	13.1	3.9	B
EB	Left Turn	268	268	100.0%	49.9	5.7	D
	Through	37	33	90.1%	39.3	10.6	D
	Right Turn	11	11	100.0%	10.2	5.3	B
	Subtotal	316	312	98.8%	47.6	5.0	D
WB	Left Turn	5	5	104.4%	58.0	33.6	E
	Through	16	16	102.8%	63.2	18.4	E
	Right Turn	43	40	93.0%	9.3	3.6	A
	Subtotal	64	62	96.4%	28.4	6.6	C
Total		3,791	3,769	99.4%	18.7	3.1	B

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 5 Lane + KHD Signal**
Volume and Delay by Movement | **PM Peak**

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	250	253	101.3%	29.8	6.3	C
	Through	1,088	1,078	99.1%	3.8	1.4	A
	Right Turn	22	21	96.5%	3.1	1.6	A
	Subtotal	1,360	1,352	99.4%	8.9	2.6	A
SB	Left Turn	22	20	90.9%	35.0	17.7	D
	Through	1,665	1,665	100.0%	11.1	5.7	B
	Right Turn	44	48	110.1%	6.9	4.9	A
	Subtotal	1,731	1,734	100.2%	11.2	5.7	B
EB	Left Turn	39	36	92.3%	45.9	18.5	D
	Through	11	12	107.1%	44.4	17.2	D
	Right Turn	205	206	100.5%	15.3	2.8	B
	Subtotal	255	254	99.6%	20.7	3.8	C
WB	Left Turn	6	6	101.9%	50.6	26.5	D
	Through	6	6	94.4%	51.0	17.7	D
	Right Turn	22	20	91.4%	13.7	15.9	B
	Subtotal	34	32	93.8%	29.8	11.8	C
Total		3,380	3,372	99.8%	11.2	3.0	B

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	777	775	99.7%	24.4	3.7	C
	Right Turn						
	Subtotal	777	775	99.7%	24.4	3.7	C
SB	Left Turn						
	Through	133	141	105.8%	24.7	5.8	C
	Right Turn	1,265	1,316	104.0%	33.4	13.9	C
	Subtotal	1,398	1,457	104.2%	32.7	13.1	C
EB	Left Turn	572	576	100.7%	53.2	11.2	D
	Through						
	Right Turn	6	4	74.1%	14.3	13.8	B
	Subtotal	578	580	100.4%	52.9	11.1	D
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,753	2,812	102.1%	34.5	5.9	C

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 5 Lane + KHD Signal**
Volume and Delay by Movement | **PM Peak**

Intersection 7 | **Wasatch Blvd/Little Cottonwood Rd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	61	59	96.4%	72.9	22.2	E
	Through	272	273	100.5%	12.4	2.5	B
	Right Turn	33	33	99.3%	4.3	4.3	A
	Subtotal	366	365	99.7%	20.9	5.0	C
SB	Left Turn	39	40	102.0%	46.8	29.5	D
	Through	827	865	104.6%	75.2	25.0	E
	Right Turn	422	445	105.6%	122.4	68.0	F
	Subtotal	1,288	1,350	104.8%	88.9	37.2	F
EB	Left Turn	216	212	98.4%	52.0	9.6	D
	Through	78	81	104.3%	30.8	8.6	C
	Right Turn	83	81	97.9%	16.0	4.1	B
	Subtotal	377	375	99.5%	39.0	7.2	D
WB	Left Turn	117	125	106.5%	28.3	4.8	C
	Through	216	215	99.4%	28.2	3.1	C
	Right Turn	17	16	96.1%	25.0	13.6	C
	Subtotal	350	356	101.6%	28.1	2.8	C
Total		2,381	2,446	102.7%	62.7	21.1	E

Intersection 14 | **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	6	5	75.9%	61.3	32.0	E
	Through	1,271	1,266	99.6%	16.5	2.1	B
	Right Turn	28	29	102.0%	3.6	1.5	A
	Subtotal	1,305	1,299	99.5%	16.5	2.0	B
SB	Left Turn	128	129	100.7%	33.0	3.5	C
	Through	1,726	1,727	100.1%	3.5	1.2	A
	Right Turn	22	20	89.4%	2.7	1.8	A
	Subtotal	1,876	1,876	100.0%	5.7	1.2	A
EB	Left Turn	11	11	96.0%	66.2	21.5	E
	Through						
	Right Turn	11	9	84.8%	15.4	17.3	B
	Subtotal	22	20	90.4%	40.8	19.4	D
WB	Left Turn	11	11	102.0%	61.5	25.3	E
	Through						
	Right Turn	78	76	97.9%	8.3	0.5	A
	Subtotal	89	88	98.4%	15.2	4.7	B
Total		3,292	3,282	99.7%	10.5	1.0	B

Future (2050) Peak Hour LOS

Imbalanced Lanes Alternative

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance**
Volume and Delay by Movement | **AM Peak**

Intersection 1 | **SR-210/Ft Union** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	196	185	94.3%	25.7	2.7	C
	Through	1,308	1,285	98.2%	22.9	3.9	C
	Right Turn	169	156	92.4%	9.0	2.8	A
	Subtotal	1,673	1,626	97.2%	21.8	3.4	C
SB	Left Turn	382	374	97.9%	33.4	4.3	C
	Through	992	1,003	101.1%	11.7	2.6	B
	Right Turn	114	111	97.1%	3.7	1.2	A
	Subtotal	1,488	1,488	100.0%	16.7	2.4	B
EB	Left Turn	87	92	105.5%	49.3	8.7	D
	Through	223	219	98.3%	45.3	5.4	D
	Right Turn	174	173	99.6%	8.3	1.5	A
	Subtotal	484	484	100.0%	33.4	3.3	C
WB	Left Turn	22	25	111.6%	58.8	14.1	E
	Through	33	32	97.0%	43.9	11.4	D
	Right Turn	65	62	95.9%	4.7	1.1	A
	Subtotal	120	119	99.1%	26.6	6.0	C
Total		3,765	3,717	98.7%	21.5	2.2	C

Intersection 4 | **SR-210/Bengal Blvd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	5	5	95.6%	20.7	29.6	C
	Through	1,063	1,025	96.4%	36.7	13.1	D
	Right Turn	5	6	117.8%	27.8	20.0	C
	Subtotal	1,073	1,036	96.5%	36.7	13.0	D
SB	Left Turn	27	26	97.5%	100.4	90.3	F
	Through	916	928	101.3%	10.3	3.3	B
	Right Turn	136	136	100.3%	3.7	1.8	A
	Subtotal	1,079	1,091	101.1%	12.3	6.5	B
EB	Left Turn	491	486	99.0%	46.1	6.1	D
	Through	33	33	100.3%	32.7	6.4	C
	Right Turn	16	19	116.7%	4.1	1.8	A
	Subtotal	540	538	99.6%	43.4	5.8	D
WB	Left Turn	5	7	135.6%	36.1	35.2	D
	Through	27	30	110.7%	63.6	9.0	E
	Right Turn	87	82	94.3%	6.2	1.2	A
	Subtotal	119	119	99.7%	24.1	6.9	C
Total		2,811	2,784	99.0%	28.6	6.9	C

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	142	139	98.1%	11.0	2.5	B
	Through	992	957	96.5%	6.8	0.9	A
	Right Turn	5	4	86.7%	2.3	2.0	A
	Subtotal	1,139	1,101	96.7%	7.3	1.0	A
SB	Left Turn	16	18	109.7%	11.9	6.9	B
	Through	877	888	101.3%	8.6	3.4	A
	Right Turn	44	47	107.1%	4.8	2.4	A
	Subtotal	937	953	101.7%	8.5	3.3	A
EB	Left Turn	60	58	96.3%	32.5	4.4	C
	Through	5	5	95.6%	24.2	18.9	C
	Right Turn	207	209	101.2%	9.7	1.9	A
	Subtotal	272	272	100.0%	15.2	2.0	B
WB	Left Turn	16	17	109.0%	25.9	9.6	C
	Through	5	5	106.7%	22.1	17.4	C
	Right Turn	22	19	87.4%	12.6	4.3	B
	Subtotal	43	42	97.7%	20.6	4.5	C
Total		2,391	2,368	99.0%	9.0	1.8	A

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	327	290	88.7%	24.5	2.4	C
	Right Turn						
	Subtotal	327	290	88.7%	24.5	2.4	C
SB	Left Turn						
	Through	768	780	101.6%	34.3	6.3	C
	Right Turn	223	234	104.8%	5.0	1.6	A
	Subtotal	991	1,014	102.3%	27.4	5.5	C
EB	Left Turn	730	731	100.1%	22.0	2.6	C
	Through						
	Right Turn	98	102	104.2%	13.9	3.1	B
	Subtotal	828	833	100.6%	21.1	2.5	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,146	2,136	99.6%	24.5	3.3	C

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	93	93	99.9%	19.5	2.8	B
	Through	572	570	99.6%	19.0	2.9	B
	Right Turn	262	260	99.3%	14.1	2.6	B
	Subtotal	927	923	99.6%	17.7	2.6	B
SB	Left Turn	11	11	99.0%	36.2	21.8	D
	Through	44	48	109.1%	11.8	6.1	B
	Right Turn	44	45	102.5%	4.8	1.5	A
	Subtotal	99	104	105.1%	11.7	4.7	B
EB	Left Turn	131	129	98.6%	44.9	5.4	D
	Through	354	358	101.2%	42.7	3.7	D
	Right Turn	104	106	101.8%	9.1	2.1	A
	Subtotal	589	593	100.8%	37.8	3.5	D
WB	Left Turn	55	57	103.8%	58.9	15.3	E
	Through	93	86	93.0%	36.8	7.7	D
	Right Turn	60	62	103.1%	22.7	6.5	C
	Subtotal	208	205	98.8%	38.5	5.6	D
Total		1,823	1,826	100.2%	26.3	1.8	C

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	1,025	987	96.2%	2.1	0.1	A
	Right Turn	5	5	100.0%	1.9	1.4	A
	Subtotal	1,030	992	96.3%	2.1	0.1	A
SB	Left Turn	33	33	99.7%	6.5	1.9	A
	Through	1,068	1,082	101.3%	1.1	0.2	A
	Right Turn						
	Subtotal	1,101	1,115	101.2%	1.3	0.2	A
EB	Left Turn	11	11	100.0%	23.3	11.3	C
	Through						
	Right Turn	5	5	100.0%	6.4	2.6	A
	Subtotal	16	16	100.0%	15.9	6.7	C
WB	Left Turn	5	7	131.1%	10.5	7.4	B
	Through						
	Right Turn	104	101	96.8%	10.1	1.9	B
	Subtotal	109	107	98.4%	10.2	1.9	B
Total		2,256	2,229	98.8%	2.1	0.1	A

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance**
Volume and Delay by Movement | **PM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	198	183	92.4%	155.1	47.6	F
	Through	1,107	1,109	100.2%	30.8	12.2	C
	Right Turn	59	53	89.1%	6.3	3.5	A
	Subtotal	1,364	1,345	98.6%	44.3	14.1	D
SB	Left Turn	177	173	97.9%	39.0	7.5	D
	Through	1,728	1,733	100.3%	26.2	2.4	C
	Right Turn	134	135	100.5%	11.4	2.5	B
	Subtotal	2,039	2,041	100.1%	26.4	2.0	C
EB	Left Turn	150	149	99.2%	117.2	55.1	F
	Through	86	89	103.1%	51.7	12.5	D
	Right Turn	407	401	98.5%	40.8	13.5	D
	Subtotal	643	638	99.3%	59.1	14.9	E
WB	Left Turn	134	128	95.2%	62.4	13.5	E
	Through	134	134	100.1%	40.1	3.6	D
	Right Turn	348	353	101.4%	9.9	1.0	A
	Subtotal	616	614	99.7%	27.3	4.2	C
Total		4,662	4,639	99.5%	35.5	4.8	D

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	16	14	88.2%	52.3	23.1	D
	Through	1,122	1,116	99.5%	18.7	4.6	B
	Right Turn	11	11	100.0%	12.9	11.8	B
	Subtotal	1,149	1,142	99.4%	19.1	4.4	B
SB	Left Turn	91	89	98.3%	46.8	15.0	D
	Through	1,716	1,716	100.0%	22.6	3.4	C
	Right Turn	455	457	100.5%	17.7	3.1	B
	Subtotal	2,262	2,263	100.0%	22.6	3.5	C
EB	Left Turn	268	268	100.1%	50.1	4.9	D
	Through	37	33	90.1%	38.4	9.6	D
	Right Turn	11	11	99.0%	14.5	9.5	B
	Subtotal	316	312	98.9%	47.9	4.8	D
WB	Left Turn	5	5	104.4%	58.9	33.8	E
	Through	16	16	102.8%	61.0	17.1	E
	Right Turn	43	40	93.0%	6.8	2.5	A
	Subtotal	64	62	96.4%	26.0	4.7	C
Total		3,791	3,779	99.7%	23.9	3.3	C

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance**
Volume and Delay by Movement | **PM Peak**

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	250	254	101.5%	35.6	10.8	D
	Through	1,088	1,081	99.3%	14.0	6.3	B
	Right Turn	22	21	97.5%	10.9	8.1	B
	Subtotal	1,360	1,356	99.7%	18.0	7.0	B
SB	Left Turn	22	20	91.4%	30.8	18.6	C
	Through	1,665	1,667	100.1%	14.6	11.4	B
	Right Turn	44	48	109.8%	9.3	6.1	A
	Subtotal	1,731	1,735	100.3%	14.7	11.2	B
EB	Left Turn	39	36	92.3%	49.9	6.8	D
	Through	11	12	107.1%	46.4	27.9	D
	Right Turn	205	205	100.2%	18.8	5.3	B
	Subtotal	255	253	99.3%	25.6	4.9	C
WB	Left Turn	6	6	103.7%	54.0	24.1	D
	Through	6	6	94.4%	20.0	25.7	B
	Right Turn	22	20	91.4%	14.2	5.0	B
	Subtotal	34	32	94.1%	26.4	6.9	C
Total		3,380	3,376	99.9%	16.8	8.4	B

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	777	777	100.0%	21.6	2.7	C
	Right Turn						
	Subtotal	777	777	100.0%	21.6	2.7	C
SB	Left Turn						
	Through	133	141	105.8%	24.8	9.7	C
	Right Turn	1,265	1,320	104.3%	38.0	19.7	D
	Subtotal	1,398	1,461	104.5%	36.8	18.7	D
EB	Left Turn	572	574	100.4%	77.5	16.7	E
	Through						
	Right Turn	6	4	74.1%	50.8	30.5	D
	Subtotal	578	579	100.1%	77.4	16.8	E
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,753	2,816	102.3%	40.6	8.6	D

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance**
Volume and Delay by Movement | **PM Peak**

Intersection 7 | **Wasatch Blvd/Little Cottonwood Rd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	61	58	95.6%	69.6	37.2	E
	Through	272	273	100.3%	13.7	3.0	B
	Right Turn	33	33	99.0%	3.0	0.9	A
	Subtotal	366	364	99.4%	20.4	5.7	C
SB	Left Turn	39	40	103.7%	43.4	10.1	D
	Through	827	871	105.4%	67.3	13.8	E
	Right Turn	422	448	106.3%	88.1	31.4	F
	Subtotal	1,288	1,360	105.6%	73.0	18.4	E
EB	Left Turn	216	211	97.8%	61.8	11.7	E
	Through	78	82	104.8%	41.5	12.3	D
	Right Turn	83	81	98.0%	18.6	5.1	B
	Subtotal	377	374	99.3%	48.1	9.1	D
WB	Left Turn	117	124	106.4%	41.8	5.8	D
	Through	216	215	99.4%	34.5	5.1	C
	Right Turn	17	16	95.4%	34.3	8.2	C
	Subtotal	350	355	101.5%	37.0	4.2	D
Total		2,381	2,454	103.1%	56.4	10.4	E

Intersection 14 | **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** | **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	6	4	74.1%	1.9	2.6	A
	Through	1,271	1,264	99.5%	3.2	0.4	A
	Right Turn	28	28	101.2%	3.2	1.3	A
	Subtotal	1,305	1,297	99.4%	3.2	0.4	A
SB	Left Turn	128	129	100.8%	9.8	2.9	A
	Through	1,726	1,729	100.1%	2.4	0.3	A
	Right Turn	22	20	88.9%	2.7	0.7	A
	Subtotal	1,876	1,877	100.1%	2.9	0.4	A
EB	Left Turn	11	11	96.0%	37.6	12.5	E
	Through						
	Right Turn	11	9	84.8%	12.5	6.3	B
	Subtotal	22	20	90.4%	25.6	10.2	D
WB	Left Turn	11	11	102.0%	18.3	5.2	C
	Through						
	Right Turn	78	77	98.4%	11.6	3.8	B
	Subtotal	89	88	98.9%	12.4	2.9	B
Total		3,292	3,282	99.7%	3.4	0.3	A

Future (2050) Peak Hour LOS

Imbalanced Lanes Alternative

With Traffic Signal at Kings Hill Drive

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance + KHD Signal**
Volume and Delay by Movement | **AM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	196	185	94.3%	28.2	5.1	C
	Through	1,308	1,285	98.3%	23.0	4.3	C
	Right Turn	169	157	92.8%	9.6	1.7	A
	Subtotal	1,673	1,627	97.3%	22.2	3.8	C
SB	Left Turn	382	374	97.8%	34.4	5.8	C
	Through	992	1,003	101.1%	11.6	2.5	B
	Right Turn	114	111	97.1%	3.7	1.2	A
	Subtotal	1,488	1,488	100.0%	16.8	2.6	B
EB	Left Turn	87	92	105.5%	48.8	7.7	D
	Through	223	219	98.4%	45.2	5.2	D
	Right Turn	174	173	99.6%	8.1	1.4	A
	Subtotal	484	484	100.1%	33.2	3.1	C
WB	Left Turn	22	25	111.6%	59.2	14.2	E
	Through	33	32	97.0%	43.9	11.4	D
	Right Turn	65	62	95.9%	4.7	1.1	A
	Subtotal	120	119	99.1%	26.7	6.0	C
Total		3,765	3,718	98.7%	21.7	2.4	C

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	5	5	97.8%	27.3	38.3	C
	Through	1,063	1,027	96.6%	32.3	10.3	C
	Right Turn	5	6	120.0%	24.9	23.3	C
	Subtotal	1,073	1,037	96.7%	32.3	10.3	C
SB	Left Turn	27	26	97.9%	65.3	36.6	E
	Through	916	928	101.3%	9.9	2.5	A
	Right Turn	136	136	100.2%	3.7	1.6	A
	Subtotal	1,079	1,091	101.1%	10.7	3.1	B
EB	Left Turn	491	486	99.0%	46.1	6.1	D
	Through	33	33	100.3%	32.7	6.4	C
	Right Turn	16	19	116.7%	4.1	1.8	A
	Subtotal	540	538	99.6%	43.4	5.8	D
WB	Left Turn	5	7	135.6%	36.1	35.2	D
	Through	27	30	110.7%	63.6	9.0	E
	Right Turn	87	82	94.3%	6.6	1.5	A
	Subtotal	119	119	99.7%	24.4	6.8	C
Total		2,811	2,785	99.1%	26.3	4.8	C

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance + KHD Signal**
Volume and Delay by Movement | **AM Peak**

Intersection 5 | **SR-210/3500 E** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	142	139	98.2%	10.8	2.7	B
	Through	992	958	96.6%	6.0	0.5	A
	Right Turn	5	4	86.7%	3.2	2.6	A
	Subtotal	1,139	1,102	96.8%	6.6	0.7	A
SB	Left Turn	16	18	110.4%	16.1	8.0	B
	Through	877	888	101.2%	8.2	2.1	A
	Right Turn	44	47	107.1%	4.1	1.9	A
	Subtotal	937	953	101.7%	8.2	2.2	A
EB	Left Turn	60	58	96.5%	32.0	6.6	C
	Through	5	5	95.6%	16.4	16.0	B
	Right Turn	207	209	101.1%	9.8	1.4	A
	Subtotal	272	272	100.0%	15.2	2.6	B
WB	Left Turn	16	18	109.7%	29.7	8.9	C
	Through	5	5	106.7%	25.6	21.0	C
	Right Turn	22	19	87.4%	12.0	4.2	B
	Subtotal	43	42	97.9%	21.7	5.8	C
Total		2,391	2,369	99.1%	8.6	1.3	A

Intersection 6 | **SR-210/Wasatch Blvd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	327	290	88.7%	24.8	1.7	C
	Right Turn						
	Subtotal	327	290	88.7%	24.8	1.7	C
SB	Left Turn						
	Through	768	779	101.5%	33.4	6.1	C
	Right Turn	223	234	104.8%	4.8	1.4	A
	Subtotal	991	1,013	102.2%	26.7	5.1	C
EB	Left Turn	730	732	100.3%	23.6	1.7	C
	Through						
	Right Turn	98	102	104.0%	15.6	1.8	B
	Subtotal	828	834	100.7%	22.6	1.5	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,146	2,137	99.6%	24.8	2.8	C

Intersection 7 | **Wasatch Blvd/Little Cottonwood Rd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	93	93	99.9%	20.2	2.7	C
	Through	572	569	99.6%	19.7	3.0	B
	Right Turn	262	260	99.4%	14.6	2.9	B
	Subtotal	927	923	99.5%	18.3	2.7	B
SB	Left Turn	11	11	99.0%	36.5	23.9	D
	Through	44	48	109.3%	12.5	6.3	B
	Right Turn	44	45	102.8%	5.3	1.9	A
	Subtotal	99	104	105.3%	12.2	4.7	B
EB	Left Turn	131	129	98.1%	46.5	6.5	D
	Through	354	358	101.2%	43.0	2.8	D
	Right Turn	104	106	101.8%	9.3	1.6	A
	Subtotal	589	593	100.6%	38.3	3.2	D
WB	Left Turn	55	57	104.2%	55.5	10.0	E
	Through	93	87	93.1%	39.1	6.6	D
	Right Turn	60	62	103.3%	25.3	4.3	C
	Subtotal	208	206	99.0%	39.6	3.5	D
Total		1,823	1,826	100.1%	26.9	1.6	C

Intersection 14 | **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	1,025	987	96.3%	2.9	0.7	A
	Right Turn	5	5	100.0%	6.1	3.7	A
	Subtotal	1,030	992	96.3%	3.0	0.7	A
SB	Left Turn	33	33	99.0%	7.4	2.1	A
	Through	1,068	1,081	101.2%	1.4	0.4	A
	Right Turn						
	Subtotal	1,101	1,114	101.2%	1.6	0.4	A
EB	Left Turn	11	11	101.0%	64.4	18.0	E
	Through						
	Right Turn	5	5	100.0%	9.0	13.5	A
	Subtotal	16	16	100.7%	58.0	14.2	E
WB	Left Turn	5	7	133.3%	50.8	26.1	D
	Through						
	Right Turn	104	101	97.2%	9.2	1.2	A
	Subtotal	109	108	98.9%	12.2	2.8	B
Total		2,256	2,230	98.9%	3.2	0.5	A

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance + KHD Signal**
Volume and Delay by Movement | **PM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	198	184	93.0%	147.4	51.4	F
	Through	1,107	1,110	100.3%	32.6	30.4	C
	Right Turn	59	53	89.5%	7.0	4.0	A
	Subtotal	1,364	1,347	98.8%	45.7	32.2	D
SB	Left Turn	177	174	98.1%	43.5	11.3	D
	Through	1,728	1,734	100.4%	25.8	2.1	C
	Right Turn	134	135	100.4%	10.9	2.4	B
	Subtotal	2,039	2,043	100.2%	26.4	2.2	C
EB	Left Turn	150	149	99.5%	108.7	49.7	F
	Through	86	89	103.1%	49.2	14.2	D
	Right Turn	407	401	98.4%	39.3	13.0	D
	Subtotal	643	639	99.3%	55.7	13.2	E
WB	Left Turn	134	127	95.0%	63.0	15.0	E
	Through	134	134	100.1%	40.7	4.0	D
	Right Turn	348	353	101.4%	9.9	1.0	A
	Subtotal	616	614	99.7%	27.5	4.8	C
Total		4,662	4,642	99.6%	35.3	7.2	D

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	16	14	88.9%	46.7	22.1	D
	Through	1,122	1,114	99.3%	16.4	5.6	B
	Right Turn	11	11	100.0%	15.3	16.1	B
	Subtotal	1,149	1,139	99.1%	16.8	5.5	B
SB	Left Turn	91	89	98.2%	50.5	24.7	D
	Through	1,716	1,716	100.0%	23.8	4.2	C
	Right Turn	455	457	100.5%	19.3	4.1	B
	Subtotal	2,262	2,262	100.0%	24.0	4.7	C
EB	Left Turn	268	268	100.1%	50.1	4.9	D
	Through	37	33	90.1%	38.4	9.6	D
	Right Turn	11	11	101.0%	15.9	11.9	B
	Subtotal	316	313	98.9%	47.9	4.9	D
WB	Left Turn	5	5	104.4%	58.9	33.8	E
	Through	16	16	102.8%	61.0	17.1	E
	Right Turn	43	40	93.0%	6.8	2.4	A
	Subtotal	64	62	96.4%	26.1	5.1	C
Total		3,791	3,776	99.6%	24.1	4.4	C

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance + KHD Signal**
Volume and Delay by Movement | **PM Peak**

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	250	253	101.2%	33.5	17.2	C
	Through	1,088	1,082	99.4%	14.3	10.6	B
	Right Turn	22	21	97.0%	7.0	4.2	A
	Subtotal	1,360	1,356	99.7%	18.1	12.3	B
SB	Left Turn	22	20	91.9%	26.1	17.5	C
	Through	1,665	1,670	100.3%	19.3	9.5	B
	Right Turn	44	48	109.8%	13.0	8.2	B
	Subtotal	1,731	1,738	100.4%	19.2	9.4	B
EB	Left Turn	39	36	92.6%	53.5	13.3	D
	Through	11	12	107.1%	52.6	23.1	D
	Right Turn	205	205	100.2%	17.6	4.1	B
	Subtotal	255	253	99.3%	23.6	3.8	C
WB	Left Turn	6	6	101.9%	53.5	37.4	D
	Through	6	6	94.4%	43.9	24.2	D
	Right Turn	22	20	91.9%	19.5	11.1	B
	Subtotal	34	32	94.1%	31.9	14.6	C
Total		3,380	3,380	100.0%	19.2	9.4	B

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	777	775	99.7%	21.6	2.1	C
	Right Turn						
	Subtotal	777	775	99.7%	21.6	2.1	C
SB	Left Turn						
	Through	133	141	105.8%	23.5	10.0	C
	Right Turn	1,265	1,321	104.4%	37.4	10.8	D
	Subtotal	1,398	1,461	104.5%	36.1	10.5	D
EB	Left Turn	572	577	100.8%	80.2	11.1	F
	Through						
	Right Turn	6	4	74.1%	42.0	31.1	D
	Subtotal	578	581	100.5%	79.9	11.2	E
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,753	2,817	102.3%	41.0	5.2	D

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	61	58	95.6%	74.9	46.6	E
	Through	272	273	100.2%	13.7	2.5	B
	Right Turn	33	33	99.0%	2.9	0.9	A
	Subtotal	366	364	99.4%	21.1	6.7	C
SB	Left Turn	39	40	102.6%	43.4	13.3	D
	Through	827	866	104.7%	67.7	9.0	E
	Right Turn	422	445	105.5%	87.3	17.0	F
	Subtotal	1,288	1,351	104.9%	73.2	11.3	E
EB	Left Turn	216	211	97.5%	63.5	11.6	E
	Through	78	81	104.1%	40.5	8.4	D
	Right Turn	83	81	98.0%	18.1	5.8	B
	Subtotal	377	373	99.0%	48.6	7.1	D
WB	Left Turn	117	124	106.3%	43.8	5.5	D
	Through	216	215	99.5%	35.3	5.3	D
	Right Turn	17	16	95.4%	34.2	12.0	C
	Subtotal	350	355	101.6%	38.2	3.7	D
Total		2,381	2,443	102.6%	57.0	6.5	E

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	6	4	74.1%	23.9	17.6	C
	Through	1,271	1,265	99.5%	10.2	11.5	B
	Right Turn	28	28	101.2%	16.2	14.2	B
	Subtotal	1,305	1,298	99.5%	10.4	11.5	B
SB	Left Turn	128	129	101.1%	22.3	4.3	C
	Through	1,726	1,727	100.0%	8.0	5.7	A
	Right Turn	22	20	89.4%	15.9	7.9	B
	Subtotal	1,876	1,876	100.0%	9.0	5.4	A
EB	Left Turn	11	11	97.0%	46.0	33.0	D
	Through						
	Right Turn	11	9	84.8%	59.7	117.6	E
	Subtotal	22	20	90.9%	54.0	70.7	D
WB	Left Turn	11	11	102.0%	47.4	20.9	D
	Through						
	Right Turn	78	77	98.3%	18.6	10.9	B
	Subtotal	89	88	98.8%	21.9	9.1	C
Total		3,292	3,282	99.7%	10.3	5.5	B

Future (2050) Peak Hour LOS

Reversible Lane Alternative

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Reversable (NB)**
Volume and Delay by Movement | **AM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	196	184	94.1%	41.6	6.1	D
	Through	1,308	1,289	98.5%	19.1	1.8	B
	Right Turn	169	156	92.5%	9.4	1.5	A
	Subtotal	1,673	1,630	97.4%	20.5	1.8	C
SB	Left Turn	382	372	97.5%	44.7	11.8	D
	Through	992	1,003	101.1%	13.9	2.4	B
	Right Turn	114	111	97.1%	3.9	0.8	A
	Subtotal	1,488	1,486	99.9%	21.2	4.3	C
EB	Left Turn	87	92	105.6%	44.7	5.4	D
	Through	223	219	98.4%	45.1	6.1	D
	Right Turn	174	173	99.4%	8.1	2.0	A
	Subtotal	484	484	100.0%	32.2	3.1	C
WB	Left Turn	22	25	112.1%	57.4	10.9	E
	Through	33	32	97.3%	42.5	14.6	D
	Right Turn	65	62	95.9%	4.8	0.9	A
	Subtotal	120	119	99.3%	25.6	5.5	C
Total		3,765	3,719	98.8%	22.6	2.1	C

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	5	5	95.6%	32.8	37.1	C
	Through	1,063	1,029	96.8%	15.9	2.1	B
	Right Turn	5	6	122.2%	8.7	12.2	A
	Subtotal	1,073	1,040	96.9%	16.1	2.4	B
SB	Left Turn	27	27	98.4%	24.3	8.8	C
	Through	916	926	101.1%	15.7	5.1	B
	Right Turn	136	136	100.1%	2.4	0.8	A
	Subtotal	1,079	1,089	100.9%	14.2	4.4	B
EB	Left Turn	491	487	99.1%	46.4	5.9	D
	Through	33	33	100.3%	30.6	5.3	C
	Right Turn	16	19	116.7%	2.8	1.8	A
	Subtotal	540	539	99.7%	44.3	5.1	D
WB	Left Turn	5	7	137.8%	68.3	23.7	E
	Through	27	30	109.9%	55.0	13.7	D
	Right Turn	87	82	94.1%	7.0	2.1	A
	Subtotal	119	118	99.5%	24.9	3.3	C
Total		2,811	2,786	99.1%	21.7	2.8	C

Vissim Post-Processor **SR-210**
Average Results from 10 Runs **Weekday 2050 + 3 Lane Reversable (NB)**
Volume and Delay by Movement **AM Peak**

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	142	139	97.6%	27.8	13.9	C
	Through	992	960	96.8%	8.7	2.9	A
	Right Turn	5	0	0.0%	0.0	0.0	A
	Subtotal	1,139	1,099	96.5%	11.3	4.1	B
SB	Left Turn	16	17	107.6%	119.9	129.9	F
	Through	877	872	99.4%	65.9	64.0	E
	Right Turn	44	46	105.3%	41.8	53.2	D
	Subtotal	937	935	99.8%	65.2	63.3	E
EB	Left Turn	60	58	96.7%	64.6	6.6	E
	Through	5	5	100.0%	29.9	38.0	C
	Right Turn	207	210	101.6%	22.1	9.0	C
	Subtotal	272	273	100.4%	31.8	7.6	C
WB	Left Turn	16	18	109.7%	68.2	12.2	E
	Through	5	5	108.9%	64.4	40.6	E
	Right Turn	22	19	87.4%	26.3	21.1	C
	Subtotal	43	42	98.2%	54.2	15.6	D
Total		2,391	2,350	98.3%	36.0	27.5	D

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	327	293	89.6%	27.9	2.7	C
	Right Turn						
	Subtotal	327	293	89.6%	27.9	2.7	C
SB	Left Turn						
	Through	768	753	98.0%	202.8	40.1	F
	Right Turn	223	228	102.3%	172.0	42.1	F
	Subtotal	991	981	99.0%	195.0	40.0	F
EB	Left Turn	730	734	100.5%	55.9	4.2	E
	Through						
	Right Turn	98	102	104.3%	42.9	5.8	D
	Subtotal	828	836	101.0%	54.3	4.2	D
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,146	2,110	98.3%	116.8	19.3	F

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Reversable (NB)**
Volume and Delay by Movement | **AM Peak**

Intersection 7 | **Wasatch Blvd/Little Cottonwood Rd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	93	93	99.8%	19.2	6.2	B
	Through	572	571	99.8%	20.6	3.8	C
	Right Turn	262	261	99.5%	14.4	3.7	B
	Subtotal	927	924	99.7%	18.7	3.9	B
SB	Left Turn	11	10	90.9%	32.3	29.7	C
	Through	44	47	106.1%	18.9	8.2	B
	Right Turn	44	44	101.0%	6.8	1.7	A
	Subtotal	99	101	102.1%	16.5	3.8	B
EB	Left Turn	131	128	97.7%	43.4	5.8	D
	Through	354	357	100.9%	43.5	6.9	D
	Right Turn	104	106	101.8%	11.8	6.3	B
	Subtotal	589	591	100.4%	38.0	6.0	D
WB	Left Turn	55	57	102.8%	56.1	12.8	E
	Through	93	85	91.3%	37.3	8.0	D
	Right Turn	60	62	102.6%	26.4	10.6	C
	Subtotal	208	203	97.6%	39.5	9.0	D
Total		1,823	1,820	99.8%	26.8	2.7	C

Intersection 14 | **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** | **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	1,025	991	96.7%	0.9	1.2	A
	Right Turn	5	5	102.2%	1.7	1.4	A
	Subtotal	1,030	996	96.7%	0.9	1.2	A
SB	Left Turn	33	32	98.0%	24.2	19.7	C
	Through	1,068	1,060	99.3%	33.7	27.6	D
	Right Turn						
	Subtotal	1,101	1,092	99.2%	33.4	27.4	D
EB	Left Turn	11	11	99.0%	13.9	5.7	B
	Through						
	Right Turn	5	5	97.8%	49.2	71.7	E
	Subtotal	16	16	98.6%	25.5	20.6	D
WB	Left Turn	5	6	128.9%	86.5	189.6	F
	Through						
	Right Turn	104	101	96.8%	7.0	1.2	A
	Subtotal	109	107	98.3%	11.1	7.2	B
Total		2,256	2,211	98.0%	17.7	14.0	C

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	198	183	92.4%	155.1	47.6	F
	Through	1,107	1,109	100.2%	30.8	12.2	C
	Right Turn	59	53	89.1%	6.3	3.5	A
	Subtotal	1,364	1,345	98.6%	44.3	14.1	D
SB	Left Turn	177	173	97.9%	39.0	7.5	D
	Through	1,728	1,733	100.3%	26.2	2.4	C
	Right Turn	134	135	100.5%	11.4	2.5	B
	Subtotal	2,039	2,041	100.1%	26.4	2.0	C
EB	Left Turn	150	149	99.2%	117.2	55.1	F
	Through	86	89	103.1%	51.7	12.5	D
	Right Turn	407	401	98.5%	40.8	13.5	D
	Subtotal	643	638	99.3%	59.1	14.9	E
WB	Left Turn	134	128	95.2%	62.4	13.5	E
	Through	134	134	100.1%	40.1	3.6	D
	Right Turn	348	353	101.4%	9.9	1.0	A
	Subtotal	616	614	99.7%	27.3	4.2	C
Total		4,662	4,639	99.5%	35.5	4.8	D

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	16	14	88.2%	52.3	23.1	D
	Through	1,122	1,116	99.5%	18.7	4.6	B
	Right Turn	11	11	100.0%	12.9	11.8	B
	Subtotal	1,149	1,142	99.4%	19.1	4.4	B
SB	Left Turn	91	89	98.3%	46.8	15.0	D
	Through	1,716	1,716	100.0%	22.6	3.4	C
	Right Turn	455	457	100.5%	17.7	3.1	B
	Subtotal	2,262	2,263	100.0%	22.6	3.5	C
EB	Left Turn	268	268	100.1%	50.1	4.9	D
	Through	37	33	90.1%	38.4	9.6	D
	Right Turn	11	11	99.0%	14.5	9.5	B
	Subtotal	316	312	98.9%	47.9	4.8	D
WB	Left Turn	5	5	104.4%	58.9	33.8	E
	Through	16	16	102.8%	61.0	17.1	E
	Right Turn	43	40	93.0%	6.8	2.5	A
	Subtotal	64	62	96.4%	26.0	4.7	C
Total		3,791	3,779	99.7%	23.9	3.3	C

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	250	254	101.5%	35.6	10.8	D
	Through	1,088	1,081	99.3%	14.0	6.3	B
	Right Turn	22	21	97.5%	10.9	8.1	B
	Subtotal	1,360	1,356	99.7%	18.0	7.0	B
SB	Left Turn	22	20	91.4%	30.8	18.6	C
	Through	1,665	1,667	100.1%	14.6	11.4	B
	Right Turn	44	48	109.8%	9.3	6.1	A
	Subtotal	1,731	1,735	100.3%	14.7	11.2	B
EB	Left Turn	39	36	92.3%	49.9	6.8	D
	Through	11	12	107.1%	46.4	27.9	D
	Right Turn	205	205	100.2%	18.8	5.3	B
	Subtotal	255	253	99.3%	25.6	4.9	C
WB	Left Turn	6	6	103.7%	54.0	24.1	D
	Through	6	6	94.4%	20.0	25.7	B
	Right Turn	22	20	91.4%	14.2	5.0	B
	Subtotal	34	32	94.1%	26.4	6.9	C
Total		3,380	3,376	99.9%	16.8	8.4	B

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	777	777	100.0%	21.6	2.7	C
	Right Turn						
	Subtotal	777	777	100.0%	21.6	2.7	C
SB	Left Turn						
	Through	133	141	105.8%	24.8	9.7	C
	Right Turn	1,265	1,320	104.3%	38.0	19.7	D
	Subtotal	1,398	1,461	104.5%	36.8	18.7	D
EB	Left Turn	572	574	100.4%	77.5	16.7	E
	Through						
	Right Turn	6	4	74.1%	50.8	30.5	D
	Subtotal	578	579	100.1%	77.4	16.8	E
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,753	2,816	102.3%	40.6	8.6	D

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	61	58	95.6%	69.6	37.2	E
	Through	272	273	100.3%	13.7	3.0	B
	Right Turn	33	33	99.0%	3.0	0.9	A
	Subtotal	366	364	99.4%	20.4	5.7	C
SB	Left Turn	39	40	103.7%	43.4	10.1	D
	Through	827	871	105.4%	67.3	13.8	E
	Right Turn	422	448	106.3%	88.1	31.4	F
	Subtotal	1,288	1,360	105.6%	73.0	18.4	E
EB	Left Turn	216	211	97.8%	61.8	11.7	E
	Through	78	82	104.8%	41.5	12.3	D
	Right Turn	83	81	98.0%	18.6	5.1	B
	Subtotal	377	374	99.3%	48.1	9.1	D
WB	Left Turn	117	124	106.4%	41.8	5.8	D
	Through	216	215	99.4%	34.5	5.1	C
	Right Turn	17	16	95.4%	34.3	8.2	C
	Subtotal	350	355	101.5%	37.0	4.2	D
Total		2,381	2,454	103.1%	56.4	10.4	E

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	6	4	74.1%	1.9	2.6	A
	Through	1,271	1,264	99.5%	3.2	0.4	A
	Right Turn	28	28	101.2%	3.2	1.3	A
	Subtotal	1,305	1,297	99.4%	3.2	0.4	A
SB	Left Turn	128	129	100.8%	9.8	2.9	A
	Through	1,726	1,729	100.1%	2.4	0.3	A
	Right Turn	22	20	88.9%	2.7	0.7	A
	Subtotal	1,876	1,877	100.1%	2.9	0.4	A
EB	Left Turn	11	11	96.0%	37.6	12.5	E
	Through						
	Right Turn	11	9	84.8%	12.5	6.3	B
	Subtotal	22	20	90.4%	25.6	10.2	D
WB	Left Turn	11	11	102.0%	18.3	5.2	C
	Through						
	Right Turn	78	77	98.4%	11.6	3.8	B
	Subtotal	89	88	98.9%	12.4	2.9	B
Total		3,292	3,282	99.7%	3.4	0.3	A

Future (2050) Peak Hour LOS

Reversible Lane Alternative

With Traffic Signal at Kings Hill Drive

Vissim Post-Processor **SR-210**
Average Results from 10 Runs **Weekday 2050 + 3 Lane Reversable (NB) + KHD Signal**
Volume and Delay by Movement **AM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	196	183	93.5%	44.2	7.2	D
	Through	1,308	1,286	98.3%	16.6	2.4	B
	Right Turn	169	156	92.6%	7.4	2.2	A
	Subtotal	1,673	1,626	97.2%	19.2	2.3	B
SB	Left Turn	382	373	97.6%	40.7	9.4	D
	Through	992	1,003	101.1%	14.8	2.9	B
	Right Turn	114	111	97.0%	4.2	1.0	A
	Subtotal	1,488	1,487	99.9%	20.6	3.4	C
EB	Left Turn	87	92	105.6%	47.8	7.4	D
	Through	223	220	98.5%	46.9	5.7	D
	Right Turn	174	173	99.5%	8.2	2.3	A
	Subtotal	484	485	100.1%	33.1	3.5	C
WB	Left Turn	22	25	112.1%	56.4	21.2	E
	Through	33	32	97.3%	47.9	10.2	D
	Right Turn	65	62	95.9%	5.0	0.5	A
	Subtotal	120	119	99.3%	26.7	9.4	C
Total		3,765	3,716	98.7%	21.6	1.8	C

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	5	5	97.8%	32.7	30.9	C
	Through	1,063	1,026	96.5%	15.5	3.6	B
	Right Turn	5	6	120.0%	7.8	10.6	A
	Subtotal	1,073	1,037	96.7%	15.7	3.7	B
SB	Left Turn	27	26	97.9%	46.2	36.5	D
	Through	916	921	100.5%	29.5	30.7	C
	Right Turn	136	136	100.2%	4.4	5.1	A
	Subtotal	1,079	1,083	100.4%	26.8	27.7	C
EB	Left Turn	491	487	99.1%	46.4	5.9	D
	Through	33	33	100.3%	30.6	5.3	C
	Right Turn	16	19	116.7%	4.2	4.5	A
	Subtotal	540	539	99.7%	44.3	5.1	D
WB	Left Turn	5	7	137.8%	68.3	23.7	E
	Through	27	30	109.9%	55.0	13.7	D
	Right Turn	87	82	94.1%	6.7	1.5	A
	Subtotal	119	118	99.5%	24.7	3.1	C
Total		2,811	2,777	98.8%	26.5	11.9	C

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	142	139	97.9%	29.7	9.9	C
	Through	992	960	96.8%	9.0	4.9	A
	Right Turn	5	0	0.0%	0.0	0.0	A
	Subtotal	1,139	1,099	96.5%	11.8	4.9	B
SB	Left Turn	16	17	108.3%	126.3	107.1	F
	Through	877	855	97.5%	103.7	84.5	F
	Right Turn	44	45	103.0%	76.3	71.9	E
	Subtotal	937	918	98.0%	103.2	83.8	F
EB	Left Turn	60	58	97.0%	60.2	9.5	E
	Through	5	5	100.0%	17.3	27.4	B
	Right Turn	207	210	101.5%	19.4	9.9	B
	Subtotal	272	273	100.5%	28.2	7.9	C
WB	Left Turn	16	13	78.5%	50.3	30.1	D
	Through	5	5	91.1%	48.5	46.9	D
	Right Turn	22	16	73.2%	17.9	16.5	B
	Subtotal	43	33	77.3%	38.7	24.5	D
Total		2,391	2,323	97.2%	49.7	32.8	D

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	327	292	89.4%	27.4	3.9	C
	Right Turn						
	Subtotal	327	292	89.4%	27.4	3.9	C
SB	Left Turn						
	Through	768	754	98.2%	205.7	21.4	F
	Right Turn	223	228	102.2%	173.4	21.3	F
	Subtotal	991	982	99.1%	199.0	21.1	F
EB	Left Turn	730	737	100.9%	43.0	11.1	D
	Through						
	Right Turn	98	102	104.4%	30.1	9.2	C
	Subtotal	828	839	101.4%	41.4	10.8	D
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,146	2,114	98.5%	110.5	9.0	F

Vissim Post-Processor **SR-210**
Average Results from 10 Runs **Weekday 2050 + 3 Lane Reversable (NB) + KHD Signal**
Volume and Delay by Movement **AM Peak**

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	93	93	99.8%	19.1	6.3	B
	Through	572	571	99.9%	19.9	3.1	B
	Right Turn	262	261	99.5%	14.0	3.2	B
	Subtotal	927	925	99.8%	18.1	3.2	B
SB	Left Turn	11	10	91.9%	29.4	22.1	C
	Through	44	47	106.1%	15.9	4.5	B
	Right Turn	44	45	101.3%	5.3	1.8	A
	Subtotal	99	101	102.4%	13.6	1.9	B
EB	Left Turn	131	128	97.7%	44.0	5.9	D
	Through	354	357	101.0%	43.0	7.4	D
	Right Turn	104	106	101.7%	11.9	6.8	B
	Subtotal	589	591	100.4%	37.8	6.6	D
WB	Left Turn	55	57	103.4%	56.5	9.0	E
	Through	93	85	91.4%	35.4	4.1	D
	Right Turn	60	61	101.9%	23.5	8.8	C
	Subtotal	208	203	97.6%	38.2	4.5	D
Total		1,823	1,820	99.9%	26.3	2.3	C

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	1,025	992	96.8%	0.6	0.1	A
	Right Turn	5	5	102.2%	6.4	3.8	A
	Subtotal	1,030	997	96.8%	0.6	0.1	A
SB	Left Turn	33	32	97.3%	28.0	26.3	C
	Through	1,068	1,044	97.7%	29.6	29.0	C
	Right Turn						
	Subtotal	1,101	1,076	97.7%	29.5	28.8	C
EB	Left Turn	11	11	101.0%	45.7	24.8	D
	Through						
	Right Turn	5	5	97.8%	67.0	70.8	E
	Subtotal	16	16	100.0%	69.3	34.4	E
WB	Left Turn	5	7	133.3%	72.9	75.6	E
	Through						
	Right Turn	104	101	97.2%	6.8	0.8	A
	Subtotal	109	108	98.9%	12.2	5.6	B
Total		2,256	2,197	97.4%	15.9	14.4	B

Vissim Post-Processor **SR-210**
Average Results from 10 Runs **Weekday 2050 + 3 Lane Imbalance + KHD Signal**
Volume and Delay by Movement **PM Peak**

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	198	184	93.0%	147.4	51.4	F
	Through	1,107	1,110	100.3%	32.6	30.4	C
	Right Turn	59	53	89.5%	7.0	4.0	A
	Subtotal	1,364	1,347	98.8%	45.7	32.2	D
SB	Left Turn	177	174	98.1%	43.5	11.3	D
	Through	1,728	1,734	100.4%	25.8	2.1	C
	Right Turn	134	135	100.4%	10.9	2.4	B
	Subtotal	2,039	2,043	100.2%	26.4	2.2	C
EB	Left Turn	150	149	99.5%	108.7	49.7	F
	Through	86	89	103.1%	49.2	14.2	D
	Right Turn	407	401	98.4%	39.3	13.0	D
	Subtotal	643	639	99.3%	55.7	13.2	E
WB	Left Turn	134	127	95.0%	63.0	15.0	E
	Through	134	134	100.1%	40.7	4.0	D
	Right Turn	348	353	101.4%	9.9	1.0	A
	Subtotal	616	614	99.7%	27.5	4.8	C
Total		4,662	4,642	99.6%	35.3	7.2	D

Intersection 4 **SR-210/Bengal Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	16	14	88.9%	46.7	22.1	D
	Through	1,122	1,114	99.3%	16.4	5.6	B
	Right Turn	11	11	100.0%	15.3	16.1	B
	Subtotal	1,149	1,139	99.1%	16.8	5.5	B
SB	Left Turn	91	89	98.2%	50.5	24.7	D
	Through	1,716	1,716	100.0%	23.8	4.2	C
	Right Turn	455	457	100.5%	19.3	4.1	B
	Subtotal	2,262	2,262	100.0%	24.0	4.7	C
EB	Left Turn	268	268	100.1%	50.1	4.9	D
	Through	37	33	90.1%	38.4	9.6	D
	Right Turn	11	11	101.0%	15.9	11.9	B
	Subtotal	316	313	98.9%	47.9	4.9	D
WB	Left Turn	5	5	104.4%	58.9	33.8	E
	Through	16	16	102.8%	61.0	17.1	E
	Right Turn	43	40	93.0%	6.8	2.4	A
	Subtotal	64	62	96.4%	26.1	5.1	C
Total		3,791	3,776	99.6%	24.1	4.4	C

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance + KHD Signal**
Volume and Delay by Movement | **PM Peak**

Intersection 5 **SR-210/3500 E** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	250	253	101.2%	33.5	17.2	C
	Through	1,088	1,082	99.4%	14.3	10.6	B
	Right Turn	22	21	97.0%	7.0	4.2	A
	Subtotal	1,360	1,356	99.7%	18.1	12.3	B
SB	Left Turn	22	20	91.9%	26.1	17.5	C
	Through	1,665	1,670	100.3%	19.3	9.5	B
	Right Turn	44	48	109.8%	13.0	8.2	B
	Subtotal	1,731	1,738	100.4%	19.2	9.4	B
EB	Left Turn	39	36	92.6%	53.5	13.3	D
	Through	11	12	107.1%	52.6	23.1	D
	Right Turn	205	205	100.2%	17.6	4.1	B
	Subtotal	255	253	99.3%	23.6	3.8	C
WB	Left Turn	6	6	101.9%	53.5	37.4	D
	Through	6	6	94.4%	43.9	24.2	D
	Right Turn	22	20	91.9%	19.5	11.1	B
	Subtotal	34	32	94.1%	31.9	14.6	C
Total		3,380	3,380	100.0%	19.2	9.4	B

Intersection 6 **SR-210/Wasatch Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	777	775	99.7%	21.6	2.1	C
	Right Turn						
	Subtotal	777	775	99.7%	21.6	2.1	C
SB	Left Turn						
	Through	133	141	105.8%	23.5	10.0	C
	Right Turn	1,265	1,321	104.4%	37.4	10.8	D
	Subtotal	1,398	1,461	104.5%	36.1	10.5	D
EB	Left Turn	572	577	100.8%	80.2	11.1	F
	Through						
	Right Turn	6	4	74.1%	42.0	31.1	D
	Subtotal	578	581	100.5%	79.9	11.2	E
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,753	2,817	102.3%	41.0	5.2	D

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 3 Lane Imbalance + KHD Signal**
Volume and Delay by Movement | **PM Peak**

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	61	58	95.6%	74.9	46.6	E
	Through	272	273	100.2%	13.7	2.5	B
	Right Turn	33	33	99.0%	2.9	0.9	A
	Subtotal	366	364	99.4%	21.1	6.7	C
SB	Left Turn	39	40	102.6%	43.4	13.3	D
	Through	827	866	104.7%	67.7	9.0	E
	Right Turn	422	445	105.5%	87.3	17.0	F
	Subtotal	1,288	1,351	104.9%	73.2	11.3	E
EB	Left Turn	216	211	97.5%	63.5	11.6	E
	Through	78	81	104.1%	40.5	8.4	D
	Right Turn	83	81	98.0%	18.1	5.8	B
	Subtotal	377	373	99.0%	48.6	7.1	D
WB	Left Turn	117	124	106.3%	43.8	5.5	D
	Through	216	215	99.5%	35.3	5.3	D
	Right Turn	17	16	95.4%	34.2	12.0	C
	Subtotal	350	355	101.6%	38.2	3.7	D
Total		2,381	2,443	102.6%	57.0	6.5	E

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	6	4	74.1%	23.9	17.6	C
	Through	1,271	1,265	99.5%	10.2	11.5	B
	Right Turn	28	28	101.2%	16.2	14.2	B
	Subtotal	1,305	1,298	99.5%	10.4	11.5	B
SB	Left Turn	128	129	101.1%	22.3	4.3	C
	Through	1,726	1,727	100.0%	8.0	5.7	A
	Right Turn	22	20	89.4%	15.9	7.9	B
	Subtotal	1,876	1,876	100.0%	9.0	5.4	A
EB	Left Turn	11	11	97.0%	46.0	33.0	D
	Through						
	Right Turn	11	9	84.8%	59.7	117.6	E
	Subtotal	22	20	90.9%	54.0	70.7	D
WB	Left Turn	11	11	102.0%	47.4	20.9	D
	Through						
	Right Turn	78	77	98.3%	18.6	10.9	B
	Subtotal	89	88	98.8%	21.9	9.1	C
Total		3,292	3,282	99.7%	10.3	5.5	B

Future (2050) Peak Hour LOS

Roundabouts Alternative

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 4 Lane + Roundabouts**
Volume and Delay by Movement | **AM Peak**

Intersection 1 | **SR-210/Ft Union** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	196	121	61.5%	22.1	3.4	C
	Through	1,308	818	62.6%	15.3	2.7	B
	Right Turn	169	102	60.1%	7.7	1.2	A
	Subtotal	1,673	1,041	62.2%	15.5	2.1	B
SB	Left Turn	382	374	97.9%	18.9	3.0	B
	Through	992	1,003	101.1%	11.5	1.2	B
	Right Turn	114	111	97.0%	3.5	0.5	A
	Subtotal	1,488	1,488	100.0%	12.7	1.1	B
EB	Left Turn	87	92	105.9%	44.6	8.8	D
	Through	223	219	98.2%	45.0	4.7	D
	Right Turn	174	173	99.7%	8.2	1.8	A
	Subtotal	484	485	100.1%	32.3	3.1	C
WB	Left Turn	22	25	112.1%	57.5	16.9	E
	Through	33	32	96.6%	42.0	13.2	D
	Right Turn	65	62	95.9%	4.7	1.2	A
	Subtotal	120	119	99.1%	26.3	6.4	C
Total		3,765	3,132	83.2%	17.3	1.1	B

Intersection 4 | **SR-210/Bengal Blvd** | **Roundabout**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	5	2	42.2%	7.1	6.1	A
	Through	1,063	573	53.9%	8.5	1.7	A
	Right Turn	5	3	66.7%	5.6	7.8	A
	Subtotal	1,073	579	53.9%	8.5	1.7	A
SB	Left Turn	27	27	98.4%	7.0	3.0	A
	Through	916	927	101.2%	6.9	1.4	A
	Right Turn	136	136	99.8%	6.3	1.8	A
	Subtotal	1,079	1,089	100.9%	6.8	1.4	A
EB	Left Turn	491	327	66.6%	410.5	27.8	F
	Through	33	20	61.6%	418.4	61.9	F
	Right Turn	16	13	82.6%	365.5	143.0	F
	Subtotal	540	361	66.8%	410.6	28.3	F
WB	Left Turn	5	7	135.6%	9.2	10.2	A
	Through	27	30	111.9%	11.1	2.5	B
	Right Turn	87	82	94.8%	11.8	3.6	B
	Subtotal	119	119	100.4%	11.6	2.7	B
Total		2,811	2,148	76.4%	79.2	7.1	F

Intersection 5 **SR-210/3500 E** **Roundabout**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	142	74	51.8%	4.3	1.0	A
	Through	992	500	50.4%	3.3	0.5	A
	Right Turn	5	2	46.7%	0.8	1.1	A
	Subtotal	1,139	575	50.5%	3.4	0.5	A
SB	Left Turn	16	18	110.4%	6.1	2.4	A
	Through	877	883	100.6%	6.1	1.1	A
	Right Turn	44	47	107.8%	5.4	1.1	A
	Subtotal	937	948	101.2%	6.0	1.0	A
EB	Left Turn	60	58	96.7%	67.5	37.5	F
	Through	5	5	100.0%	44.2	42.7	E
	Right Turn	207	211	101.8%	68.5	32.0	F
	Subtotal	272	274	100.6%	68.3	33.0	F
WB	Left Turn	16	18	110.4%	8.1	3.5	A
	Through	5	5	104.4%	3.6	4.8	A
	Right Turn	22	19	87.4%	5.1	3.4	A
	Subtotal	43	42	97.9%	6.7	2.3	A
Total		2,391	1,839	76.9%	15.6	6.0	C

Intersection 6 **SR-210/Wasatch Blvd** **Roundabout**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	327	222	67.9%	7.4	1.3	A
	Right Turn						
	Subtotal	327	222	67.9%	7.4	1.3	A
SB	Left Turn						
	Through	768	774	100.7%	6.9	1.7	A
	Right Turn	223	232	104.0%	3.0	0.3	A
	Subtotal	991	1,006	101.5%	6.1	1.5	A
EB	Left Turn	730	258	35.3%	273.0	36.3	F
	Through						
	Right Turn	98	34	34.4%	262.7	39.6	F
	Subtotal	828	292	35.2%	272.0	36.2	F
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,146	1,519	70.8%	58.5	5.6	F

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 4 Lane + Roundabouts**
Volume and Delay by Movement | **AM Peak**

Intersection 7 | **Wasatch Blvd/Little Cottonwood Rd** | **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	93	16	17.1%	879.4	540.3	F
	Through	572	113	19.8%	1296.4	541.1	F
	Right Turn	262	50	19.2%	948.3	362.0	F
	Subtotal	927	180	19.4%	1185.1	487.4	F
SB	Left Turn	11	11	97.0%	13.9	12.8	B
	Through	44	48	108.1%	12.6	5.5	B
	Right Turn	44	45	103.0%	4.1	0.9	A
	Subtotal	99	104	104.6%	10.0	3.5	B
EB	Left Turn	131	115	88.0%	412.3	168.2	F
	Through	354	354	100.0%	197.7	120.2	F
	Right Turn	104	105	101.4%	138.0	104.7	F
	Subtotal	589	575	97.6%	230.5	128.5	F
WB	Left Turn	55	55	100.2%	53.9	13.4	D
	Through	93	80	86.0%	113.6	41.0	F
	Right Turn	60	61	102.0%	216.1	54.1	F
	Subtotal	208	196	94.4%	127.2	37.9	F
Total		1,823	1,054	57.8%	320.1	122.1	F

Intersection 14 | **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** | **Roundabout**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	1,025	463	45.2%	3.2	0.4	A
	Right Turn	5	2	42.2%	0.9	1.6	A
	Subtotal	1,030	465	45.1%	3.2	0.4	A
SB	Left Turn	33	33	100.0%	3.5	1.3	A
	Through	1,068	1,080	101.1%	3.3	0.2	A
	Right Turn						
	Subtotal	1,101	1,113	101.1%	3.3	0.2	A
EB	Left Turn	11	11	100.0%	6.5	5.3	A
	Through						
	Right Turn	5	5	97.8%	9.1	4.8	A
	Subtotal	16	16	99.3%	8.5	2.7	A
WB	Left Turn	5	7	131.1%	4.3	4.8	A
	Through						
	Right Turn	104	101	96.7%	5.4	1.9	A
	Subtotal	109	107	98.3%	5.3	1.8	A
Total		2,256	1,701	75.4%	3.4	0.2	A

Vissim Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

SR-210
Weekday 2050 + 4 Lane + Roundabouts
PM Peak

Intersection 1 **SR-210/Ft Union** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	198	128	64.8%	66.5	6.8	E
	Through	1,107	739	66.7%	15.6	2.5	B
	Right Turn	59	39	65.9%	4.4	1.8	A
	Subtotal	1,364	906	66.4%	22.8	2.6	C
SB	Left Turn	177	156	88.3%	307.2	24.0	F
	Through	1,728	1,495	86.5%	396.6	14.3	F
	Right Turn	134	112	83.7%	321.4	45.4	F
	Subtotal	2,039	1,764	86.5%	383.0	14.0	F
EB	Left Turn	150	150	100.2%	121.9	71.7	F
	Through	86	89	103.6%	69.5	66.6	E
	Right Turn	407	398	97.9%	70.1	87.9	E
	Subtotal	643	638	99.2%	83.6	78.4	F
WB	Left Turn	134	127	95.0%	73.5	20.6	E
	Through	134	134	100.1%	45.5	6.2	D
	Right Turn	348	353	101.3%	7.6	1.0	A
	Subtotal	616	614	99.7%	31.0	5.8	C
Total		4,662	3,921	84.1%	198.6	16.1	F

Intersection 4 **SR-210/Bengal Blvd** **Roundabout**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	16	11	71.5%	5.0	1.1	A
	Through	1,122	883	78.7%	3.0	0.3	A
	Right Turn	11	8	70.7%	2.9	1.3	A
	Subtotal	1,149	902	78.5%	3.1	0.3	A
SB	Left Turn	91	80	87.7%	131.6	7.5	F
	Through	1,716	1,532	89.3%	129.6	4.4	F
	Right Turn	455	404	88.9%	127.7	4.5	F
	Subtotal	2,262	2,016	89.1%	129.3	4.3	F
EB	Left Turn	268	26	9.5%	5777.3	411.4	F
	Through	37	4	10.5%	3256.7	3099.1	F
	Right Turn	11	1	9.1%	1240.1	2468.3	F
	Subtotal	316	30	9.6%	5787.4	389.9	F
WB	Left Turn	5	5	106.7%	8.1	6.6	A
	Through	16	17	104.2%	7.2	2.5	A
	Right Turn	43	40	93.3%	5.8	1.2	A
	Subtotal	64	62	97.0%	6.4	0.9	A
Total		3,791	3,011	79.4%	148.8	24.5	F

Vissim Post-Processor | **SR-210**
Average Results from 10 Runs | **Weekday 2050 + 4 Lane + Roundabouts**
Volume and Delay by Movement | **PM Peak**

Intersection 5 **SR-210/3500 E** **Roundabout**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	250	203	81.4%	4.9	0.7	A
	Through	1,088	868	79.7%	3.5	0.2	A
	Right Turn	22	18	80.8%	2.8	1.2	A
	Subtotal	1,360	1,089	80.1%	3.8	0.3	A
SB	Left Turn	22	18	82.3%	26.7	19.1	D
	Through	1,665	1,475	88.6%	30.4	19.4	D
	Right Turn	44	44	99.7%	34.0	22.6	D
	Subtotal	1,731	1,537	88.8%	30.5	19.5	D
EB	Left Turn	39	13	32.8%	1899.7	246.0	F
	Through	11	3	30.3%	421.3	847.2	F
	Right Turn	205	65	31.9%	1916.2	240.3	F
	Subtotal	255	81	31.9%	1910.4	239.6	F
WB	Left Turn	6	6	101.9%	15.6	5.9	C
	Through	6	6	94.4%	9.4	10.2	A
	Right Turn	22	20	90.9%	11.7	4.1	B
	Subtotal	34	32	93.5%	12.8	3.7	B
Total		3,380	2,739	81.0%	79.4	17.4	F

Intersection 6 **SR-210/Wasatch Blvd** **Roundabout**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	777	491	63.2%	718.6	55.7	F
	Right Turn						
	Subtotal	777	491	63.2%	718.6	55.7	F
SB	Left Turn						
	Through	133	112	84.3%	4.7	3.1	A
	Right Turn	1,265	1,095	86.5%	33.3	19.7	D
	Subtotal	1,398	1,207	86.3%	30.7	18.3	D
EB	Left Turn	572	578	101.1%	9.2	1.3	A
	Through						
	Right Turn	6	4	74.1%	5.1	5.9	A
	Subtotal	578	583	100.8%	9.2	1.2	A
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,753	2,280	82.8%	178.2	13.2	F

Intersection 7 **Wasatch Blvd/Little Cottonwood Rd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	61	59	97.1%	65.9	21.4	E
	Through	272	273	100.2%	13.3	2.4	B
	Right Turn	33	33	99.0%	4.2	1.0	A
	Subtotal	366	365	99.6%	21.8	6.4	C
SB	Left Turn	39	36	91.5%	20.5	6.9	C
	Through	827	719	87.0%	27.0	8.0	C
	Right Turn	422	365	86.4%	20.0	8.1	C
	Subtotal	1,288	1,120	86.9%	24.5	7.8	C
EB	Left Turn	216	218	101.0%	35.3	14.3	D
	Through	78	82	104.6%	17.7	7.2	B
	Right Turn	83	81	98.0%	9.7	2.6	A
	Subtotal	377	381	101.1%	26.0	10.1	C
WB	Left Turn	117	96	82.3%	18.7	2.2	B
	Through	216	165	76.2%	16.5	2.3	B
	Right Turn	17	13	77.1%	11.2	5.3	B
	Subtotal	350	274	78.3%	17.1	1.5	B
Total		2,381	2,140	89.9%	23.2	5.2	C

Intersection 14 **Wasatch Blvd-Little Cottonwood Rd/Kings Hill Dr** **Roundabout**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	6	5	77.8%	5.8	5.3	A
	Through	1,271	1,000	78.7%	6.0	0.9	A
	Right Turn	28	25	87.7%	5.6	2.4	A
	Subtotal	1,305	1,030	78.9%	6.0	1.0	A
SB	Left Turn	128	108	84.3%	5.5	0.7	A
	Through	1,726	1,425	82.6%	5.1	0.7	A
	Right Turn	22	17	76.3%	5.4	1.6	A
	Subtotal	1,876	1,550	82.6%	5.1	0.7	A
EB	Left Turn	11	11	96.0%	29.3	16.3	D
	Through						
	Right Turn	11	10	86.9%	38.2	20.2	E
	Subtotal	22	20	91.4%	33.8	15.0	D
WB	Left Turn	11	11	102.0%	14.6	6.8	B
	Through						
	Right Turn	78	76	97.6%	16.5	4.5	C
	Subtotal	89	87	98.1%	16.4	4.4	C
Total		3,292	2,687	81.6%	6.1	0.6	A

Attachment B. Link Characteristics for the Gravel Pit Mobility Hub

Link ID	Vehicle Activity	Speed (mph)	January AM Peak Traffic Numbers	January Midday Traffic Numbers	January PM Peak Traffic Numbers	January Overnight Traffic Numbers	Travel Type	Link Length (meters)
6	Bus only	2.5	12	6	12	0	Queue	39.6
9	Bus only	15	12	6	12	0	Accel/decel	40.0
14	Full fleet	50	282	469	1,289	168	Free flow	171.2
16	Light duty + buses	40	17	26	72	5	Accel/decel	86.3
18	Light-duty only	25	45	180	540	45	Accel/decel	81.3
20	Light-duty only	10	540	180	45	45	Accel/decel	48.4
21	Light-duty only	10	600	200	50	50	Accel/decel	40.4
22	Light-duty only	30	540	180	45	45	Accel/decel	73.2
25	Light duty + buses	2.5	72	26	17	5	Queue	31.8
29	Light-duty only	2.5	50	200	600	50	Queue	39.9
31	Light duty + buses	30	72	26	17	5	Accel/decel	64.4
32	Light-duty only	15	540	180	45	45	Queue	38.1
35	Full fleet	50	1,022	409	700	107	Free flow	106.8
58	Light-duty only	10	45	180	540	45	Accel/decel	12.1
60	Bus only	2.5	12	6	12	0	Queue	40.3
61	Light-duty only	2.5	612	206	62	50	Queue	40.2
62	Light-duty only	15	300	100	25	25	Accel/decel	74.7
63	Light-duty only	10	25	100	300	25	Accel/decel	14.6
64	Light-duty only	10	50	200	600	50	Accel/decel	40.3
65	Light-duty only	10	25	100	300	25	Accel/decel	38.8
66	Light-duty only	2.5	25	100	300	25	Queue	41.3
67	Light-duty only	15	25	100	300	25	Free flow	49.0
68	Light-duty only	2.5	25	100	300	25	Queue	28.1
69	Full fleet	50	282	469	1,289	168	Free flow	76.1
70	Full fleet	50	282	469	1,289	168	Free flow	108.3
71	Full fleet	50	1,022	409	700	107	Free flow	165.5
72	Full fleet	50	1,022	409	700	107	Free flow	98.8
73	Light-duty only	40	45	180	540	45	Accel/decel	66.7
74	Bus only	15	12	6	12	0	Accel/decel	114.2
75	Bus only	15	12	6	12	0	Accel/decel	74.0
77	Light-duty only	15	300	100	25	25	Free flow	98.0
78	Light-duty only	15	300	100	25	25	Free flow	31.1
79	Light-duty only	15	300	100	25	25	Free flow	103.1
80	Light-duty only	15	25	100	300	25	Free flow	140.2

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Link ID	Vehicle Activity	Speed (mph)	January AM Peak Traffic Numbers	January Midday Traffic Numbers	January PM Peak Traffic Numbers	January Overnight Traffic Numbers	Travel Type	Link Length (meters)
81	Light-duty only	15	25	100	300	25	Free flow	21.9
82	Light-duty only	10	300	100	25	25	Accel/decel	73.3
83	Light-duty only	15	25	100	300	25	Accel/decel	98.4
84	Light-duty only	10	25	100	300	25	Accel/decel	12.5
85	Light-duty only	10	300	100	25	25	Accel/decel	16.1
86	Light-duty only	15	300	100	25	25	Accel/decel	26.8
87	Light-duty only	15	300	100	25	25	Accel/decel	114.5
88	Light-duty only	2.5	300	100	25	25	Queue	24.0
89	Light-duty only	10	25	100	300	25	Accel/decel	122.2
90	Light-duty only	2.5	25	100	300	25	Queue	15.7
91	Light-duty only	10	25	100	300	25	Accel/decel	13.0
92	Light-duty only	10	300	100	25	25	Accel/decel	17.2
93	Light-duty only	10	275	100	0	25	Accel/decel	32.4
94	Light-duty only	10	275	100	0	25	Accel/decel	28.9
95	Light-duty only	10	0	100	275	25	Accel/decel	29.7
96	Light-duty only	2.5	0	100	275	25	Queue	32.3
97	Light-duty only	10	275	100	0	25	Accel/decel	13.3
98	Light-duty only	10	0	100	275	25	Accel/decel	8.7
99	Light-duty only	10	275	100	0	25	Accel/decel	20.9
100	Light-duty only	10	0	100	275	25	Accel/decel	25.7
101	Light-duty only	10	0	100	275	25	Accel/decel	5.4
102	Light-duty only	10	275	100	0	25	Accel/decel	4.6
103	Light-duty only	2.5	300	100	25	25	Queue	24.8
104	Light-duty only	2.5	25	100	300	25	Queue	25.2
105	Light-duty only	2.5	300	100	25	25	Queue	31.3
106	Light-duty only	10	300	100	25	25	Accel/decel	37.2
107	Light-duty only	15	25	100	300	25	Accel/decel	30.1
108	Light-duty only	10	25	100	300	25	Accel/decel	34.6
109	Light-duty only	10	300	100	25	25	Accel/decel	17.0
111	Light-duty only	10	300	100	25	25	Accel/decel	31.2
112	Light-duty only	15	5	20	60	5	Accel/decel	48.9
114	Light-duty only	10	12	6	12	0	Accel/decel	48.5
115	Light-duty only	10	72	26	17	5	Accel/decel	12.2
117	Light-duty only	10	540	180	45	45	Accel/decel	28.6

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Link ID	Vehicle Activity	Speed (mph)	January AM Peak Traffic Numbers	January Midday Traffic Numbers	January PM Peak Traffic Numbers	January Overnight Traffic Numbers	Travel Type	Link Length (meters)
118	Light-duty only	20	5	20	60	5	Accel/decel	28.3
119	Light duty + buses	30	17	26	72	5	Accel/decel	80.3
120	Bus only	15	12	6	12	0	Accel/decel	20.4
122	Light-duty only	10	25	100	300	25	Accel/decel	75.8
123	Light-duty only	15	300	100	25	25	Free flow	28.3
124	Light-duty only	15	300	100	25	25	Free flow	139.2
125	Light-duty only	15	25	100	300	25	Free flow	225.5
127	Light-duty only	15	300	100	25	25	Accel/decel	22.7
128	Light-duty only	15	300	100	25	25	Accel/decel	161.1
129	Light-duty only	2.5	300	100	25	25	Queue	41.7
130	Light-duty only	15	25	100	300	25	Accel/decel	193.8
131	Light-duty only	2.5	25	100	300	25	Queue	16.1
132	Light-duty only	2.5	25	100	300	25	Queue	17.5
133	Light-duty only	10	25	100	300	25	Accel/decel	17.8
134	Light-duty only	10	300	100	25	25	Accel/decel	12.2
135	Light-duty only	10	275	100	0	25	Accel/decel	75.4
136	Light-duty only	10	275	100	0	25	Accel/decel	12.1
137	Light-duty only	10	0	100	275	25	Accel/decel	10.8
138	Light-duty only	15	0	100	275	25	Accel/decel	48.7
139	Light-duty only	10	0	100	275	25	Accel/decel	20.2
140	Light-duty only	10	275	100	0	25	Accel/decel	14.0
141	Light-duty only	2.5	0	100	275	25	Queue	25.2
142	Bus only	10	12	6	12	0	Accel/decel	26.7
143	Bus only	2.5	12	6	12	0	Queue	105.4
144	Bus only	10	12	6	12	0	Accel/decel	23.0
145	Bus only	10	12	6	12	0	Accel/decel	24.1
146	Bus only	2.5	12	6	12	0	Queue	103.0
147	Bus only	10	12	6	12	0	Accel/decel	28.4
148	Light-duty only	2.5	300	100	25	25	Queue	40.1
149	Light-duty only	10	300	100	25	25	Accel/decel	47.7
150	Light-duty only	2.5	25	0	25	0	Queue	67.8
151	Light-duty only	15	25	0	25	0	Free flow	71.4
152	Light-duty only	2.5	25	0	25	0	Free flow	169.3
153	Light-duty only	10	25	0	25	0	Accel/decel	21.1

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Link ID	Vehicle Activity	Speed (mph)	January AM Peak Traffic Numbers	January Midday Traffic Numbers	January PM Peak Traffic Numbers	January Overnight Traffic Numbers	Travel Type	Link Length (meters)
154	Light-duty only	15	25	0	25	0	Accel/decel	23.4
155	Light-duty only	15	25	0	25	0	Accel/decel	50.6
161	Light-duty only	10	25	0	25	0	Accel/decel	43.5
164	Light-duty only	10	25	0	25	0	Accel/decel	22.9
165	Light-duty only	2.5	25	0	25	0	Queue	21.5
166	Light-duty only	10	25	0	25	0	Accel/decel	23.5
169	Light-duty only	10	25	0	25	0	Accel/decel	7.5
170	Light-duty only	15	25	0	25	0	Accel/decel	9.7
171	Light-duty only	10	25	0	25	0	Accel/decel	10.8
172	Light-duty only	10	25	0	25	0	Accel/decel	10.3
177	Light-duty only	15	25	0	25	0	Free flow	78.3
178	Light-duty only	15	25	0	25	0	Free flow	86.2
179	Light-duty only	2.5	25	0	25	0	Queue	68.4
180	Light-duty only	10	25	0	25	0	Accel/decel	10.3
181	Light-duty only	10	25	0	25	0	Accel/decel	14.1
183	Light-duty only	10	25	0	25	0	Accel/decel	13.0
189	Light-duty only	15	25	0	25	0	Free flow	30.9
190	Light-duty only	15	25	0	25	0	Free flow	10.7
191	Light-duty only	15	25	0	25	0	Free flow	43.4
193	Light-duty only	15	25	0	25	0	Free flow	9.6
194	Light-duty only	10	25	0	25	0	Accel/decel	7.2
195	Light-duty only	15	25	0	25	0	Free flow	25.0
196	Light-duty only	10	25	0	25	0	Accel/decel	6.2
197	Light-duty only	15	25	0	25	0	Free flow	32.9
198	Light-duty only	10	25	0	25	0	Accel/decel	5.6
199	Light-duty only	15	25	0	25	0	Free flow	43.5
200	Light-duty only	15	25	0	25	0	Free flow	26.9
201	Light-duty only	10	25	0	25	0	Accel/decel	5.4
202	Light-duty only	15	25	0	25	0	Free flow	18.8
203	Light-duty only	15	300	100	25	25	Accel/decel	20.6
204	Light duty + buses	15	72	26	17	5	Accel/decel	55.2
205	Full fleet	50	1,067	589	1,240	152	Free flow	25.9
206	Bus only	10	12	6	12	0	Accel/decel	18.1
207	Light-duty only	5	275	100	0	25	Parking garage	96.8

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Link ID	Vehicle Activity	Speed (mph)	January AM Peak Traffic Numbers	January Midday Traffic Numbers	January PM Peak Traffic Numbers	January Overnight Traffic Numbers	Travel Type	Link Length (meters)
208	Light-duty only	5	0	100	275	25	Parking garage	96.2
209	Light-duty only	5	275	100	0	25	Parking garage	94.7
210	Light-duty only	5	0	100	275	25	Parking garage	96.2
211	Light-duty only	5	275	100	0	25	Parking garage	47.7
212	Light-duty only	5	0	100	275	25	Parking garage	46.0
213	Light-duty only	5	275	100	0	25	Parking garage	96.0
214	Light-duty only	5	0	100	275	25	Parking garage	95.6
215	Light-duty only	5	275	100	0	25	Parking garage	97.3
216	Light-duty only	5	0	100	275	25	Parking garage	97.5
217	Light-duty only	5	275	100	0	25	Parking garage	49.0
218	Light-duty only	5	0	100	275	25	Parking garage	46.5
219	Light-duty only	2.5	540	180	45	45	Queue	36.5
223	Bus only	0	1	1	1	0	Bus stop	12.2
224	Bus only	0	1	1	1	0	Bus stop	12.2
225	Bus only	0	1	1	1	0	Bus stop	12.2
226	Bus only	0	1	1	1	0	Bus stop	12.2
227	Bus only	0	1	1	1	0	Bus stop	12.2
228	Bus only	0	1	1	1	0	Bus stop	12.2
229	Bus only	0	1	1	1	0	Bus stop	12.2
230	Bus only	0	1	1	1	0	Bus stop	12.2
232	Light-duty only	5	275	100	0	25	Parking garage	23.3
233	Light-duty only	5	275	100	0	25	Parking garage	22.6
234	Light-duty only	5	275	100	0	25	Parking garage	23.3
235	Light-duty only	5	275	100	0	25	Parking garage	22.6
236	Light-duty only	5	0	100	275	25	Parking garage	22.9
237	Light-duty only	5	0	100	275	25	Parking garage	22.3
238	Light-duty only	5	0	100	275	25	Parking garage	22.9
239	Light-duty only	5	0	100	275	25	Parking garage	22.3
240	Light-duty only	5	275	100	0	25	Parking garage	22.3
241	Light-duty only	5	275	100	0	25	Parking garage	22.2
242	Light-duty only	5	275	100	0	25	Parking garage	23.3
243	Light-duty only	5	275	100	0	25	Parking garage	22.2
244	Light-duty only	5	0	100	275	25	Parking garage	23.3
245	Light-duty only	5	0	100	275	25	Parking garage	22.3

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Link ID	Vehicle Activity	Speed (mph)	January AM Peak Traffic Numbers	January Midday Traffic Numbers	January PM Peak Traffic Numbers	January Overnight Traffic Numbers	Travel Type	Link Length (meters)
246	Light-duty only	5	0	100	275	25	Parking garage	23.3
247	Light-duty only	5	0	100	275	25	Parking garage	22.3
500	Light-duty only (plus 24 buses parked overnight)	0	1,500	200	1,500	50	Parking structure	0.0

Attachment C. Link Characteristics for the Gondola Base Station

Link ID	Vehicle Activity	Speed (mph)	January AM Peak Traffic Numbers	January Midday Traffic Numbers	January PM Peak Traffic Numbers	January Overnight Traffic Numbers	Travel Type	Link Length (meters)
1	Bus only	15	24	12	24	0	Accel/decel	10.9
2	Bus only	15	12	6	12	0	Accel/decel	26.0
3	Full fleet	40	117	185	513	54	Free flow	110.5
4	Full fleet	20	513	208	117	46	Accel/decel	45.0
5	Full fleet	2.5	92	160	488	29	Queue	30.2
7	Bus only	15	12	6	12	0	Accel/decel	17.7
8	Full fleet	20	92	160	488	29	Accel/decel	42.0
10	Bus only	15	24	12	24	0	Accel/decel	92.9
11	Full fleet	25	117	185	513	54	Accel/decel	55.7
12	Bus only	15	12	6	12	0	Accel/decel	14.1
13	Full fleet	20	92	160	488	29	Accel/decel	27.5
15	Bus only	2.5	12	6	12	0	Queue	45.0
17	Full fleet	40	513	208	117	46	Free flow	106.7
19	Bus only	2.5	24	12	24	0	Queue	36.2
23	Bus only	15	24	12	24	0	Accel/decel	16.8
24	Full fleet	20	25	25	25	25	Accel/decel	15.9
26	Full fleet	25	25	25	25	25	Accel/decel	26.2
27	Full fleet	2.5	37	31	37	25	Queue	29.9
28	Bus only	2.5	24	12	24	0	Queue	56.8
30	Full fleet	40	1190	442	200	51	Free flow	247.5
33	Bus only	25	12	6	12	0	Accel/decel	21.7
34	Full fleet	40	157	262	751	68	Free flow	160.9
36	Full fleet	25	476	177	80	21	Accel/decel	78.1
37	Full fleet	2.5	476	177	80	21	Queue	29.6
38	Full fleet	40	751	296	157	56	Free flow	141.1
39	Full fleet	40	714	265	120	31	Free flow	72.3
40	Full fleet	40	714	265	120	31	Free flow	109.6
41	Full fleet	40	200	384	1190	71	Free flow	209.7
42	Full fleet	40	132	237	726	43	Free flow	44.5
43	Full fleet	40	132	237	726	43	Free flow	42.8
44	Full fleet	15	92	160	488	29	Accel/decel	14.3
45	Full fleet	30	25	25	25	25	Accel/decel	18.5
46	Full fleet	2.5	513	208	117	46	Queue	13.3
47	Full fleet	15	476	177	80	21	Accel/decel	8.2

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Link ID	Vehicle Activity	Speed (mph)	January AM Peak Traffic Numbers	January Midday Traffic Numbers	January PM Peak Traffic Numbers	January Overnight Traffic Numbers	Travel Type	Link Length (meters)
48	Full fleet	30	476	177	80	21	Accel/decel	55.9
50	Bus only	15	24	12	24	0	Accel/decel	13.9
51	Full fleet	40	157	262	751	68	Free flow	46.6
52	Full fleet	40	224	396	1,214	71	Free flow	41.2
53	Full fleet	40	739	290	145	56	Free flow	39.3
54	Bus only	15	24	12	24	0	Accel/decel	13.6
55	Bus only	15	24	12	24	0	Accel/decel	29.4
56	Bus only	15	24	12	24	0	Accel/decel	9.5
57	Full fleet	40	224	396	1,214	71	Free flow	63.0
220	Bus only	0	1	1	1	0	Bus stop	12.2
221	Bus only	0	1	1	1	0	Bus stop	12.2
222	Bus only	0	1	1	1	0	Bus stop	12.2

Attachment D. Variable Emission Generator Methodology

To create an air dispersion modeling analysis that uses temporally varying emission rates for each source of emissions, variable emissions keywords were used in the SO pathway of the AERMOD input files. A Microsoft Excel workbook was used to generate the appropriate text to be added into the input file for each AERMOD run.

List of Steps for Variable Emission File

1. Each MOVES output file was added to a separate tab of an Excel workbook (2 pollutants × 4 times of day = 8 tabs of output data).
2. In each of the summary tabs, four columns were created for each period of the day (AM, midday, PM, and overnight). Cells under these columns reference the corresponding MOVES output tab to produce emission rates in grams per second (g/s) for each linkID for each period of the day.
3. To create a daily profile of emission factors by hour, 24 columns were created and separated by the period of the day. Each cell in these columns references the emission factor corresponding to the appropriate link and period of the day from the four columns described in step 2. The time of day was divided as follows:
    a. Hours 1–6: Overnight
    b. Hours 7–9: AM peak
    c. Hours 10–14: Midday
    d. Hours 15–17: PM peak
    e. Hours 18–24: Overnight
4. To create text that could be added to an AERMOD input file, a concatenate function was used to string together the keyword “EMISFACT”, the link/sourceID, “HROFDY”, and the 24 cells of g/s emission rates.
5. The resulting lines of text were copied from the workbook and pasted into an AERMOD input file that had emission rates of 1 g/s assigned to each source. Area source emission rates of 1.0 g/s were divided by the area of the source to produce values in units of grams per second per square meter (g/sec-m^2).
6. An input file was produced in the Lakes Environmental’s AERMOD View (version 9.8.3), and file paths were updated to reference the appropriate folders for receptor files, meteorological data, and the output pathway.