Chapter 2: Alternatives

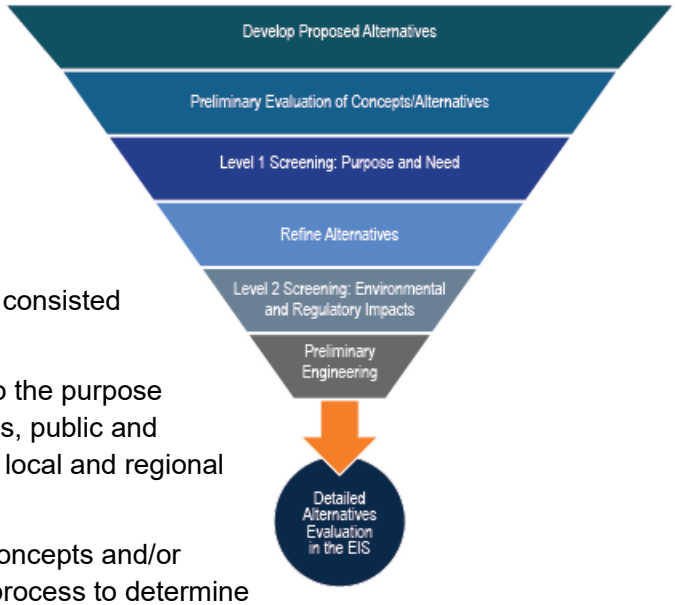
2.1 Introduction

This chapter describes the alternatives that were considered for meeting the purpose of and need for the State Route (S.R.) 210 Project as described in Section 1.2.1, Purpose of the Project, in Chapter 1, Purpose and Need. This chapter describes the alternatives that were developed during the scoping process and as part of public engagement opportunities, reviews the alternatives that were eliminated from further study through the alternatives screening process, describes the No-Action Alternative and the action alternatives that were carried forward for further study in this Environmental Impact Statement (EIS), and summarizes the advantages and disadvantages of the No-Action and action alternatives.

2.2 Alternatives Development and Screening Process

Figure 2.2-1 presents an overview of the alternatives development and screening process. This section provides a summary overview of the alternatives development and screening process as documented in the *Draft Alternatives Development and Screening Report* and the *Draft Alternatives Development and Screening Report Addendum* (UDOT 2020a, 2020b) (see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020).

Figure 2.2-1. Overview of the S.R. 210 Alternatives Development and Screening Process



The alternatives development and screening process consisted of these phases:

1. Develop proposed alternatives that respond to the purpose and need statement based on previous studies, public and agency input during the scoping process, and local and regional land use and transportation plans.
2. Conduct a preliminary evaluation of general concepts and/or alternatives received during the EIS scoping process to determine which concepts and/or alternatives could generally meet the project purpose, are within the scope of the EIS and EIS study area, and are technically feasible. The alternatives that were not eliminated during the preliminary evaluation were carried forward into Level 1 screening.
3. Apply initial (Level 1) screening criteria to eliminate alternatives that do not meet the purpose of and need for the project.
4. Refine alternatives that pass the Level 1 screening process.

5. Apply secondary (Level 2) screening criteria to eliminate alternatives that might meet the purpose of and need for the project but would be unreasonable alternatives for other reasons—for example, an alternative would have unreasonable impacts to the natural and human environment, would not meet regulatory requirements, or could be replaced by a less costly alternative with similar impacts to the natural and human environment.
6. Conduct preliminary engineering. The alternatives that passed Level 1 and Level 2 screening were further developed to avoid and minimize impacts to the natural and human environment and were designed to a higher level of detail before the Utah Department of Transportation (UDOT) performed the detailed impact analyses for this EIS.

The alternatives development and screening process is designed to be dynamic throughout the EIS process. If a new alternative or refinement of an alternative is developed or arises later in the EIS process, it will be subject to the same screening process as all of the other alternatives, as described in this chapter.

The alternatives screening process had two phases: the June 2020 release of the *Draft Alternatives Development and Screening Report* and the November 2020 release of the *Draft Alternatives Development and Screening Report Addendum*. The addendum was prepared to address new alternatives suggested during the public and agency review of the June 2020 report.

2.2.1 Range of Alternatives To Be Considered – June 2020

The preliminary alternatives were developed based on previous planning studies and through the EIS agency and public scoping process. The Little Cottonwood Canyon EIS team considered alternatives from the following previous transportation studies:

- Mountain Accord Process
- *Mountain Transportation Study Final Report* (Fehr & Peers 2012)
- *Cottonwood Heights General Plan* (Cottonwood Heights City 2005)
- *Cottonwood Canyons Scenic Byways Corridor Management Plan* (Fehr & Peers 2008)
- *Wasatch Boulevard Master Plan* (Cottonwood Heights City 2019)

During the EIS scoping process, and during and after meetings with agencies and the public in 2018 and 2019, UDOT received more than 1,500 comments, approximately 100 of which suggested concepts and alternatives for UDOT to evaluate in this EIS (see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020). These approximately 100 comments addressed alternative locations, alternative configurations, travel modes, safety, construction costs, construction methods, and logical termini. Where applicable, the Little Cottonwood Canyon EIS team incorporated the alternatives scoping comments when developing the range of preliminary alternatives.

Public comments provided during the EIS scoping period and the public review of the June 2020 *Draft Alternatives Development and Screening Report* suggested that climate change should be considered in the development of alternatives. Specifically, public comments stated that, with the warming climate, there will be less snow and thus fewer skiers at the resorts in Little Cottonwood Canyon. The commenters stated that, with fewer skiers, UDOT would not need to improve S.R. 210 in Little Cottonwood Canyon. UDOT did consider whether the existence of climate change would affect the alternatives development process. Based on a review of literature and traffic data, UDOT determined that climate change would not change the need for the project or how alternatives were developed. For more information, refer to Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020.

2.2.2 Alternatives Screening Phase – June 2020

The preliminary alternatives were screened with regard to the following project purpose elements:

- **Improve mobility on S.R. 210:**
  - Mobility on Wasatch Boulevard
  - Mobility on S.R. 210 from Fort Union Boulevard to Alta
- **Improve reliability and safety on S.R. 210:**
  - Avalanche mitigation
  - Trailhead parking
  - Winter roadside parking

What is Wasatch Boulevard?

Wasatch Boulevard is a segment of S.R. 210 from Fort Union Boulevard to North Little Cottonwood Road.

The Level 1 screening process was performed to eliminate alternatives that would not meet the purpose of and need for the project. Alternatives that are determined by UDOT to not meet the purpose of and need for the project are considered unreasonable for National Environmental Policy Act (NEPA) purposes, not practicable under the Clean Water Act, and not prudent under Section 4(f) of the Department of Transportation Act, and such alternatives were not carried forward for further analysis in Level 2 screening. Table 2.2-1 lists the Level 1 screening criteria.

What was the purpose of Level 1 screening?

The Level 1 screening process was performed to eliminate alternatives that would not meet the purpose of and need for the project.

Table 2.2-1. Level 1 Screening Criteria (Purpose and Need)

Criterion	Measures
Improve mobility in 2050	**Improve Mobility on Wasatch Boulevard – Level 1 Screening Criteria** • By 2050, meet UDOT's goal of level of service (LOS) D in the weekday AM and PM peak periods on Wasatch Boulevard. **Improve Mobility on S.R. 210 from Fort Union Boulevard to Alta – Level 1 Screening Criteria** • Substantially improve peak-hour per-person (defined as the 30th-busiest hour[a]) travel times in Little Cottonwood Canyon for uphill and downhill users in 2050 compared to travel times with the No-Action Alternative in 2050. • Meet peak-hour average total person-demand on busy ski days in Little Cottonwood Canyon. • Substantially reduce vehicle backups on S.R. 210 and S.R. 209 through residential areas on busy ski days (30th-busiest day).
Improve reliability and safety in 2050	**Improve Reliability and Safety through Avalanche Mitigation – Level 1 Screening Criteria** • Substantially reduce the number of hours and/or days during which avalanches delay users. • Substantially reduce the avalanche hazard for roadway users. **Improve Reliability and Safety through Trailhead and Winter Roadside Parking – Level 1 Screening Criteria** • Improve roadway safety at existing trailhead locations in summer and winter. • Reduce or eliminate traffic conflicts between motorized and nonmotorized transportation modes at key trailhead locations in summer and winter. • Reduce or eliminate roadside parking to improve the safety and operational characteristics of S.R. 210 in summer and winter.

[a] The travel demand during the 30th-busiest hour in 2050 would be about 1,555 vehicles or about 3,250 people.

The purpose of Level 2 screening is to identify alternatives that are practicable and reasonable and should be evaluated in detail in this EIS. During Level 2 screening, UDOT collectively evaluated the alternatives that passed Level 1 screening against key criteria that focus on an alternative's impacts to the natural and built environment, estimated project costs, logistical considerations, and technological feasibility. Table 2.2-2 lists the Level 2 screening criteria.

What is the purpose of Level 2 screening?

The purpose of Level 2 screening is to identify alternatives that are practicable and reasonable and should be evaluated in detail in this EIS.

Table 2.2-2. Level 2 Screening Criteria (Impacts)

Criterion	Measure(s)
Cost	• Alternative's cost compared to other similar alternatives that pass Level 1 screening
Consistency and compatibility with local and regional plans	• Alternative's consistency with local and regional land use and transportation plans[a] • Alternative's compliance with the Wilderness Act of 1964 and consistency with the 2003 *Revised Forest Plan: Wasatch-Cache National Forest*
Compatibility with permitting requirements	• Permit requirements
Impacts related to Clean Water Act	• Acres and types of wetlands and other waters of the United States[b]
Impacts to natural resources	• Acres of floodplain • Acres of critical habitat
Impacts to the built environment	• Number and area of parks • Number of community facilities • Number of potential property acquisitions including residential and business • Number of Section 4(f)/Section 6(f) uses[c] • Number of cultural resources (for example, historic and archaeological resources) affected

[a] This criterion is a secondary objective that will be used to measure how well an alternative meets local community desires after environmental impacts are considered and to make minor shifts to alternatives' alignments. It will not be used to determine whether an alternative is reasonable or practicable.

[b] Based on Clean Water Act requirements, an alternative with a substantially greater number of wetland impacts could be eliminated from detailed study in this EIS. UDOT will not use the criteria listed in this table to eliminate alternatives from detailed study in this EIS before considering whether the alternatives would comply with the Clean Water Act Section 401(b)(1) Guidelines. Each alternative will be evaluated individually regarding cost, existing technology, and logistics before the other criteria in this table are considered.

[c] Based on the requirements of Section 4(f) of the Department of Transportation Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act of 1965, an alternative with substantially greater Section 4(f) or Section 6(f) impacts could be eliminated from detailed study in this EIS.

2.2.2.1 Improve Mobility on Wasatch Boulevard

Improving mobility on S.R. 210 in 2050 involves meeting two different needs: improving mobility for commuter traffic during the weekday on Wasatch Boulevard and improving mobility for the winter ski traffic on S.R. 210 along the entire corridor from Fort Union Boulevard to the town of Alta. The screening criteria for weekday commuter traffic on Wasatch Boulevard are different than for winter ski traffic since the roadway travel demand varies by each type of traffic.

What is travel demand?

Travel demand is the expected number of transportation trips in an area. Travel demand can be met by various modes of travel, such as automobile, bus, rail, carpooling, walking, and bicycling.

Because the criteria are different, the alternatives screening process for Wasatch Boulevard in particular was conducted separately from and prior to the alternatives screening process for S.R. 210 overall (see Section 2.2.2.2, Improve Mobility on S.R. 210 from Fort Union Boulevard to Alta). The mobility benefits provided by the Wasatch Boulevard alternatives that passed Level 1 and Level 2 screening were considered part of the baseline conditions when evaluating how to improve mobility on S.R. 210 overall (see Section 2.2.2.2). For more details about the Wasatch Boulevard screening results, see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020.

Table 2.2-3 shows the alternatives considered for Wasatch Boulevard and the screening results. As shown in the table, only the Imbalanced-lane Alternative and the Five-lane Alternative passed the screening process. Both alternatives met UDOT's level of service goal of LOS D or better. With the Imbalanced-lane Alternative, the level of service on Wasatch Boulevard would be LOS C in 2050, and with the Five-lane Alternative, the level of service would be LOS B or C. With all of the other alternatives, segments of Wasatch Boulevard would operate at a level of service of LOS F.

What is level of service?

Level of service is a measure of the operating conditions on a road or at an intersection. Level of service is represented by a letter "grade" ranging from A (free-flowing traffic and little delay) to F (extremely congested, stop-and-go traffic and excessive delay).

The footprints and impact lines for the Imbalanced-lane Alternative and the Five-lane Alternative are similar, are mostly within UDOT's existing right of way, and would not have substantially different impacts to any of the Level 2 resources considered. Because the two alternatives would have similar levels of impacts and costs, the Level 2 screening analysis did not give UDOT a reason to eliminate either alternative.

Based on the screening results, the following Wasatch Boulevard alternatives were carried forward for further evaluation in this EIS and were considered as part of the S.R. 210 mobility analysis described in Section 2.2.2.2, Improve Mobility on S.R. 210 from Fort Union Boulevard to Alta:

- Imbalanced-lane Alternative
- Five-lane Alternative

Table 2.2-3. Improve Mobility on Wasatch Boulevard – Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Signalized Intersection at Kings Hill Drive	This alternative consists of changing the existing two-way stop-controlled intersection at Kings Hill Drive to a full signalized intersection.	Does not meet signal warrant requirements.	—	—
Mass Transit	The Mass Transit Alternative includes all current transit on Wasatch Boulevard, all future planned transit on Wasatch Boulevard in the Wasatch Front Regional Council's 2019–2050 *Wasatch Front Regional Transportation Plan* (RTP), expanded transit proposed as part of this alternative, and future widening of Highland Drive.	Does not meet level of service goal of LOS D. Bus service on Wasatch Boulevard is included in the RTP and is assumed as part of the baseline conditions.	—	—
Imbalanced Lane[b]	The Imbalanced-lane Alternative includes one northbound lane from North Little Cottonwood Road to Bengal Boulevard and two southbound lanes from Bengal Boulevard to North Little Cottonwood Road. From Fort Union Boulevard to Bengal Boulevard, there would be four travel lanes, similar to existing conditions. A center two-way left-turn lane would be included from Fort Union Boulevard to North Little Cottonwood Road. At the southern end of Wasatch Boulevard, the two southbound lanes would pass through the intersection of Wasatch Boulevard and North Little Cottonwood Road and then merge down to one lane.	✓	✓	✓
Reversible Three-lane	The Reversible Three-lane Alternative would add one additional travel lane. The reversible lane would be used by northbound traffic during the morning peak period and southbound traffic during the evening peak period. During non-peak periods, the center lane would be used as a center two-way left-turn lane. The reversible lane would require lighted direction signs over Wasatch Boulevard about every 1,320 feet with additional signs required at intersections and cross streets. Overall, there would be about 12 overhead signs on Wasatch Boulevard from Fort Union Boulevard to North Little Cottonwood Road.	✓	Does not meet level of service goal of LOS D. Segments of Wasatch Boulevard would operate at LOS F.	—

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Table 2.2-3. Improve Mobility on Wasatch Boulevard – Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Five Lane[c]	The Five-lane Alternative would add one additional travel lane in each direction between Bengal Boulevard and North Little Cottonwood Road while maintaining a center two-way left-turn lane. At the southern end of Wasatch Boulevard, the two southbound lanes would pass through the intersection of Wasatch Boulevard and North Little Cottonwood Road and then merge down to one lane.	✓	✓	✓
Multiple Roundabouts	The Multiple Roundabouts Alternative would add an additional travel lane in each direction, for a total of four travel lanes. It would place roundabouts at the intersections of S.R. 210 with Bengal Boulevard, 3500 East, Kings Hill Drive, and North Little Cottonwood Road. Left-turn lanes would be provided at key streets, but there would be no continuous center median.	✓	Does not meet level of service goal of LOS D. Segments of Wasatch Boulevard would operate at LOS F.	—

[a] One element of the Level 1 screening criteria is to meet UDOT's goal of LOS D in the weekday AM and PM peak periods on Wasatch Boulevard by 2050. UDOT has set a goal of maintaining roads in urban parts of the state at LOS D or better. Typically, in urban areas, LOS E and F are considered unacceptable operating conditions, and LOS D and above are considered acceptable operating conditions.

[b] With the Imbalanced-lane Alternative, all Wasatch Boulevard segments and intersections would operate at LOS C in 2050.

[c] With the Five-lane Alternative, all Wasatch Boulevard segments and intersections would operate at LOS B or C in 2050.

2.2.2.2 Improve Mobility on S.R. 210 from Fort Union Boulevard to Alta

Improving mobility on S.R. 210 in 2050 involves meeting two different needs: improving mobility on Wasatch Boulevard in particular for commuter traffic and improving mobility on S.R. 210 overall for winter ski traffic. This section looks at the latter need—improving mobility on S.R. 210 from Fort Union Boulevard to the town of Alta.

The mobility benefits provided by the Wasatch Boulevard alternatives that passed Level 1 and Level 2 screening (see Section 2.2.2.1, Improve Mobility on Wasatch Boulevard) are considered part of the baseline conditions in this evaluation of improving mobility on S.R. 210 overall. Both the Imbalanced-lane and Five-lane Alternatives would provide a similar benefit (in terms of mobility improvement) for the S.R. 210 alternatives; therefore, the Imbalanced-lane Alternative was used for the analysis.

Table 2.2-4 shows the alternatives considered for S.R. 210 from Fort Union Boulevard to the town of Alta and the screening results (for more details, see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020). As shown in the table, the Enhanced Bus Service Alternative, the Enhanced Bus Service in Peak-period Shoulder Lane Alternative, and the Gondola Alternative passed the screening process. These three alternatives would substantially improve peak-hour per-person travel times on S.R. 210, would meet peak-hour average total person-demand on a busy ski day, and would substantially reduce vehicle backups on S.R. 210 and S.R. 209 through residential areas on busy ski days. In addition, based on Level 2 screening, the three alternatives would have similar impacts to the natural and built environment and were within a similar cost range.

Based on the screening results, the following S.R. 210 alternatives were carried forward for further evaluation in this EIS:

- **Alternative 2 – Enhanced Bus Service B1** – 24 buses per hour during the peak period
- **Alternative 3 – Gondola**
- **Alternative 6 – Enhanced Bus Service B2** – 24 buses per hour during the peak period in peak-period, shoulder-running bus lanes

Table 2.2-4. Improve Mobility on S.R. 210 – Fort Union Boulevard to Alta Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Roadway Alternatives – Preliminary Screening Results				
Double Stacking	This alternative consists of closing the downhill lane on S.R. 210 in Little Cottonwood Canyon in the morning and the uphill lane in the afternoon to provide one-way vehicle flow during peak periods to reduce congestion.	Causes backups on S.R. 210 and could slow emergency response vehicle access.	—	—
S.R. 209 Roundabout	This alternative consists of constructing a roundabout at the intersection of S.R. 209 and S.R. 210 to improve mobility in the canyon.	Does not improve mobility. Would cause congestion on S.R. 210 and S.R. 209.	—	—
Reversible Lane – Moveable Barrier	This alternative consists of adding an additional travel lane on S.R. 210 (three travel lanes total) from the Wasatch Boulevard/North Little Cottonwood Road intersection to the ski resorts. This alternative would include a reversible middle lane to accommodate morning and evening peak traffic. A moveable barrier would direct traffic into the reversible lane. The reversible lane could be used at various times of day as an all-vehicle lane, a high-occupancy vehicle (HOV)/bus lane, and a bus-only lane.	Requires extensive maintenance to move the barrier. Barrier could be damaged by avalanches. Barrier could hinder wildlife movement.	—	—
Reversible Lane – Signs	This alternative consists of adding an additional travel lane on S.R. 210 (three travel lanes total) from the Wasatch Boulevard/North Little Cottonwood Road intersection to the ski resorts. This alternative would include a reversible middle lane to accommodate morning and evening peak traffic. Overhead signs would direct traffic into the reversible lane. The reversible lane could be used at various times of day as an all-vehicle lane, an HOV/bus lane, and a bus-only lane.	Visual impacts from overhead lighted gantries. Up to 62 overhead signs could be required.	—	—
Peak-period Shoulder	This alternative consists of one uphill lane and one downhill lane in Little Cottonwood Canyon with roadway shoulders large enough to accommodate buses. The shoulder lane could be used at various times of day by buses. The shoulders would be open to buses during peak travel times or when there is heavy congestion on S.R. 210. When not in use by buses, the shoulders would be open for emergency use and cyclists only. No parking would be allowed on the shoulders.	✓	—	—

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Table 2.2-4. Improve Mobility on S.R. 210 – Fort Union Boulevard to Alta Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Transit Alternatives – Preliminary Screening Results				
Bus Alternatives – Preliminary Screening Results				
Bus Only	This alternative would increase bus service to meet the peak-hour person demand without increasing roadway capacity. The bus service assumes nonstop service from Fort Union Boulevard/Wasatch Boulevard and 9400 South/Highland Drive to the Snowbird and Alta ski resorts. This alternative assumes that buses would provide the primary vehicle transportation in Little Cottonwood Canyon, though nonresident and resort employee vehicles would be allowed. Similar to existing bus service, the bus routes would be on S.R. 210 and S.R. 209.	Not reasonable because the alternative would require 1.6-minute headways and about 75 buses per hour. Headways less than 5 minutes would not be feasible since it would not be possible to load and unload buses quickly enough to maintain the schedule.	—	—
Regional Shuttle	This alternative is similar to the existing Utah Transit Authority (UTA) bus system but would use neighborhood parking areas dispersed throughout the Salt Lake Valley as pickup points for users. The system could operate with smaller vans or shuttles that would provide direct service from the pickup location to the resort. Given that there are two resorts in Little Cottonwood Canyon, such a system would require a substantial bus fleet to meet the needs of skiers across the valley.	Would require a substantial bus fleet. Can be implemented independent of this EIS as part of a mobility hub concept (for more information, see Section 2.2.2.3, Improve Mobility with Mobility Hubs).	—	—
Bus or Gondola from and to Park City	This alternative would provide aerial transit or express bus service from Park City to the ski resorts in Little Cottonwood Canyon. This alternative assumes that vehicle traffic would be reduced enough that no additional roadway capacity would be needed.	Does not remove enough traffic from S.R. 210 to improve mobility.	—	—

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Table 2.2-4. Improve Mobility on S.R. 210 – Fort Union Boulevard to Alta Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Enhanced Bus A1 Mixed flow, 7.5-minute headways	This alternative would increase bus service to reduce vehicle use in the canyon. Transit would be incentivized through travel management strategies such as a toll or a prohibition on single-occupant vehicles. Similar to existing bus service, the bus routes would be on S.R. 210 and S.R. 209. This alternative would operate from mobility hub locations that could include feeder bus routes to the mobility hub locations from areas across the Salt Lake Valley.	✓	—	—
Enhanced Bus A2 Bus lane, 7.5-minute headways	Same as Enhanced Bus A1 but includes bus-only peak-period shoulder lanes on S.R. 210 from North Little Cottonwood Road to Alta.	✓	—	—
Enhanced Bus B1 Mixed flow, 5-minute headways	Same as Enhanced Bus A1 but at higher 5-minute bus frequency.	✓	—	—
Enhanced Bus B2 Bus lane, 5-minute headways	Same as Enhanced Bus A1 but at higher 5-minute bus frequency and with bus-only peak-period shoulder lanes on S.R. 210 from North Little Cottonwood Road to Alta.	✓	—	—
Aerial Transit Alternatives – Preliminary Screening Results				
Tramway, Funifor, or Funitel	Tramways and funifors are fixed-cable gondolas, and funitels are detachable-cable gondolas. These alternatives would provide a tramway, funifor, or funitel system to carry users to the ski resorts and back down the canyon.	Does not provide enough capacity, has slow travel speeds, or is mechanically complex.	—	—
Mono-cable (1S) or Bi-cable (2S) Gondola	These alternatives would provide a single- or double-cable gondola system to carry users to the ski resorts and back down the canyon.	Slow travel speeds, low operational wind speeds, and narrow tower spacing.	—	—
Tri-cable (3S) Gondola	This alternative would provide a tri-cable gondola system to carry users to the ski resorts and back down the canyon.	✓	—	—

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Table 2.2-4. Improve Mobility on S.R. 210 – Fort Union Boulevard to Alta Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Gondola (3S) Alternatives – Preliminary Screening Results				
Gondola 1 Base at entrance	This alternative would provide expanded parking and a base station at the entrance to the canyon. The gondola would stop at Snowbird and Alta only.	Does not improve mobility at entrance to canyon. Traffic still focused at canyon entrance.	—	—
Gondola 2 Base 1 mile away	This alternative would provide expanded parking and a base station 1 mile from the entrance to the canyon immediately south of the Wasatch Boulevard and North Little Cottonwood Road intersection on the west side of S.R. 210. The gondola would stop at Snowbird and Alta only.	Does not improve mobility on Wasatch Boulevard and is not compatible with adjacent land uses.	—	—
Gondola 3A Base at gravel pit	This alternative would provide a complete gondola alignment from the gravel pit mobility hub (on the east side of Wasatch Boulevard between 6200 South and Fort Union Boulevard) to the entrance to the canyon and continuing to the resorts. The gondola would stop at Snowbird and Alta only.	Aerial corridor is over existing homes, causing privacy concerns.	—	—
Gondola 3B Bus from gravel pit to base at entrance	This alternative would provide a bus trip from the gravel pit mobility hub to a base station at the entrance to the canyon. The gondola would stop at Snowbird and Alta only.	✓	—	—
Gondola 4A Base at 9400 South	This alternative would provide a complete gondola alignment from the 9400 South/Highland Drive mobility hub to the entrance to the canyon and continuing to the resorts. The gondola would stop at Snowbird and Alta only.	Aerial corridor is over existing homes, causing privacy concerns.	—	—
Gondola 4B Bus from 9400 South to base at entrance	This alternative would provide a bus trip from the 9400 South/Highland Drive mobility hub to a base station at the entrance to of the canyon. The gondola would stop at Snowbird and Alta only.	Mobility concerns on 9400 South. Requires extensive road modifications to 9400 South.	—	—

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Table 2.2-4. Improve Mobility on S.R. 210 – Fort Union Boulevard to Alta Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Rail Transit – Preliminary Screening Results				
Heavy Rail, Light Rail, Monorail, or Maglev	These alternatives would provide regular diesel-powered heavy rail, electrical light rail, monorail, or maglev from the entrance of the canyon to Snowbird and Alta.	Cannot operate on the steep grades in the canyon.	—	—
SkyTran or D.A.V.E	These alternatives are similar to monorail. They are currently nonoperational-technology rail systems.	Technology does not exist.	—	—
Funicular	This alternative would provide a fixed-guideway transit system powered by a cable traction designed for steep inclines.	Does not provide enough person-capacity.	—	—
Cog Rail	This alternative would provide electrically powered light-rail cars with a third rail for additional traction on steep grades.	✓	—	—
Cog Rail Alternatives – Preliminary Screening Results				
Cog Rail 1 Base station at canyon entrance	This alternative would provide expanded parking and a rail base station at the entrance to the canyon, a distance of about 8 miles to the Alta ski resort.	Does not improve mobility at entrance to canyon. Traffic still focused at canyon entrance.	—	—
Cog Rail 2 Base station at gravel pit	This alternative would provide expanded parking and a rail base station at a mobility hub located at the gravel pit (near Wasatch Boulevard and Fort Union Boulevard), a distance of about 12.2 miles to the Alta ski resort.	Would have extensive residential relocations on Wasatch Boulevard.	—	—
Cog Rail 3 Base station at 9400 South	This alternative would provide expanded parking and a rail base station at a mobility hub near 9400 South (S.R. 209) and Highland Drive, a distance of about 11.5 miles to the Alta ski resort.	No TRAX connection and not enough area for the needed 15-acre cog rail station and operations and maintenance facility.	—	—
Cog Rail 4A Connection at Midvale Fort Union TRAX Station	This alternative would connect a cog rail system to the existing TRAX system at the Midvale Fort Union TRAX Station (S.R. 190 and 7200 South), a distance of 18.1 miles to the Alta ski resort.	Duplicative to Cog Rail 4B with greater cost and more residential relocations.	—	—
Cog Rail 4B Connection at Historic Sandy TRAX Station	This alternative would connect a cog rail system to the existing TRAX system at the Historic Sandy TRAX Station (at 9000 South and about 150 East), a distance of about 14.3 miles to the Alta ski resort.	✓	—	—

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Table 2.2-4. Improve Mobility on S.R. 210 – Fort Union Boulevard to Alta Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Transit and Roadway Alternatives – Preliminary, Level 1, and Level 2 Screening Results				
Enhanced Bus A1 Mixed flow, 7.5-minute headways	See Enhanced Bus A1 Alternative above.	✓	Does not reduce vehicle backups on S.R. 210 and S.R. 209.	—
Enhanced Bus A2 Bus lane, 7.5-minute headways	See Enhanced Bus A2 Alternative above.	✓	Does not reduce vehicle backups on S.R. 210 and S.R. 209.	—
Enhanced Bus B1 Mixed flow, 5-minute headways	See Enhanced Bus B1 Alternative above.	✓	✓	✓
Enhanced Bus B2 Bus lane, 5-minute headways	See Enhanced Bus B2 Alternative above.	✓	✓	✓
Gondola 3B Bus from gravel pit to base at entrance	See Gondola 3B Alternative above.	✓	✓	✓
Cog Rail 4B Connection at Historic Sandy TRAX Station	See Cog Rail 4B Alternative above.	✓	✓	High cost and extensive residential relocations and Section 4(f) impacts.

[a] Three elements of the Level 1 screening criteria are to substantially improve peak-hour per-person (defined as the 30th-busiest hour or about 1,555 vehicles per hour) travel times in Little Cottonwood Canyon for uphill and downhill users in 2050 compared to travel times with the No-Action Alternative in 2050; meet peak-hour average total person-demand on busy ski days in Little Cottonwood Canyon (about 3,250 persons); and substantially reduce vehicle backups on S.R. 210 and S.R. 209 through residential areas on busy ski days (30th-busiest day).

2.2.2.3 Improve Mobility with Mobility Hubs

To support personal vehicle parking for the transit alternatives (bus, aerial transit, and rail transit), UDOT evaluated suitable locations for a mobility hub. For the transit alternatives, UDOT considered comments provided during scoping about mobility hub locations. For more information, see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020.

What is a mobility hub?

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

As shown in Table 2.2-5, UDOT evaluated 14 potential locations for a mobility hub to service Little Cottonwood Canyon. The mobility hub locations could be used for bus service directly to the ski resorts or for bus service to a gondola or cog rail station located at the entrance to Little Cottonwood Canyon.

Based on the alternatives screening summarized above in Table 2.2-4, UDOT determined that the best locations for a mobility hub were the **gravel pit on the east side of Wasatch Boulevard between 6200 South and Fort Union Boulevard** and the **UTA park-and-ride lot at 9400 South and Highland Drive**. Both locations meet the lot size and availability requirements and would provide convenient access for users and transit to Little Cottonwood Canyon. These locations were used with each bus, gondola, and cog rail alternative to help evaluate each transit alternative.

2.2.2.4 Improve Reliability and Safety through Avalanche Mitigation

Improving reliability and safety on S.R. 210 is focused on road closures and safety concerns associated with avalanche hazards. Avalanche hazards cause substantial traffic delays as a result of 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. In turn, the reliability of vehicle travel in Little Cottonwood Canyon affects the mobility on S.R. 210. Safety is related to the risk that avalanches present to the traveling public and how to reduce that risk. For more information regarding avalanche mitigation, see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020.

Table 2.2-6 shows the avalanche mitigation alternatives considered for S.R. 210 in Little Cottonwood Canyon and the screening results. Alternatives that would not reduce the number of hours and/or days of closure, would not improve safety, or would require construction in a designated wilderness area were eliminated.

Based on the screening process for snow sheds, UDOT decided to carry forward the **Snow Sheds with Berms Alternative** and the **Snow Sheds with Realigned Road Alternative** for detailed evaluation in this EIS. The Snow Sheds with No Berms Alternative was eliminated from further consideration because the alternative had similar environmental impacts but higher cost without any additional safety benefits compared to the Snow Sheds with Realigned Road Alternative (no berms).

What are snow sheds?

Snow sheds are rigid concrete and/or steel structures that protect a road by diverting avalanche flows over the top of the structure.

Table 2.2-5. Improve Mobility on S.R. 210 – Mobility Hubs Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening	Level 2 Screening
Little Cottonwood Canyon Park-and-ride	Little Cottonwood Canyon park-and-ride	Lot size is too small[a]	—	—
Big Cottonwood Canyon Park-and-ride	Big Cottonwood Canyon park-and-ride	Lot size is too small[a]	—	—
9400 South Park-and-ride	9400 South/Highland Drive park-and-ride	✓	✓	✓
6200 South Park-and-ride	6200 South/Wasatch Blvd. park-and-ride	Lot size is too small[a]	—	—
Reams 7200 South	Reams Market at 7200 South	Not available[b]	—	—
Tree Farm Wasatch	Tree farm off of Wasatch Blvd.	Does not improve mobility on S.R. 210[c]	—	—
3662 North Little Cottonwood Road	3662 North Little Cottonwood Road	Does not improve mobility on S.R. 210[c]	—	—
Swamp Lot	Swamp Lot at 3500 South and Wasatch Blvd.	Lot size is too small[a]	—	—
Lower Canyon	South side of S.R. 210 immediately north of the Little Cottonwood Creek trailhead	Does not improve mobility at entrance to Little Cottonwood Canyon[c]	—	—
School and Church Lots	School and church parking lots in the Salt Lake Valley	Not available[b]	—	—
Business Park 6200 South	Commercial businesses at 6200 South	Not available[b]	—	—
Gravel Pit	6755 S. Wasatch Blvd.	✓	✓	✓
Holladay Mall	Abandoned Holladay Mall at 4878 S. Highland Drive	Location is too far from Little Cottonwood Canyon and freeways[c]	—	—
Fashion Place Mall	Fashion Place Mall in Murray at 6191 S. State Street	Not available[b]	—	—

[a] For new or existing mobility hub locations, the area must be about 4 acres or must accommodate about 1,000 to 1,500 parking spaces.
[b] The alternative must be available on weekdays, weekends, holidays, heavy snow days, and extended vacation periods (for example, the Christmas, Presidents' Day, and Easter holidays).
[c] The alternative must provide convenient access to traffic from the south and north ends of the Salt Lake Valley, reduce out-of-direction travel, reduce potential traffic conflicts with residential traffic, and provide convenient bus access to Little Cottonwood Canyon.

Table 2.2-6. Improve Reliability and Safety on S.R. 210 – Avalanche Mitigation Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Avalanche Mitigation – Preliminary Screening Results				
Active Control	Current avalanche-mitigation strategy of remote-activation devices and artillery.	Does not reduce the amount of closure days or hours.	—	—
Snow-supporting Structure	Snow-supporting structures are placed in the avalanche starting zone to hold the snow in place and prevent avalanches.	Construction would be in a Wilderness Area, which is prohibited.	—	—
Road Realignments	S.R. 210 would be realigned to facilitate structures that would be built so that the avalanche flows could pass under the roadway to eliminate risk, or S.R. 210 would be realigned to move the road outside the avalanche path.	Construction would be in a Wilderness Area, which is prohibited.	—	—
Earth Berms	Earth berms are large, earth-fill structures that are constructed in the runout zone to divert or stop avalanche flows. Berms that stop avalanches are called stopping dams, and berms that divert avalanche flows are called diversion berms.	Not effective in stopping avalanches from affecting S.R. 210.	—	—
Stopping Walls	Stopping walls are constructed to stop avalanche flows in the runout zone. They are typically built adjacent to a highway or structure that is to be protected.	Not effective in stopping avalanches from affecting S.R. 210.	—	—
Reduced Traffic Flow	This alternative includes options to reduce the vehicle use in Little Cottonwood Canyon through increased use of transit, gondola, or rail.	Does not reduce the amount of closure days or hours.	—	—
3S Gondola	Gondola system would be used when road is closed for avalanche mitigation (system would need to be closed during artillery use).	✓	—	—
Snow Sheds	Snow sheds are rigid concrete and/or steel structures that protect a road by diverting avalanche flows over the top of the structure.	✓	—	—

(*continued on next page*)

Table 2.2-6. Improve Reliability and Safety on S.R. 210 – Avalanche Mitigation Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Snow Sheds Alternatives – Preliminary, Level 1, and Level 2 Screening Results				
Snow Sheds without Berms	Snow sheds on S.R. 210.	✓	✓	Similar impacts and shed configuration as Snow Sheds with Realigned Road Alternative, but higher cost and with no additional safety benefit.
Snow Sheds with Berms	Snow sheds on S.R. 210 but with 300-foot-long, 20-foot-tall guiding berms to direct avalanche flows over the snow sheds to reduce snow shed length.	✓	✓	✓
Snow Sheds with Realigned Road	Snow sheds on S.R. 210 but with a realigned S.R. 210 to the north to reduce fill, improve the ability to tie snow sheds into the mountain, and improve curves and vehicle sight distances.	✓	✓	✓

[a] Must substantially reduce the number of hours and/or days when avalanches delay users and substantially reduce the avalanche hazard index.

2.2.2.5 Improve Reliability and Safety through Improving Trailhead Parking

Trailhead parking areas in Little Cottonwood Canyon are small and can quickly reach capacity in the summer, forcing many people to park on the side of the road and walk along or across the roadway to access trailheads, which creates a safety risk. Roadside parking also creates a safety hazard for cyclists and pedestrians traveling along the roadway shoulder because it narrows the area in which they can travel and requires them in some locations to use part of the travel lane to pass parked vehicles.

Eliminating roadside parking would remove the conflict of cyclists being forced around shoulder-parked vehicles and into the road travel lanes. Roadside parking at trailheads leads to increased creation of social trails as people create new routes connecting to trailheads and trails and creates a safety risk for people walking along the road in the travel lane as they access the trailhead.

Table 2.2-7 shows the trailhead parking alternatives considered for S.R. 210 in Little Cottonwood Canyon and the screening results (for more details, see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020). UDOT considered one parking lot improvement (Alternative A) for the Gate Buttress and Bridge Trailheads and two alternatives (Alternatives A and B) for the Lisa Falls and White Pine Trailheads. With the improved parking lot alternatives (parking lot improvement Alternatives A and B), UDOT considered two alternatives for roadside parking: one that would eliminate roadside parking within ¼ mile uphill and ¼ mile downhill of each trailhead parking area and one that would eliminate all roadside parking from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1. Both of these two alternatives could use the parking lot improvement Alternatives A and B. UDOT also considered Alternative C, which would eliminate roadside trailhead parking related to summer use from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1 with no expansion of existing parking areas.

As shown in Table 2.2-7, all of the Alternative A trailhead parking area alternatives, White Pine Alternative B, and Alternative C (no parking improvements and eliminate roadside parking) passed Level 1 screening. The A and B parking lot improvement alternatives that passed screening could include eliminating roadside parking within ¼ mile of the improved trailhead parking or eliminating all roadside parking from the S.R. 209/S.R. 210 intersection to Snowbird Entry 1 along with the improved trailhead parking. In Level 2 screening, White Pine Trailhead Alternative B was eliminated because the alternative did not address safety as well as Alternative A and had the same environmental impacts.

Based on the screening process, the following trailhead alternatives were carried forward for further evaluation in this EIS:

- Alternative A Parking Areas – Trailhead Parking Improvements with No Roadside Parking within ¼ Mile
- Alternative A Parking Areas – Trailhead Parking Improvements with No Roadside Parking from Canyon Entrance to Snowbird Entry 1
- Alternative C – No Trailhead Parking Improvements with No Roadside Parking from Canyon Entrance to Snowbird

Table 2.2-7. Improve Reliability and Safety on S.R. 210 – Trailhead Parking Screening Results

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Canyon Parking Study Alternatives				
Lisa Falls Trailhead	65 parking spaces both in formal lot and on roadside.	Does not eliminate roadside parking.	—	—
White Pine Trailhead	125 parking spaces both in formal lot and on roadside.	Does not eliminate roadside parking.	—	—
Alternative A[b] Parking Areas – improve lots, eliminate roadside parking ¼ mile or from S.R. 210/S.R. 209 intersection to Snowbird Entry 1				
Gate Buttress	21 spaces in formal lot.	✓	✓	✓
Bridge Trailhead	15 spaces in formal lot.	✓	✓	✓
Lisa Falls Trailhead	41 spaces in formal lot.	✓	✓	✓
White Pine Trailhead	144 spaces in formal lot.	✓	✓	✓
Alternative B[b] Parking Areas – improve lots, eliminate roadside parking ¼ mile or from S.R. 210/S.R. 209 intersection to Snowbird Entry 1				
Lisa Falls Trailhead	46 spaces in formal lot and requires realignment of S.R. 210 on bridge over ravine.	✓	High impacts and cost. Requires realigning road and constructing new bridge.	—
White Pine Trailhead	141 spaces in formal lot and horizontal parking along S.R. 210.	✓	✓	Alternative A addresses safety greater than Alternative B, which has some roadside parking.
Alternative C –do not improve lots, eliminate all roadside parking to Snowbird Entry 1				
No Lot Improvements, No Roadside Parking	No improvement to parking area and elimination of roadside parking from the intersection of S.R. 209/ S.R. 210 to Snowbird Entry 1.	✓	✓	✓

[a] Three elements of the Level 1 screening criteria are to improve safety at existing trailhead locations, reduce or eliminate traffic conflicts between motorized and nonmotorized transportation modes at existing trailheads, and reduce or eliminate roadside parking to improve the safety and operational characteristics of S.R. 210.

[b] Alternatives A and B include eliminating roadside parking within ¼ mile of each trailhead and eliminating roadside parking from S.R. 209/S.R. 210 to Snowbird Entry 1.

2.2.2.6 Improve Reliability and Safety through Eliminating Winter Roadside Parking

Parking on the shoulder of S.R. 210 adjacent to the Snowbird and Alta ski resorts is a common occurrence since the ski resorts do not have enough parking lot capacity to handle the demand. Roadside parking during the winter can also increase congestion as the travel lane widths are reduced and vehicles slow down as they move through the area. The roadside parking also causes safety concerns with pedestrian-vehicle conflicts as skiers walk along the road to access the resorts. The purposes of reducing or eliminating roadside parking on S.R. 210 would be to improve pedestrian and vehicle safety, improve winter snow plowing operations by removing vehicles parking on the road shoulders, and reduce travel time.

Eliminating roadside parking is an operational issue that UDOT could implement outside the NEPA process. If UDOT decides to eliminate roadside parking, there would be enough parking with the alternatives being evaluated (see Section 2.2.2.7, Alternatives Screening Process) in the Salt Lake Valley to accommodate resort users. By eliminating roadside parking, fewer private vehicles would use S.R. 210 in Little Cottonwood Canyon, which would improve overall mobility. Eliminating roadside parking adjacent to the ski areas was a component of the alternatives evaluated in detail in this EIS.

2.2.2.7 Alternatives Screening Process Results – June 2020

Based on the screening process described in Section 2.2.2, Alternatives Screening Phase – June 2020, the following alternative options (designated with square bullets) passed the preliminary evaluation and Level 1 and Level 2 screening:

- **Improve mobility on S.R. 210:**
  - Mobility on Wasatch Boulevard:
    - Imbalanced-lane alternative
    - Five-lane alternative
  - Mobility on S.R. 210 from Fort Union Boulevard to Alta:
    - Enhanced bus service with no widening of S.R. 210 in Little Cottonwood Canyon (24 buses per hour during the peak period)
    - Enhanced bus service in peak-period shoulder lanes on S.R. 210 in Little Cottonwood Canyon (24 buses per hour during the peak period)
    - Gondola Alternative starting at canyon entrance with enhanced bus service
- **Improve reliability and safety on S.R. 210:**
  - Avalanche mitigation:
    - Snow sheds with guiding berms
    - Snow sheds and realigned road with no guiding berms
  - Trailhead parking:
    - Trailhead parking improvements with no roadside parking within ¼ mile
    - Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1
    - No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird
  - Winter roadside parking:
    - Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts

These action alternatives are presented in Table 2.2-8.

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Table 2.2-8. Alternatives and Options To Be Evaluated in the Draft EIS – June 2020 Draft Alternatives Development and Screening Report

Alternative	Purpose Element and Associated Options				
	Purpose Element: Improve Mobility		Purpose Element: Improve Reliability and Safety		
	Wasatch Boulevard Options	S.R. 210 from Fort Union Boulevard to Alta Options	Avalanche Mitigation Options	Trailhead Parking Options	Winter Roadside Parking Options
Enhanced Bus Service Alternative	• Imbalanced-lane Alternative • Five-lane Alternative	**Enhanced bus service with mobility hubs at the gravel pit[a] and 9400 South/Highland Drive** • Winter point-to-point bus service from each mobility hub directly to the ski resorts • No summer bus service[b] • 24 buses per hour in the peak hour • About 1,008 people on buses in the peak hour • 2,500 new parking spaces divided between two mobility hubs at the gravel pit and 9400 South and Highland Drive • Bus priority on Wasatch Boulevard • Tolling or other management strategies such as no single-occupant vehicles during peak periods	• Snow sheds with berms • Snow sheds and realigned road with no berms	• Trailhead parking improvements with no roadside parking within 0.25 mile • Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1 • No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird	• Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	• Imbalanced-lane Alternative • Five-lane Alternative	**Enhanced bus service with mobility hubs at the gravel pit[a] and 9400 South/Highland Drive** • Winter point-to-point bus service from each mobility hub directly to the ski resorts • No summer bus service[b] • 24 buses per hour in the peak hour • About 1,008 people on buses in the peak hour • 2,500 new parking spaces divided between two mobility hubs at the gravel pit and 9400 South and Highland Drive • Bus priority on Wasatch Boulevard • Tolling or other management strategies such as no single-occupant vehicles during peak periods • Winter bus-only peak-period shoulder lanes from the North Little Cottonwood Road/Wasatch Boulevard intersection to the Alta Bypass Road; peak-period shoulder lanes would be cyclist and pedestrian facilities in summer	• Snow sheds with berms • Snow sheds and realigned road with no berms	• Trailhead parking improvements with no roadside parking within 0.25 mile • Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1 • No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird	• Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts
Gondola Alternative	• Imbalanced-lane Alternative • Five-lane Alternative	**Gondola from the entrance of Little Cottonwood Canyon to Alta ski resort** • Gondola starting at the gondola station at the entrance of Little Cottonwood Canyon with stops at Snowbird ski resort and Alta ski resort only • About 30 gondola cabins per hour • About 1,050 people on gondolas in the peak hour • 2,500-space parking structure at the gravel pit • Enhanced bus service from the gravel pit to the gondola base station at the entrance of Little Cottonwood Canyon (there would be no parking at the base station) • Bus priority on Wasatch Boulevard • Tolling or other management strategies such as no single-occupant vehicles during peak periods • No summer gondola service[b]	• None; gondola could be used when S.R. 210 is closed for avalanche mitigation, similar to existing conditions	• Trailhead parking improvements with no roadside parking within 0.25 mile • Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1 • No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird	• Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts

[a] The gravel pit is located on the east side of Wasatch Boulevard between 6200 South and Fort Union Boulevard.
[b] The purpose of the project is to improve winter mobility. Summer mobility was not identified as a project need. Therefore, summer mobility alternatives such as bus and gondola service were not evaluated.

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2.2.2.8 Public and Agency Review

The results of the alternatives screening process were published for agency and public review on June 8, 2020. The review and comment period was from June 8 through July 10, 2020. The process included two virtual meetings with about 295 people attending and one in-person meeting with 2 attendees. During the comment period, UDOT received about 6,500 individual comment submissions from the public and agencies. The various comments included support for or opposition to a specific alternative, refinement of some of the proposed alternatives, or new alternatives that should be evaluated. The new alternatives that were suggested by the public and agencies during the comment period were evaluated by UDOT through a screening addendum process (see Section 2.2.2.8, Public and Agency Review).

2.2.3 Alternatives Screening Addendum – November 2020

Based on the comments made during the public and agency review of the June 2020 *Draft Alternatives Development and Screening Report*, UDOT conducted an additional screening process, which is documented in the November 2020 *Draft Alternatives Development and Screening Report Addendum* (UDOT 2020b). This process did not change the results of the alternatives that passed screening in the June 2020 screening process but rather was an evaluation of the new alternatives suggested by the public and agencies to determine whether any of these alternatives would pass the screening process.

2.2.3.1 Alternatives Considered and Screening Process – November 2020

2.2.3.1.1 New Alternatives Evaluation

Table 2.2-9 shows the alternatives considered in the November 2020 *Draft Alternatives Development and Screening Report Addendum* and the screening results (for more details, see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020). As shown in the table, the Gondola at La Caille Alternative and the Cog Rail Alternative passed the screening process. These two alternatives would substantially improve peak-hour per-person travel times on S.R. 210, would meet peak-hour average total person-demand on a busy ski day, and would substantially reduce vehicle backups on S.R. 210 and S.R. 209 through residential areas on busy ski days. In addition, based on Level 2 screening, the two alternatives would have similar impacts to the natural and built environment.

However, the cost of the Cog Rail at La Caille Alternative is about 2 times greater than the next-most-expensive alternative ($1.05 billion for the Cog Rail at La Caille Alternative and $576 million for the Gondola at La Caille Alternative). The cog rail system would provide about the same travel benefits in meeting the project purpose as would the other alternatives being considered but would present some operational concerns regarding snow removal. Typically, if UDOT were evaluating two roadway alternatives that both provided the same benefit in meeting the project purpose with similar impacts but one alternative would have twice the cost, the higher-cost alternative would be eliminated during the screening process. However, the cog rail system provides a completely different travel mode than the enhanced bus service and gondola alternatives that passed the screening process. Therefore, even with the substantially greater cost and operational concerns with snow removal, UDOT decided to carry the Cog Rail at La Caille Alternative forward for further evaluation to provide a reasonable range of transportation modes (bus, gondola, and rail) given the unique circumstances presented by the transportation issues in Little Cottonwood Canyon.

Based on the screening process, the following S.R. 210 alternatives were carried forward for further evaluation in this EIS as part of the screening report addendum process:

- Gondola at La Caille Alternative
- Cog Rail at La Caille Alternative

Table 2.2-9. Screening Results – November 2020 Draft Alternatives Development and Screening Report Addendum

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Improved Mobility on Wasatch Boulevard –Screening Results				
Expand Highland Drive and Include Increased Transit	Currently, Highland Drive is not complete and stops at Dimple Dell Park. This alternative includes building a new segment of Highland Drive through Dimple Dell Park and including transit so that commuters use Highland Drive from Draper instead of Wasatch Boulevard, thus eliminating the need to expand Wasatch Boulevard.	The Mass Transit Alternative with improvements to Highland Drive alone would not reduce congestion levels on the mainline and at the intersections of Wasatch Boulevard.	—	—
Improve Mobility on S.R. 210 –Screening Results				
Gondola from Gravel Pit Directly to Snowbird/Alta	This alternative would include a gondola system from the gravel pit and would go directly over the Wasatch Mountains into Snowbird and Alta.	Gondola alignment would impact Wilderness Areas.	—	—
Gondola Directly to Snowbird without Angle Stations	This alternative would include a gondola alignment directly from the Little Cottonwood Canyon park-and-ride lot at the S.R. 209/S.R. 210 intersection to Snowbird without an angle station.	Gondola alignment would impact Wilderness Areas.	—	—
Gondola from Gravel Pit to Solitude/Brighton then to Snowbird/Alta	This alternative includes a gondola alignment from the gravel pit to the Solitude and Brighton ski resorts in Big Cottonwood Canyon and then an alignment over to Little Cottonwood Canyon to the Alta and Snowbird ski resorts.	Travel times would be substantially longer (and the cost greater) compared to travel times with the gondola alternatives that passed screening. Would be less attractive for users wanting to travel to the Snowbird and Alta ski resorts and less likely to be used.	—	—

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Table 2.2-9. Screening Results – November 2020 Draft Alternatives Development and Screening Report Addendum

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Gondola with No Personal Vehicles Allowed in Little Cottonwood Canyon	This alternative includes providing a gondola system at the entrance to Little Cottonwood Canyon and eliminating personal vehicles from S.R. 210 in Little Cottonwood Canyon.	There is no need to increase the capacity of the gondola system beyond that of the gondola alternatives that passed screening. A parking structure to eliminate all roadway traffic would need to have about 7,000 parking spaces (and would require about 30 acres). There is no location near the entrance to Little Cottonwood Canyon that could reliably handle the volume of traffic associated with such a large parking structure.	—	—
Gondola at La Caille	The alternative would include a gondola base station at a proposed development south of North Little Cottonwood Road about 0.75 mile northwest of the S.R. 209/S.R. 210 intersection. The alternative would include a 1,500-vehicle parking structure, which is about 1,000 parking spaces fewer than needed for a gondola alternative; therefore, this alternative also includes parking structures at the gravel pit (600 spaces) and the 9400 South/Highland Drive park-and-ride lot (400 spaces) with bus service to the gondola base station. A parking fee would be charged for users wanting to park at the base station, and the bus service from the other parking structures to the base station would be free.	✓	✓	✓

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Table 2.2-9. Screening Results – November 2020 Draft Alternatives Development and Screening Report Addendum

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Gondola at Wasatch Boulevard and North Little Cottonwood Road	This alternative would include a 2,500-vehicle parking structure and gondola base station on North Little Cottonwood Road about 1,000 feet south of the intersection with Wasatch Boulevard (at a site commonly called the Christmas Tree Farm). With the 2,500-vehicle parking structure, users could drive to the gondola base station (no bus service would be required). The gondola alignment would cross North Little Cottonwood Road and run along the north side of S.R. 210 to an angle station at the Little Cottonwood Canyon park-and-ride lot at the S.R. 209/S.R. 210 intersection.	The base station would be located on the Wasatch Fault earthquake fault and would have a potential for high vertical displacement.	—	—
Summit County Gondola without Parking	This alternative includes a gondola system from Summit County connecting ski resorts at the tops of the Cottonwood Canyons. There would be no parking structure in Summit County. This alternative would work in conjunction with bus service on S.R. 210 in Little Cottonwood Canyon.	The gondola alternative without parking would add additional cost and environmental impacts compared to the gondola alternatives that passed screening, would duplicate one of the enhanced bus service alternatives, and has no advantage with regard to satisfying the project's purpose and need.	—	—
Summit County Gondola with Parking	This alternative includes a gondola system from Summit County connecting ski resorts at the tops of the Cottonwood Canyons. A 2,500-vehicle parking garage would be built near Kimball Junction. Skiers from the Salt Lake Valley would be encouraged to take transit or drive to the parking garage and take the gondola to the resorts in Little Cottonwood Canyon. This alternative could also work in conjunction with bus service on S.R. 210 in Little Cottonwood Canyon.	The Summit County gondola alternative with parking would add additional cost and environmental impacts, would duplicate the gondola alternatives that passed the screening process, and has no advantage with regard to satisfying the project's purpose and need.	—	—

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Table 2.2-9. Screening Results – November 2020 Draft Alternatives Development and Screening Report Addendum

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Train from Summit County	This alternative includes a train in a tunnel from Summit County to the resorts in Little Cottonwood Canyon. A 2,500-vehicle parking garage would be built near Kimball Junction or another location in Summit County. Skiers from the Salt Lake Valley would be encouraged to take transit or drive to the parking garage and take the train to the resorts in Little Cottonwood Canyon.	The train from Summit County alternative would be 2 to 3 times greater in cost than other alternatives that passed the screening process without providing any additional benefit in travel time. Therefore, it was eliminated from further consideration.	—	—
Cog Rail Refinement	This alternative includes refining the Cog Rail Alternative eliminated in the June 2020 *Draft Alternatives Development and Screening Report*. The refinements include more analysis of a single rail line instead of the double rail line considered, an alignment that more closely follows the existing S.R. 210 and 9400 South alignments, an alignment along the canyon floor of Little Cottonwood Canyon, and an alternative that includes a bus system to service the rail system starting at the entrance to Little Cottonwood Canyon. Commenters also suggested considering a diesel-powered train instead of electric power to reduce cost by eliminating overhead electric lines and suggested that snow sheds should be included with the alternative.	✓	✓	✓
Tunnel Alternative with Autonomous Vehicles	This alternative includes a tunnel loop system from the gravel pit to the Snowbird and Alta ski resorts. The tunnel would be placed under S.R. 210 within UDOT right of way. Autonomous electric vehicles would operate in the tunnel at speeds of about 60 miles per hour depending on the tunnel curvature and grade.	Without a fully operational tunnel system at the scale or vehicle type needed for the S.R. 210 Project, it is not possible for UDOT to verify the cost and operational characteristics of the tunnel alternative and compare the alternative against other alternatives being considered in this EIS.	—	—

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Table 2.2-9. Screening Results – November 2020 Draft Alternatives Development and Screening Report Addendum

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Reconfigure S.R. 209/ S.R. 210 for Enhanced Bus Service	This alternative includes closing S.R. 209 from the Wasatch Boulevard/9400 South intersection to the S.R. 209/S.R. 210 intersection to through traffic and allowing only buses and local traffic. Buses from the mobility hubs would use the closed portion of S.R. 209 to access Little Cottonwood Canyon. All vehicle through traffic other than buses would use S.R. 210. Traffic from the south portion of the Salt Lake Valley would connect to S.R. 210 at the intersection of Wasatch Boulevard and North Little Cottonwood Road.	Buses would still need to merge with S.R. 210 traffic at the intersection of S.R. 209 and S.R. 210, which would create additional delay. The alternative does not provide any additional benefit over the Enhanced Bus Service in Peak-period Shoulder Lane Alternative.	—	—
Limit Skiers	This alternative includes limiting the number of skiers at Snowbird and Alta instead of making roadway improvements. This would be accomplished by the resorts limiting ticket sales, by UDOT limiting the number of vehicles in the canyon through a reservation system, by UDOT charging a high toll, by the resorts charging a fee for parking at the ski resorts based on vehicle occupancy, by UDOT implementing odd-even license plate days,[b] and/or by UDOT stopping vehicle traffic from taking S.R. 210 into the canyon when the parking lots at the resorts are at capacity.	This strategy would not reduce peak-hour traffic congestion or vehicle backup on S.R. 210.	—	—
Autonomous or Semi-autonomous Electric Vehicles	The alternative includes using autonomous or semi-autonomous electric vehicles that can move small groups of people from central parking areas in the Salt Lake Valley to the ski resorts in Little Cottonwood Canyon. UDOT would run the fleet of autonomous or semi-autonomous electric vehicles that could be used to take users to the ski resorts.	Self-driving vehicle technology is still in its early stages. In addition, to be feasible, the self-driving vehicle alternative would require all users to have this technology. UDOT cannot mandate that users of S.R. 210 have a self-driving vehicle.	—	—
Town of Alta Vehicle-free Zone	This alternative includes moving the gondola terminal station at the Alta ski resort to the Albion parking lot and allowing parking only at the Alta Wildcat parking lot before the town of Alta. S.R. 210 through the town of Alta would become a pedestrian-only zone without vehicles.	This alternative would not improve overall mobility on S.R. 210 except in the town of Alta.	—	—

(*continued on next page*)

Table 2.2-9. Screening Results – November 2020 Draft Alternatives Development and Screening Report Addendum

Alternative	Alternative Description	Preliminary Screening	Level 1 Screening[a]	Level 2 Screening
Additional Ski Resorts	This alternative involves the State of Utah partnering with private partners to build three to five new ski resorts to serve Tooele, the western Salt Lake Valley, and potentially northern Utah County to reduce the number of people going to the ski resorts in Little Cottonwood Canyon.	UDOT does not have the authority to require private companies to build new ski resorts. In addition, if new ski resort capacity were economically viable, a private developer would likely build a resort.	—	—
Eliminate or Limit Parking in Little Cottonwood Canyon	This alternative eliminates or limits all parking in Little Cottonwood Canyon, including ski resort parking.	UDOT does not have the authority to limit or eliminate parking at privately owned ski resorts.	—	—
Dual Mode/TriTrak Motors	This alternative includes using specially designed vehicles on a rail network similar to monorail but with individual vehicles that can be driven on the street and taken home when they are not on the rail system.	A commercial dual-mode system is not available. Designing the dual-mode alternative for the S.R. 210 Project would require an extensive and costly research and development process. For these reasons, the dual-mode concept does not meet the logistical, technological, or economic requirements for a reasonable or practicable alternative.	—	—

[a] Three elements of the Level 1 screening criteria are to substantially improve peak-hour per-person (defined as the 30th-busiest hour or about 1,555 vehicles per hour) travel times in Little Cottonwood Canyon for uphill and downhill users in 2050 compared to travel times with the No-Action Alternative in 2050; meet peak-hour average total person-demand on busy ski days in Little Cottonwood Canyon (about 3,250 persons); and substantially reduce vehicle backups on S.R. 210 and S.R. 209 through residential areas on busy ski days (30th-busiest day).

[b] An odd-even license plate policy is a system in which vehicles whose license plates end with an odd or even number would be allowed in the canyon on alternating days.

2.2.3.1.2 Refinement of the Alternatives that Passed Screening from the June 2020 Draft Alternatives Development and Screening Report

The alternatives that passed the screening process from the June 2020 report (the enhanced bus service alternatives and the Gondola Alternative) were refined based on comments provided during the comment period for that report. These refinements included additional analysis regarding electric buses, adding snow sheds to the gondola alternatives, operating the gondola during the summer, and adding the 9400 South/ Highland Drive park-and-ride lot to the gondola alternatives. A summary of those revisions is provided below.

Electric Buses. In the June 2020 report, UDOT assumed diesel buses. For the EIS analysis, UDOT is assuming the use of diesel buses in the short term but, in cooperation with UTA, UDOT will evaluate electric buses during the procurement process for the Selected Alternative.

Gondola Alternatives with Snow Sheds. In the June 2020 report, the gondola alternatives did not include snow sheds. To meet the screening criteria for reducing vehicle backups and increasing reliability on S.R. 210 and improving the operational effectiveness of the gondola alternatives, UDOT decided to include snow sheds with the gondola alternatives.

Gondola and Cog Rail Summer Use. In the June 2020 report, summer use of the gondola was not included. Operating the gondola or cog rail during the summer could help pay for the capital cost of the system, and the gondola or cog rail could become a tourist attraction for those already traveling to Utah to visit other nearby attractions. This tourist attraction could provide an economic benefit to the tourism industry in Salt Lake County. Therefore, UDOT decided to include summer use of the gondola and cog rail as part of the EIS analysis.

Gondola and Cog Rail with 9400 South and Highland Drive Mobility Hub. In the June 2020 report, a mobility hub at 9400 South and Highland Drive was not included with the gondola alternatives. UDOT received comments that the gondola and cog rail alternatives should also include a mobility hub for users coming from the southern portion of the Salt Lake Valley. Commenters from the southern part of the valley said that they were less likely to use these alternatives if they had to travel north of Little Cottonwood Canyon to the gravel pit mobility hub. Therefore, UDOT decided to include the 9400 South and Highland Drive mobility hub and associated bus service with the gondola alternatives and the Cog Rail Alternative.

2.2.4 Alternatives Screening after the Addendum Process

After the *Draft Alternatives Development and Screening Report Addendum* was released in November 2020, UDOT received comments suggesting two additional alternatives: the JPods concept and a skier reservation system. UDOT also made refinements to the Cog Rail Alternative.

2.2.4.1 JPods Concept

The JPods concept is similar to the Dual Mode concept evaluated in the November 2020 addendum report since it would consist of gondola-type cabins suspended from a fixed rail similar to a monorail. A commercial JPods system is not available. Designing the JPods as an alternative for the S.R. 210 Project would require an extensive and costly research and development process. For these reasons, the JPods concept does not meet the logistical, technological, or economic requirements for a reasonable or practicable alternative (UDOT 2020c).

2.2.4.2 Skier Reservation System

The skier reservation system suggested is based on the reservation system implemented by Snowbird Resort for the 2020 ski season as a result of the COVID-19 pandemic. The reservation system guarantees a skier a parking space at the resort, and the skier can arrive anytime during the ski day. Because the reservation system does not require a specific arrival time, skiers could still all arrive during the morning peak period of 7 AM to 10 AM and ski a full day, which is what is allowed for the cost of the ski ticket. Thus, the reservation system would not reduce peak-period traffic. Additionally, the reservation system would still allow all parking to be used and would not solve the end-of-the-day congestion when skiers leave the resorts during the afternoon peak period from 3 PM to 5 PM. Finally, UDOT does not have the authority to require ski resorts to implement a reservation system.

2.2.4.3 Cog Rail Refinements

In March 2021, UDOT met with the Central Wasatch Commission and rail proponents to discuss cost differences between the UDOT estimate and those of the rail proponents. In the meeting, several new refinements were suggested that were not previously considered by UDOT, including a rail alignment that uses Snowbird Entry 3 and the Alta Bypass Road, a rail alignment that stops at Snowbird and uses shuttle buses for those users continuing to Alta, and an at-grade grade crossing of S.R. 210 at the cog rail base station at La Caille (HDR 2021).

The purpose of the Snowbird Entry 3 and Bypass Road alignment was to reduce the cost of the Cog Rail Alternative by placing the alignment on the Bypass Road, which would not require the need for snow sheds like the Cog Rail Alternative that uses S.R. 210 between Snowbird and Alta. For the Snowbird Entry 3 and Bypass Road alignment, UDOT found that the 15-minute schedule of the cog rail system could not be maintained because the cog rail vehicles would need to travel at slow travel speeds (10 miles per hour [mph]) through the sharp curves on the Bypass Road.

In addition, the proposed alignment on the Bypass Road would place the Snowbird Resort cog rail station directly in front of the main Snowbird lodge. The cog rail station would block ski-in, ski-out access to the lodge, which was one of the factors in the design of the Snowbird Resort historic complex. A change to the ski-in, ski-out access could be an adverse effect to this Section 4(f) property. [For more information about

Section 4(f) requirements, see Chapter 26, Section 4(f) and Section 6(f) Evaluation.] Because the cog rail system would not provide 15-minute headways and because of the potential impacts to the Snowbird Resort historic complex, the Snowbird Entry 3 and Bypass Road alignment was eliminated from further consideration.

The cog rail to Snowbird and shuttle bus to Alta alignment would follow the same north-side rail alignment as the Cog Rail Alternative evaluated in this EIS. However, the cog rail tracks would stop at Snowbird to avoid the need for snow sheds past the Superior and Hellgate avalanche zone. Skiers going on to Alta would need to transfer from the cog rail system to a shuttle bus for the ride to Alta. The purpose of this refinement is to reduce the cost of the cog rail alignment to Alta, which requires snow sheds in some segments between Snowbird and Alta. Removing the upper-canyon snow sheds ($116 million), track ($30 million), and Alta cog rail station ($5 million) would lower the cost by about $151 million. Adding shuttle bus service ($4 million) between Snowbird and Alta, the total cost of this alternative would be lowered by about $147 million. This would reduce the overall cost of the Cog Rail Alternative from about $1.090 billion to $944 million, which is still higher than the enhanced bus service or gondola alternatives.

Users going to Alta might view the shuttle bus system as a negative, and the bus system might discourage some Alta users from using the cog rail system since it would require another transfer (cog rail to shuttle bus) or two mode shifts, assuming that Alta-bound passengers use the parking garage at La Caille (car to train to shuttle bus). In addition, the shuttle buses could be delayed by snow or traffic congestion, whereas the cog rail service to Alta would not be delayed by snow or traffic congestion. One of the primary benefits of a cog rail system is that it is less likely to be delayed by snow on the road, and adding a bus system for part of the service is contrary to one of the reasons why cog rail is being considered. Therefore, UDOT eliminated the refinement that would add bus service between Snowbird and Alta because it is similar to the Cog Rail Alternative being evaluated in this EIS but would reduce the overall reliability of the alternative, which is its primary benefit.

UDOT also evaluated an at-grade crossing of S.R. 210 at the cog rail base station at La Caille to reduce the cost of the Cog Rail Alternative, which includes a grade-separated structure over S.R. 210. With the cog rail service, cog rail trains on 15-minute headways would cross the at-grade rail crossing 8 times per hour. Traffic modeling found that, during the morning peak travel period, vehicles waiting at the at-grade rail crossing would back up uphill by about 1,000 feet. This line of vehicles would block access into the parking area for the cog rail base station and would block access into a residential area on the west side of S.R. 210. Because the morning traffic backup would block access into the base station up to 8 times per hour and would block a residential access, UDOT thought it was prudent to provide a grade-separated structure at this location.

2.2.5 Alternatives Advanced for Further Evaluation in the EIS

Based on the results of the June and November 2020 screening processes, five primary action alternatives were determined to meet the project's purpose and were advanced for further evaluation in this EIS. Table 2.2-10 lists the five primary alternatives and sub-alternatives that are evaluated in further detail in this EIS.

Table 2.2-10. Primary Alternatives and Sub-alternatives Evaluated in the Draft EIS

Primary Alternative	Purpose Element and Associated Options				
	Purpose Element: Improve Mobility		Purpose Element: Improve Reliability and Safety		
	Wasatch Boulevard Sub-alternatives	S.R. 210 from Fort Union Boulevard to Alta Sub-alternatives	Avalanche Mitigation Sub-alternatives	Trailhead Parking Sub-alternatives[b]	Winter Roadside Parking Sub-alternatives
Enhanced Bus Service Alternative	• Imbalanced-lane Alternative • Five-lane Alternative	**Enhanced bus service with mobility hubs at the gravel pit[a] and 9400 South/Highland Drive** • Winter point-to-point bus service from each mobility hub directly to the ski resorts • No summer bus service • 24 buses per hour in the peak hour • About 1,008 people on buses in the peak hour • 2,500 new parking spaces divided between two mobility hubs at the gravel pit and 9400 South and Highland Drive • Bus priority on Wasatch Boulevard • Tolling or other management strategies such as no single-occupant vehicles during peak periods	• Snow sheds with berms • Snow sheds and realigned road with no berms	• Trailhead parking improvements with no roadside parking within 0.25 mile • Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1 • No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird	• Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	• Imbalanced-lane Alternative • Five-lane Alternative	**Enhanced bus service with mobility hubs at the gravel pit[a] and 9400 South/Highland Drive** • Winter point-to-point bus service from each mobility hub directly to the ski resorts • No summer bus service • 24 buses per hour in the peak hour • About 1,008 people on buses in the peak hour • 2,500 new parking spaces divided between two mobility hubs at the gravel pit and 9400 South and Highland Drive • Bus priority on Wasatch Boulevard • Tolling or other management strategies such as no single-occupant vehicles during peak periods • Winter bus-only peak-period shoulder lanes from the North Little Cottonwood Road/Wasatch Boulevard intersection to the Alta Bypass Road; peak-period shoulder lanes would be cyclist and pedestrian facilities in summer	• Snow sheds with berms • Snow sheds and realigned road with no berms	• Trailhead parking improvements with no roadside parking within 0.25 mile • Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1 • No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird	• Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts
Gondola Alternative A (Starting at Canyon Entrance)	• Imbalanced-lane Alternative • Five-lane Alternative	**Gondola from the entrance of Little Cottonwood Canyon to Alta ski resort** • Gondola starting at the gondola station at the entrance of Little Cottonwood Canyon with stops at Snowbird ski resort and Alta ski resort only • About 30 gondola cabins per hour • About 1,050 people on gondolas in the peak hour • 2,500 new parking spaces divided between two mobility hubs at the gravel pit and 9400 South and Highland Drive • Enhanced bus service from the mobility hubs to the gondola base station at the entrance of Little Cottonwood Canyon (there would be no parking at the base station) • Bus priority on Wasatch Boulevard • Tolling or other management strategies such as no single-occupant vehicles during peak periods • Summer gondola service	• Snow sheds with berms • Snow sheds and realigned road with no berms	• Trailhead parking improvements with no roadside parking within 0.25 mile • Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1 • No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird	• Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts

(*continued on next page*)

Table 2.2-10. Primary Alternatives and Sub-alternatives Evaluated in the Draft EIS

Primary Alternative	Purpose Element and Associated Options				
	Purpose Element: Improve Mobility		Purpose Element: Improve Reliability and Safety		
	Wasatch Boulevard Sub-alternatives	S.R. 210 from Fort Union Boulevard to Alta Sub-alternatives	Avalanche Mitigation Sub-alternatives	Trailhead Parking Sub-alternatives[b]	Winter Roadside Parking Sub-alternatives
Gondola Alternative B (Starting at La Caille)	• Imbalanced-lane Alternative • Five-lane Alternative	**Gondola from La Caille to Alta ski resort** • Gondola starting about 0.75 mile northwest from the entrance of Little Cottonwood Canyon with stops at Snowbird ski resort and Alta ski resort only • About 30 gondola cabins per hour • About 1,050 people on gondolas in the peak hour • 1,500-space parking structure at the La Caille base station • 1,000 new parking spaces divided between two mobility hubs at the gravel pit and 9400 South and Highland Drive • Enhanced bus service from the mobility hubs to the gondola base station at La Caille • Bus priority on Wasatch Boulevard • Tolling or other management strategies such as no single-occupant vehicles during peak periods • Summer gondola service	• Snow sheds with berms • Snow sheds and realigned road with no berms	• Trailhead parking improvements with no roadside parking within 0.25 mile • Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1 • No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird	• Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts
Cog Rail Alternative (Starting at La Caille)	• Imbalanced-lane Alternative • Five-lane Alternative	**Cog rail from La Caille to Alta ski resort** • Cog rail starting about 0.75 mile northwest from the entrance of Little Cottonwood Canyon with stops at Snowbird ski resort and Alta ski resort only • Service every 15 minutes during the peak hours and every 30 minutes during the off-peak hours • About 1,000 people on cog rail trains in the peak hour • 1,500-space parking structure at the La Caille base station • 1,000 new parking spaces divided between two mobility hubs at the gravel pit and 9400 South and Highland Drive • Enhanced bus service from the mobility hubs to the cog rail station at La Caille • Bus priority on Wasatch Boulevard • Tolling or other management strategies such as no single-occupant vehicles during peak periods • Summer cog rail service	• Snow sheds with berms • Snow sheds and realigned road with no berms • Snow sheds in upper canyon	• Trailhead parking improvements with no roadside parking within 0.25 mile • Trailhead parking improvements with no roadside parking from canyon entrance to Snowbird Entry 1 • No trailhead parking improvements with no roadside parking from canyon entrance to Snowbird	• Elimination of winter roadside parking on S.R. 210 adjacent to the ski resorts

[a] The gravel pit is located on the east side of Wasatch Boulevard between 6200 South and Fort Union Boulevard.
[b] Trailhead improvements would include the existing Gate Buttress, Lisa Falls, and White Pine Trailheads and a new location at the Bridge Trailhead.

2.3 Alternatives Refinement Process

The purposes of the alternatives refinement process were to further refine and develop the alternatives and to develop a construction footprint for evaluating the impacts of the reasonable alternatives. The alternatives refinement process was conducted to avoid and minimize impacts to communities, impacts to the natural environment, and hazards such as avalanches. When refining the alternative alignments, UDOT used input from stakeholders during the scoping process, public and agency comments on the initial alternatives, and stakeholder interviews. This input included the following:

What were the purposes of the alternatives refinement process?

The purposes of the alternatives refinement process were to further refine and develop the alternatives and to develop a construction footprint for evaluating the impacts of the reasonable alternatives.

- Avoid or minimize impacts to private properties.
- Avoid or minimize impacts to recreation areas and trails.
- Avoid the safety risk associated with avalanches to the alternatives' infrastructure.
- Avoid or minimize impacts to water resources.

2.3.1 Roadway Design

When developing projects through the NEPA process, UDOT follows design standards for the alternatives that are developed. UDOT's standards are in place to ensure the safety of the traveling public by providing separation from roadside obstructions, providing space for vehicles to pull out of traffic in an emergency, having adequate distance to see intersections, and providing a safe place for cyclists and pedestrians. Standards are also important for roadway operations such as providing an area for storing plowed snow and conducting routine maintenance safely.

For existing roads, UDOT bases the roadway standards on the type of road and the existing speed limit. For Wasatch Boulevard, the road is classified as a principal arterial with a speed limit of 50 mph. During the alternatives development phase, commenters suggested that UDOT design Wasatch Boulevard for a lower speed limit, thus reducing the cross-section and impacts to homes and community resources.

UDOT evaluates speed limits outside the EIS process. To determine speeds on state roads, UDOT conducts a speed study. The posted speed limit is based on the 85th-percentile speed while giving consideration to the road surface, shoulders, sight distance, development, pedestrian activity, and crash data. Using these criteria, UDOT Region Two set the current posted speed limit for Wasatch Boulevard at 50 mph. To ensure mobility on state roads and equity between cities, UDOT must apply the speed study policy equally on state roads within each city. Designing to a lower speed than what vehicles travel could create a substandard safety design.

Finally, a lower design speed would still have the same cross-section design standards as identified in Section 2.6.2.3, Wasatch Boulevard Alternatives, except that the clear zone could be reduced by 8 feet on the west side of Wasatch Boulevard. The clear zone on the east side would also be reduced by 8 feet, but the overall width needed for the roadway would not change because the area needed for the trail and the park strip would still be required. The design of the Wasatch Boulevard alternatives includes extensive use of walls to reduce the number of residential acquisitions. Reducing the width of the clear zone would not result in any fewer residential acquisitions since walls would still be needed to reduce property impacts.

UDOT follows its design standards unless it is not reasonably possible to do so; for example, in cases where meeting one standard would cause another standard not to be met. For example, in a steep canyon, increasing the length of a road by adding more corners might reduce the roadway grade to meet grade standards, but it would not allow a sight distance standard (ability to see around corners) to be met. If the road were straightened to improve sight distance, it would reduce the length of the road and thus not meet grade standards. For more information regarding how UDOT considered roadway design standards, see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020.

2.3.2 Gondola Design

A 3S, or tri-cable, gondola system was selected because it provides the best wind stability, has faster travel speeds, and offers the potential for the longest spans between towers, which is advantageous to minimize the overall number of towers in Little Cottonwood Canyon as well as to span avalanche paths. Preliminary gondola alignments were refined to address specific design considerations, which are the following:

- **Minimize direct impacts to the Tanners Flat Campground.** Previous conceptual alignments evaluated in other studies placed an angle station in the campground. To minimize direct impacts to the campground, the gondola angle station was shifted to the west.
- **Avoid Wilderness Areas.** The gondola alignment was placed to avoid impacts to Wilderness Areas.
- **Avoid Little Cottonwood Creek.** The gondola alignment was moved away from Little Cottonwood Creek and its associated riparian corridor (a plant community consisting of the vegetation near the creek).
- **Avoid avalanche paths.** The gondola alignment and towers were optimized to avoid being affected by avalanche paths to the extent feasible. This optimization included moving tower locations, designing stronger towers if they would be placed in avalanche paths, and selecting taller towers to prevent a gondola car from being affected by an avalanche powder blast. The powder cloud from some avalanches, which can extend over 200 feet in the air, creates high forces and can exert excessive pressures on the gondola cabins.
- **Avoid resort infrastructure.** The gondola alignment, towers, and terminal stations were located to avoid existing infrastructure (hotels and lifts) at the resorts.

2.3.3 Cog Rail Design

Preliminary cog rail alignments were refined to address specific design considerations, which are the following:

- **Minimize impacts to trailheads.** The initial cog rail alternatives included double track along the entire alignment, including at the Gate Buttress, Grit Mill, and Lisa Fall Trailheads. To minimize impacts, UDOT used a single-track design at these locations.
- **Avoid historic properties.** The double-track design for the cog rail alignment would impact several historic properties. In these areas, UDOT designed a single track with the rail embedded into the road.

2.3.4 Avoidance and Minimization

2.3.4.1 Property Impacts

During the alternatives design process, UDOT evaluated opportunities to avoid and minimize right-of-way impacts to private properties and recreation resources. These steps included the following:

- Optimized the Wasatch Boulevard design to include retaining walls near Kings Hill Drive to reduce the number of residential relocations from three to one.
- Modified the Enhanced Bus Service in Peak-period Shoulder Lane Alternative to include retaining walls to minimize impacts to the Grit Mill and Gate Buttress parking areas and surrounding trails.

2.3.4.2 Impacts to Water Resources

During the design process, UDOT evaluated opportunities to avoid and minimize water resource impacts. These steps included the following:

- Modified the Enhanced Bus Service in Peak-period Shoulder Lane Alternative to include retaining walls to avoid direct construction impacts to Little Cottonwood Creek.
- To minimize water quality impacts from the trailhead improvement alternatives, included water quality buffers around parking areas to add low-impact development techniques or other stormwater best management practices and provided the appropriate number of restrooms per U.S. Department of Agriculture (USDA) Forest Service guidelines and in compliance with the Architectural Barriers Act.
- Included double-walled fuel tanks for the four backup diesel generators required for the gondola and cog rail alternatives.
- Developed stormwater drainage designs to minimize water quality impacts of runoff from any action alternative improvement in Little Cottonwood Canyon.

2.4 Travel Demand Management Strategies Considered as Part of the Action Alternatives

All of the action alternatives considered in Section 2.6, Alternatives Considered for Detailed Study, would need a travel demand strategy, such as tolling or vehicle occupancy restrictions (such as a ban on single-occupant vehicles) implemented in Little Cottonwood Canyon during the ski season. The purpose of these strategies is to reduce vehicle use on S.R. 210 in the canyon and promote the use of bus, gondola, or cog rail service to the ski resorts and adjacent areas, which would improve mobility on S.R. 210.

2.4.1 Tolling

Along with improved transit options (bus, gondola, or cog rail), tolls during the ski season would make users of personal vehicles consider whether an added toll would make transit a better option. The exact amount of the toll has yet to be determined, but the toll could range from $20 to $30 for most vehicles during peak periods, with possible variations based on the time of day and the day of the week. Tolling would be focused on the area of S.R. 210 around the ski resorts that would be served by the proposed transit in the action alternatives. Residents of Little Cottonwood Canyon, drivers of service vehicles, and potentially resort employees would likely be exempt from paying the toll. In addition, if a toll were implemented for S.R. 210, UDOT likely would need to implement a toll for S.R. 190 in Big Cottonwood Canyon at the same time. If only Little Cottonwood Canyon were tolled, use of Big Cottonwood Canyon could increase as users act to avoid the toll. If a decision is made to toll Big Cottonwood Canyon, a separate environmental analysis would be conducted if necessary (for more information, see Chapter 20, Indirect Effects).

Congestion (variable) pricing is in use in areas around the United States and the world. For Little Cottonwood Canyon, variable pricing might need to be considered. For example, the toll could be free or reduced for travel during off-peak periods. This type of toll structure would encourage drivers to shift to transit during peak usage or to drive during off-peak or discount periods, both of which would be effective in improving mobility.

What is congestion (variable) pricing?

Congestion (variable) pricing is a dynamic pricing strategy in which users are charged higher prices to travel during congested periods. The purpose of congestion pricing is to shift some travel to less-congested periods or to transit.

With the enhanced bus service alternatives, tolling would be most effective with the bus alternative that has a separate bus lane because the bus travel time would be faster than vehicle travel times. The toll to the vehicle along with the faster travel time would make the bus service more attractive given the inconvenience of transferring from a vehicle to the bus and carrying ski gear onto the bus.

Although the exact type of tolling system has yet to be decided, it would likely be an electronic pass system and/or a license plate recognition system. The toll fees generated would be used to pay for the operation of the tolling system and potentially the operation and maintenance costs of the transit system to reduce fares to make transit an attractive option to paying a toll. Any tolling would need to follow applicable Federal Highway Administration and State of Utah requirements. Tolling revenue generated from a toll on a state highway must be deposited into the Tollway Special Revenue Fund and used for acquiring right of way and designing, constructing, reconstructing, operating, maintaining, and enforcing state transportation systems and facilities, including making operating improvements to the tollway and other facilities used exclusively for the operation of a tollway facility within the corridor served by the tollway.

UDOT has not identified a specific tolling technology. It could be cell phone–based system, an E-ZPass–type system, and/or a license plate reader. If the tolling system requires a gantry, UDOT would prefer a single-pole gantry over the uphill travel lane on S.R. 210. The tolling gantry would likely be placed immediately adjacent to the roadway adjacent to the existing S.R. 210 emergency roadway closure gates just west of Snowbird Entry 1. To minimize visual impacts, UDOT would coordinate with the USDA Forest Service regarding the pole aesthetics.

2.4.2 Vehicle Occupancy

Another form of congestion management would be to exclude certain vehicles from entering Little Cottonwood Canyon based on vehicle occupancy and requiring those users to take transit. With this implementation strategy, during busy ski days (typically Friday through Sunday and holidays), single-occupant vehicles would not be allowed in the canyon from 7 AM to 10 AM. Occupancy readers or other enforcement strategies would be implemented to determine the number of vehicle occupants. Current technologies and other forms of enforcement such as law enforcement needing to watch vehicles enter the canyon could limit the effectiveness of this alternative. Violators would be fined for violating the occupancy requirements. To avoid riding in a single-occupant vehicle, some single occupants might carpool, which would also improve traffic conditions by reducing the number of vehicles in the canyon.

By eliminating just single-occupant vehicles, it is possible that carpooling would increase, but the reduction in the number of vehicles might not be substantial enough to improve mobility. In this case, it is possible that, during certain periods, both single- and two-occupant vehicles might need to be restricted from Little Cottonwood Canyon. Residents of Little Cottonwood Canyon, drivers of service vehicles, and potentially resort employees would be exempt from the vehicle occupancy requirement.

2.5 Land Appropriation, Easements, and/or Special-use Permits

In Little Cottonwood Canyon, some of the action alternatives listed in Section 2.6, Alternatives Considered for Detailed Study, cross or are within National Forest System (NFS) lands. If proposed improvements would occur on NFS lands that is not currently subject to a written highway easement or other written instrument sufficient for the proposed action alternatives, the land might be subject to transfer under 23 United States Code (USC) Section 317, *Appropriation for Highway Purposes of Lands or Interests in Lands Owned by the United States*. Under Section 317, FHWA is authorized under certain conditions to cause the transfer of highway easements over federal land to state transportation departments such as UDOT.

Under the Section 317 process, FHWA makes a determination whether a proposed transportation use falls within the purview of Section 317. If it does, the U.S. Secretary of Agriculture, acting through the USDA Forest Service, can either certify that the appropriation of NFS lands for the proposed transportation use is contrary to the public interest or is inconsistent with the purposes for which the NFS lands were originally reserved, or the Secretary can agree to the appropriation of the land for transportation use with stipulated conditions to protect NFS lands. Those stipulations are then included in a highway easement deed issued by the United States to the state transportation department.

For the S.R. 210 Project, if FHWA determines that 23 USC Section 317 would not apply to a specific alternative or project component proposed to be located on NFS lands, then UDOT would be required to

obtain a special-use authorization (easement or special-use permit) from the USDA Forest Service under 36 Code of Federal Regulations Part 251. If the proposed use is not consistent with the *Revised Forest Plan: Wasatch-Cache National Forest* (USDA Forest Service 2003), a *Forest Plan* amendment would also be required. The easement or special-use permit would preserve other authorized uses that already exist in the areas of the improvements on NFS land.

The alternatives evaluated in this EIS were reviewed to determine their consistency with the *Revised Forest Plan: Wasatch-Cache National Forest*. Based on the analysis documented in this EIS, the Responsible Official for the Forest Service, the Forest Supervisor for the Wasatch-Cache National Forest, will decide whether to select UDOT's Preferred Alternative, one of the other action alternatives, or the No-Action Alternative. The USDA Forest Service would issue a separate Record of Decision to document its decision on the Selected Alternative if the Selected Alternative requires NFS lands that were determined ineligible for appropriation by FHWA under Section 317. In addition, the Record of Decision would also document whether to issue a special-use authorization and *Forest Plan* amendment with respect to transportation facilities on NFS lands.

UDOT anticipates that the enhanced bus service alternatives and snow sheds would be under the purview of 23 USC Section 317, but the gondola alternatives, the Cog Rail Alternative, and the trailhead improvement alternatives might not be. However, because FHWA has yet to make a determination regarding Section 317 applicability, UDOT has analyzed all of the action alternatives and components that would be located on NFS lands as if a special-use authorization would be required from the Uinta-Wasatch-Cache National Forest.

2.6 Alternatives Considered for Detailed Study

The alternatives carried forward for detailed study in this EIS are the No-Action Alternative (to be used as a baseline), the Enhanced Bus Service Alternative, the Enhanced Bus Service in Peak-period Shoulder Lane Alternative, Gondola Alternative A (Starting at Canyon Entrance), Gondola Alternative B (Starting at La Caille), and the Cog Rail Alternative (Starting at La Caille). This section provides a detailed description of each alternative. In order to conduct a detailed evaluation of these alternatives, UDOT developed preliminary engineering and cost estimates for the five primary action alternatives. As stated in Section 2.4, Travel Demand Management Strategies Considered as Part of the Action Alternatives, all primary action alternatives would require a toll or vehicle-occupancy requirement to incentivize their use.

Appendix 2B through Appendix 2F include figures that show the designs of the action alternatives. The design plans show how the improvements for each alternative would be located relative to the existing roadway infrastructure. For more information about the type of construction activities associated with each action alternative, see Chapter 19, Construction Impacts.

2.6.1 No-Action Alternative

NEPA requires an analysis of the No-Action Alternative. This alternative serves as a baseline so that decision-makers can compare the environmental effects of the action alternatives.

If no action is taken on S.R. 210, UDOT would continue to make minor maintenance improvements such as rehabilitating pavement, maintaining guard rails and drainage, and making minor operational improvements to parking and access. Overall, with the No-Action Alternative, the basic layout and operation of S.R. 210 would not change.

2.6.2 Enhanced Bus Service Alternative

The Enhanced Bus Service Alternative is summarized in Figure 2.6-1. This alternative includes frequent bus service from two mobility hubs, improvements to Wasatch Boulevard, snow sheds, improvements to trailheads, and no winter parking. Each of these elements is described below.

The goal of this alternative is to reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon on a busy ski day during the peak hours (7 AM to 10 AM) by about 30%. To achieve a 30% reduction, about 1,000 people would need to convert to transit in each peak hour, which is the design of the proposed bus system. To reduce personal vehicle use, a toll or a ban on single-occupant vehicles would be in place to incentivize travelers to the ski resorts to use the enhanced bus service. The cost of using the enhanced bus service, including parking at the mobility hubs, has not been determined. However, to incentivize use, the cost of using the enhanced bus service would be substantially less than a toll.

Summer bus service is currently not provided in Little Cottonwood Canyon, and it is not evaluated in this EIS because it is not necessary to meet the project's purpose. If UDOT were to implement summer bus service as part of this alternative, the price of a bus ride would be substantially higher than during the winter when the bus service is needed to reduce congestion in Little Cottonwood Canyon. Given a more expensive bus fare, canyon visitors would be unlikely to use the summer bus service since it would have longer travel times and greater cost than their personal vehicles. If a public or private entity wants to implement summer bus service to the trailheads and ski resorts in Little Cottonwood Canyon, the entity would need to work with the USDA Forest Service and any other agency with jurisdiction to determine any permitting and environmental document requirements.

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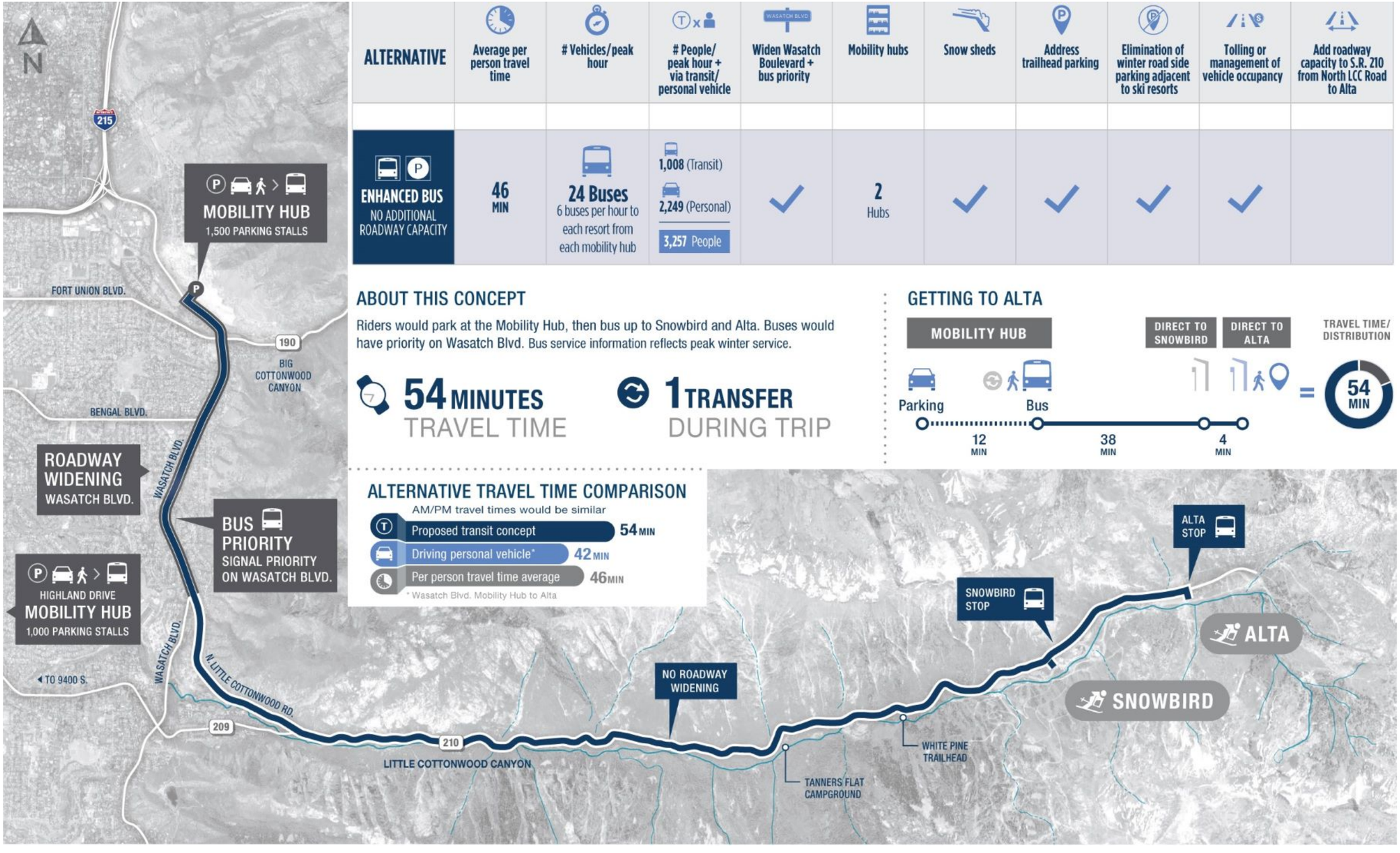
Figure 2.6-1. Enhanced Bus Service Alternative – Overview



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2.6.2.1 Bus Service

This Enhanced Bus Service Alternative consists of high-frequency bus service from two mobility hubs directly to the ski resorts. Although the exact hours of operation have not been determined, it is likely that the enhanced ski bus service would operate 7 days per week between 7 AM and 7 PM with peak service in the morning (7 AM to 10 AM) and afternoon (3 PM to 6 PM). The service would run during the winter only and would operate from late November through mid-April, the same as the current ski bus service. The total person-capacity of the enhanced bus service during the peak periods would be about 1,008 persons per hour assuming a 42-person bus capacity. The bus service is based on buses leaving every 10 minutes from each mobility hub to each ski resort for a total of 24 buses per hour. The final bus service operating times could be adjusted during the final design of the selected primary alternative considering connections to the rest of the local transit system.

The bus size and technology could change, but the assumption for this alternative is that the buses would be similar to the existing 35-foot diesel ski buses in operation today (for more details, see Appendix 2A, Draft Alternatives Development and Screening Report June 8, 2020). If an enhanced bus service alternative is selected, UDOT would evaluate electric or hybrid bus technology. The enhanced bus service could be operated by a public agency (such as UTA) or a private vendor. If a private vendor is selected, a special-use permit from the USDA Forest Service might be required and would be based on the analysis in this EIS. The alternative includes the following elements:

- About 65 buses would be purchased
- Bus priority at signalized intersections on Wasatch Boulevard and 9400 South
- Fare collection system
- Communications equipment
- Bus maintenance and storage facility

As shown in Table 2.6-1, during the peak periods, 24 buses per hour would depart for travel in Little Cottonwood Canyon, or a bus going up or down the canyon every 2 minutes 30 seconds. The enhanced bus service would operate in mixed-flow traffic with other vehicles (the current roadway configuration) on S.R. 210 in the canyon. There would be no improvements to S.R. 210 in Little Cottonwood Canyon with the Enhanced Bus Service Alternative. On Wasatch Boulevard, bus priority with the option of buses running in the shoulder during peak periods would be available (this would include signs stating that the shoulder can be used by buses only). Bus priority would allow buses to use shoulders or bus-only lanes at intersections, with the intersection signal giving buses priority through the intersection in front of vehicles.

The enhanced bus service would be provided from a new mobility hub located at the site of the existing park-and-ride lot at 9400 South and Highland Drive and from another proposed mobility hub at the gravel pit located on the east side of Wasatch Boulevard between 6200 South and Fort Union Boulevard (for more information, see Section 2.6.2.2, Mobility Hubs). The enhanced bus service would run between each of the proposed mobility hub lots directly to one transit stop at either Snowbird or Alta (buses going to Alta would not stop at Snowbird first). At Snowbird, the bus stop would likely be at the developed area at the Cliff Lodge Drive entrance where the buses could go under the Bypass Road structure to return to S.R. 210. At Alta, the bus stop would likely be the existing Goldminer's Daughter Lodge bus stop, which provides room for buses to turn around and return to S.R. 210.

Table 2.6-1. Enhanced Bus Service Alternative – Bus Operation Details

Description	Mobility Hub	Days	Buses per Hour Peak/Off-peak		Total Buses per Hour Peak/ Off-peak
			To Snowbird	To Alta	
Buses operating in mixed-flow traffic. (**No capacity added to S.R. 210 from North Little Cottonwood Road to Alta.**) Total capacity of 1,008 riders in the peak hour, or 504 per resort.	Gravel pit/ Wasatch Blvd.	Monday–Sunday	6 / 3	6 / 3	24 / 12
	9400 South	Monday–Sunday	6 / 3	6 / 3	

2.6.2.2 Mobility Hubs Alternative

To support personal vehicle parking for the Enhanced Bus Service Alternative, mobility hubs would be built at 9400 South and Highland Drive at an existing park-and-ride lot and at a gravel pit on the east side of Wasatch Boulevard between 6200 South and Fort Union Boulevard. To meet the anticipated goal of having 30% of ski resort users in Little Cottonwood Canyon shift to the enhanced bus service, about 2,500 parking spaces would be needed at the mobility hubs.

According to traffic counts taken by UDOT in March 2018 (L2 Data Collection 2018), about 40% of the traffic going to Little Cottonwood Canyon comes from the south Salt Lake Valley and uses 9400 South and S.R. 209, and about 60% comes from the north and uses S.R. 210. Based on the traffic count data, UDOT assumed that about 40% of transit users would park at the 9400 South and Highland Drive mobility hub and about 60% would park at the gravel pit mobility hub. This would result in a need for about 1,000 parking spaces at the 9400 South and Highland Drive mobility hub and about 1,500 spaces at the gravel pit mobility hub. The mobility hubs would have areas for skiers to be dropped off by personal vehicles or commercial vendors.

2.6.2.2.1 Gravel Pit (6200 South Wasatch Boulevard)

Figure 2.6-2 shows the location of the mobility hub at the gravel pit. The mobility hub would need about 1,500 parking spaces or about a three- to four-story single parking structure, assuming a 400-foot-by-400-foot structure, or two parking structures could be provided. The mobility hub would also include a bus storage area and maintenance facility. Since a detailed geotechnical survey has not been performed at the gravel pit site, the final configuration could change. To handle traffic flow requirements, the mobility hub would include an interchange from Wasatch Boulevard to the site. The site would include appropriate downward-directed security lighting. Figure 2.6-3 shows a visual concept of the proposed mobility hub.

Figure 2.6-2. Mobility Hubs – Gravel Pit (6200 South and Wasatch Boulevard) Mobility Hub Layout

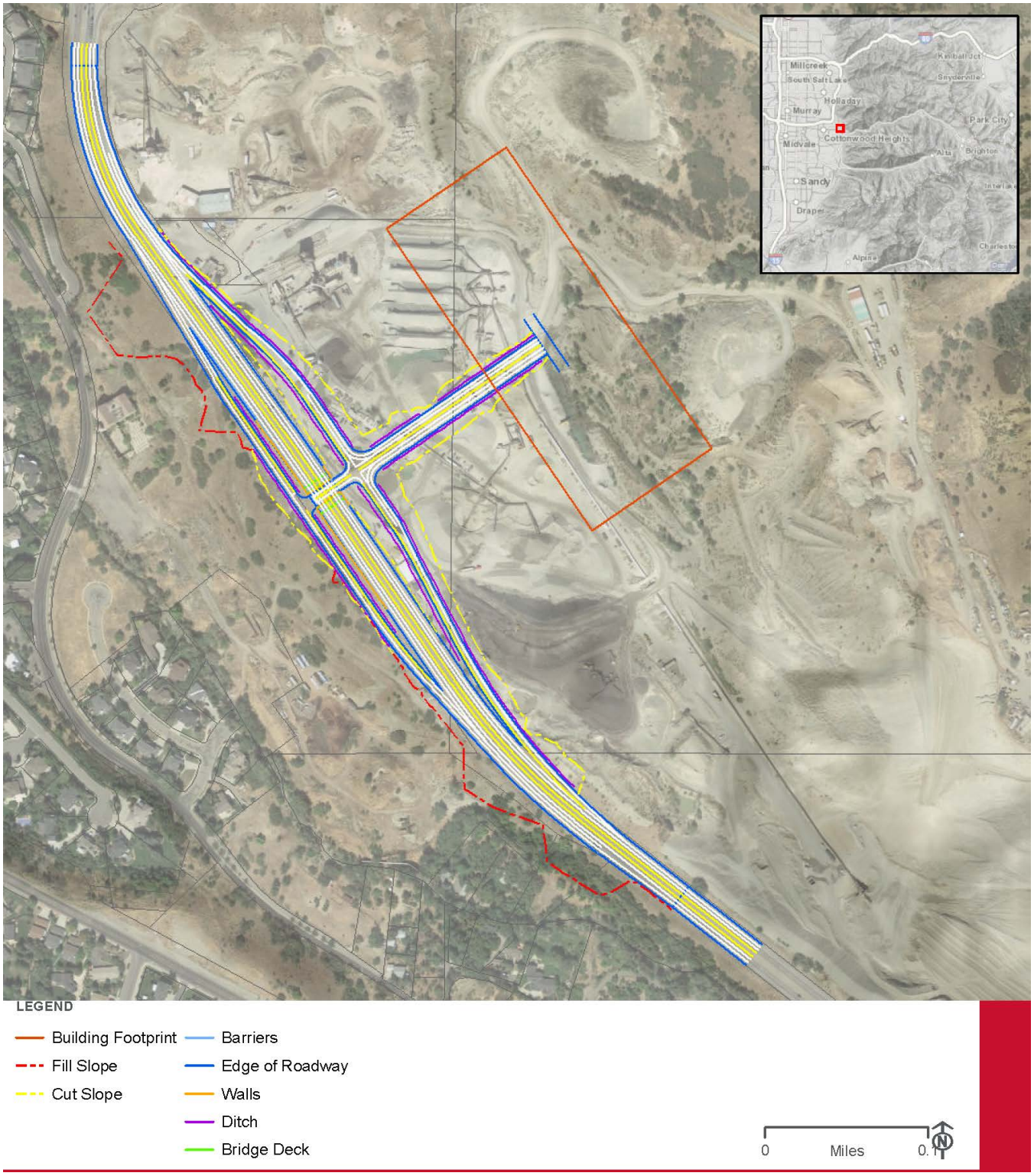
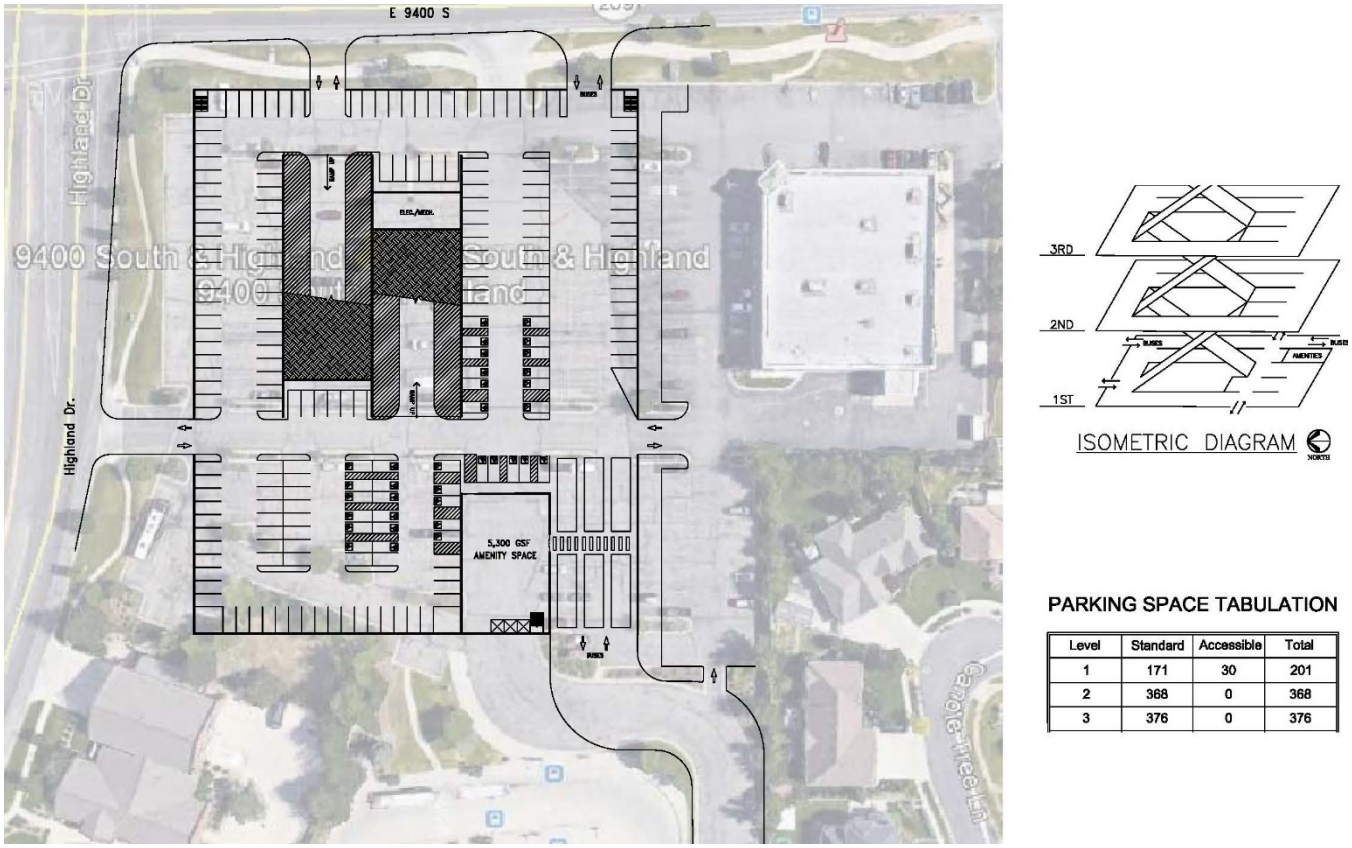


Figure 2.6-3. Mobility Hubs – Concept of Mobility Hub at the Gravel Pit

2.6.2.2.2 9400 South and Highland Drive

Figure 2.6-4 shows the location of the mobility hub at the existing park-and-ride lot at 9400 South and Highland Drive. The mobility hub would need about 1,000 parking spaces, or about a three-story parking structure that would fit within the existing parking area. No changes to the site access would be required. The site would include appropriate downward-directed security lighting similar to that at the existing park-and-ride lot.

Figure 2.6-4. Mobility Hubs – 9400 South and Highland Drive Mobility Hub Conceptual Layout



2.6.2.3 Wasatch Boulevard Alternatives

With the Enhanced Bus Service Alternative, Wasatch Boulevard would be widened using either the Imbalanced-lane Alternative or the Five-lane Alternative. If the Enhanced Bus Service Alternative is selected, one of the two Wasatch Boulevard alternatives would be identified as the preferred Wasatch Boulevard alternative. Appendix 2B, Wasatch Boulevard Imbalanced-lane Alternative Plans, and Appendix 2C, Wasatch Boulevard Five-lane Alternative Plans, show the design plans for each Wasatch Boulevard alternative.

2.6.2.3.1 Imbalanced-lane Alternative

The Imbalanced-lane Alternative involves widening Wasatch Boulevard from Fort Union Boulevard to North Little Cottonwood Road to three travel lanes with a center median.

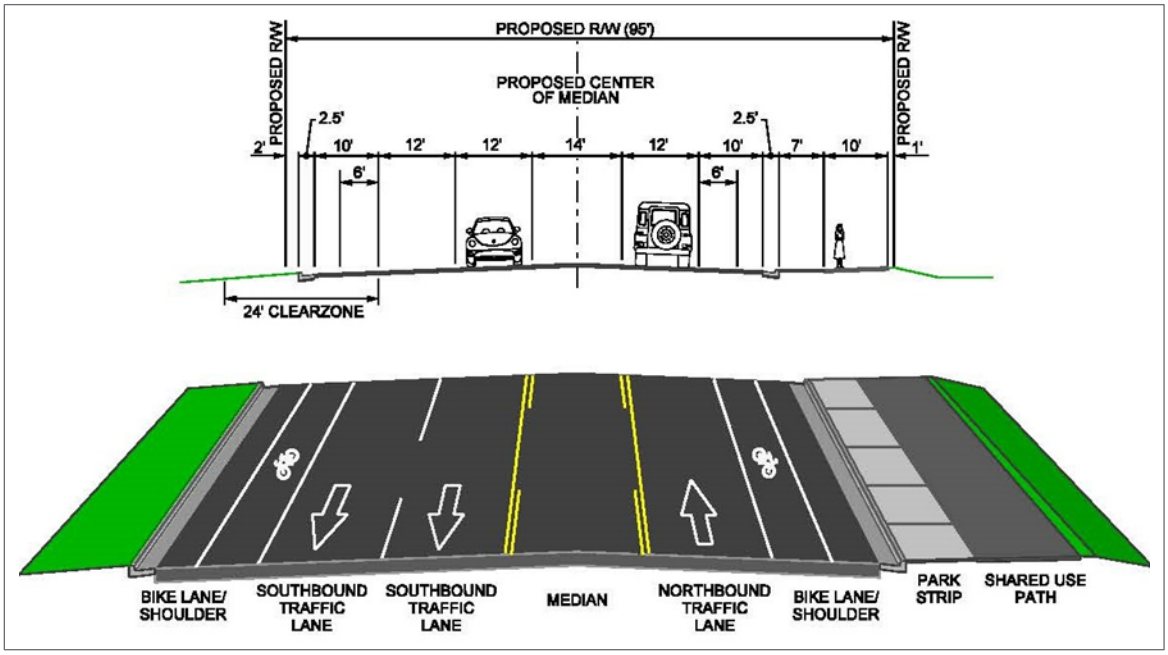
Imbalanced-lane Alternative Cross-section

Figure 2.6-5 shows the Imbalanced-lane Alternative cross-section. This alternative from Bengal Boulevard to North Little Cottonwood Road would have a four-lane (96-foot) cross-section consisting of three 12-foot travel lanes (two southbound and one northbound), a 14-foot median (either a two-way left-turn lane or a raised center median), 10-foot shoulders consisting of a striped bicycle lane and curb and gutter, and a

7-foot park strip and 10-foot shared-use path on the east side of Wasatch Boulevard. The cross-section could accommodate shoulder-running buses during peak periods. Intersections on Wasatch Boulevard would include appropriate dedicated left- and right-turn lanes, and signalized intersections would include priority signals to provide bus priority. This alternative would maintain the existing Wasatch Boulevard five-lane cross-section from Fort Union Boulevard to Bengal Boulevard.

The Imbalanced-lane Alternative would remove about 0.01 acre of the Timberline Trailhead, which is located off Timberline Drive and provides access to the Ferguson Canyon trail. As part of the Imbalanced-lane Alternative, UDOT would reconstruct the existing dirt parking area so that there would be no net loss of parking spaces.

Figure 2.6-5. Wasatch Boulevard Alternatives – Imbalanced-lane Alternative Cross-section (Bengal Boulevard to North Little Cottonwood Road)



Stormwater Drainage

A stormwater drainage system would be constructed to control the additional runoff that would result from the increase in impervious (paved) area due to the Imbalanced-lane Alternative, where feasible. In some cases, the peak discharge rate of the runoff would be controlled to match existing conditions in order to use existing storm drain features. Stormwater detention basins, grassed swales, or a combination of control features would be used to store stormwater runoff and reduce peak flows, pursuant to UDOT's stormwater design manual. These stormwater controls would also improve water quality by allowing sediment and other pollutants to settle out of the water before being discharged to receiving waters.

The initial stormwater system and detention features are based on the preliminary design (about 5%) developed for this EIS. The locations of the proposed detention basins are shown in Appendix 2B, Wasatch Boulevard Imbalanced-lane Alternative Plans. The expected impacts of this system are evaluated in this EIS; however, after this EIS is completed and the Selected Alternative goes into final design, the stormwater

system would be developed in more detail, and the locations of detention features and best management practices might be revised.

Utility Relocations

Several utilities are within or adjacent to the Wasatch Boulevard right of way, utilities including electric (overhead lines and buried lines), gas, water, sewer, and telephone/fiber optic. Many of these utilities would need to be relocated as part of a design improvement. They would be relocated within the construction area (cut and fill) required for Wasatch Boulevard.

Pedestrian Overpasses

UDOT in coordination with Cottonwood Heights City would consider pedestrian overpasses at about 325 feet south of the Fort Union Boulevard and Wasatch Boulevard intersection and at Russell Park Road. The pedestrian overpasses are being evaluated as part of the EIS process. If an action alternative is selected for Wasatch Boulevard, UDOT would work with Cottonwood Heights City to determine funding options for the pedestrian overpasses. Long-term maintenance of the pedestrian overpasses would be the responsibility of Cottonwood Heights City.

Aesthetics

UDOT in coordination with Cottonwood Heights City would develop an aesthetics plan to implement as part of proposed improvements to Wasatch Boulevard. To develop the plan, UDOT and Cottonwood Heights City would use the goals identified in the *Wasatch Boulevard Master Plan* and the general concepts shown in the *Wasatch Boulevard Aesthetic Design Plan* for preserving and enhancing scenic and natural qualities along Wasatch Boulevard (Cottonwood Heights City 2019; HDR 2020).

2.6.2.3.2 Five-lane Alternative

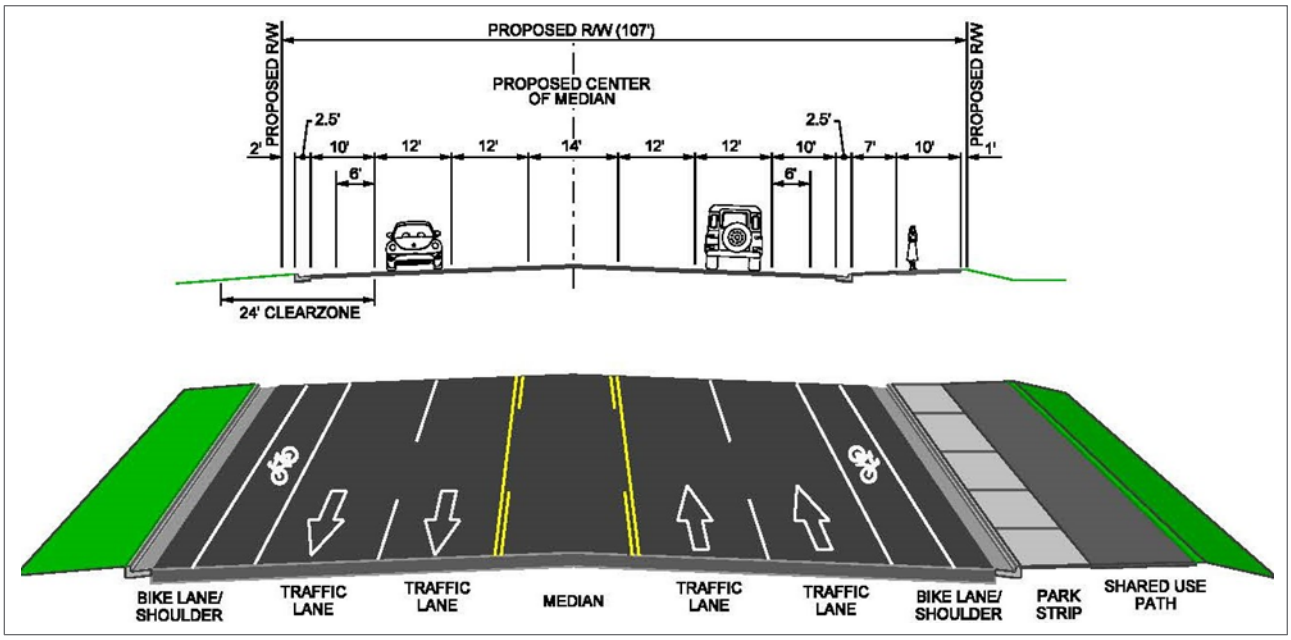
The Five-lane Alternative involves widening Wasatch Boulevard from Fort Union Boulevard to North Little Cottonwood Road to four travel lanes with a center median.

Five-lane Alternative Cross-section

Figure 2.6-6 shows the Five-lane Alternative cross-section. From Fort Union Boulevard to North Little Cottonwood Road, the alternative would have a five-lane (107-foot) cross-section consisting of four 12-foot travel lanes (two southbound and one northbound), a 14-foot median (either a two-way left-turn lane or a raised center median), 10-foot shoulders consisting of a striped bicycle lane and curb and gutter, and a 7-foot park strip and 10-foot shared-use path on the east side of Wasatch Boulevard. The cross-section would accommodate shoulder-running buses during peak periods. Intersections on Wasatch Boulevard would include appropriate dedicated left- and right-turn lanes, and signalized intersections would include priority signals to provide bus priority.

The Five-lane Alternative would remove about 0.01 acre of the Timberline Trailhead, which is located off Timberline Drive and provides access to the Ferguson Canyon trail. As part of the Five-lane Alternative, UDOT would reconstruct the dirt parking area so that there would be no net loss of parking spaces.

Figure 2.6-6. Wasatch Boulevard Alternatives – Five-lane Alternative Cross-section (Fort Union Boulevard to North Little Cottonwood Road)



Stormwater Drainage, Utility Relocations, Pedestrian Overpasses, and Aesthetics

The stormwater drainage utility relocations, pedestrian overpasses, and aesthetics plan for the Five-lane Alternative would be the same as those for the Imbalanced-lane Alternative.

2.6.2.4 Avalanche Mitigation Alternatives

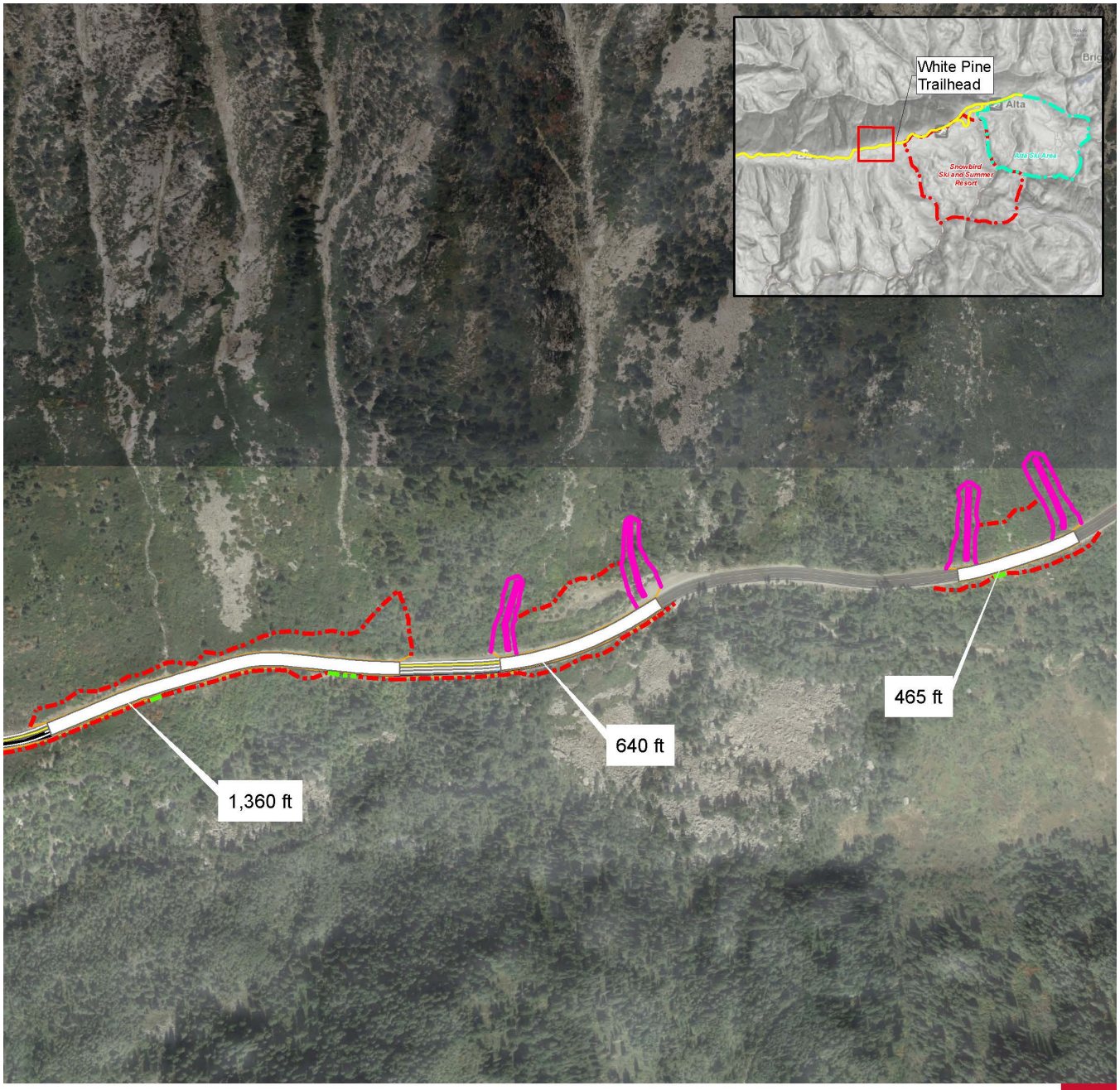
Two avalanche mitigation alternatives are being evaluated: the Snow Sheds with Berms Alternative and the Snow Sheds with Realigned Road Alternative. If the Enhanced Bus Service Alternative is selected, one of the two avalanche mitigation alternatives would be identified as the preferred avalanche mitigation alternative.

With the avalanche mitigation alternatives, there would be less need for active avalanche mitigation such as the use of artillery to trigger avalanches. Under the current avalanche-mitigation program, from 2004 to 2017, an average of 153 artillery shells per ski season were fired into the avalanche paths where the snow sheds would be placed. UDOT anticipates that, with the avalanche mitigation (snow shed) alternatives, artillery use in the avalanche paths protected by the snow sheds could be reduced by 80% to about 31 artillery shells per season (Dynamic Avalanche Consulting 2019).

2.6.2.4.1 Snow Sheds with Berms Alternative

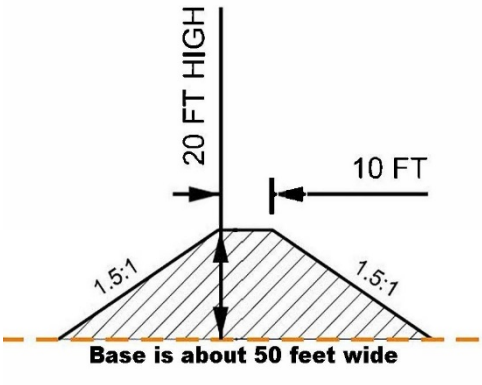
The Snow Sheds with Berms Alternative includes three separate snow sheds as shown in Figure 2.6-7. Snow sheds over three main avalanche paths (White Pine Chutes 1–4, a snow shed about 1,360 feet long; White Pine, a snow shed about 640 feet long; and Little Pine, a snow shed about 465 feet long) offer the most reduction in avalanche risk and would help keep S.R. 210 open more often.

Figure 2.6-7. Avalanche Mitigation Alternatives – Snow Sheds with Berms Alternative



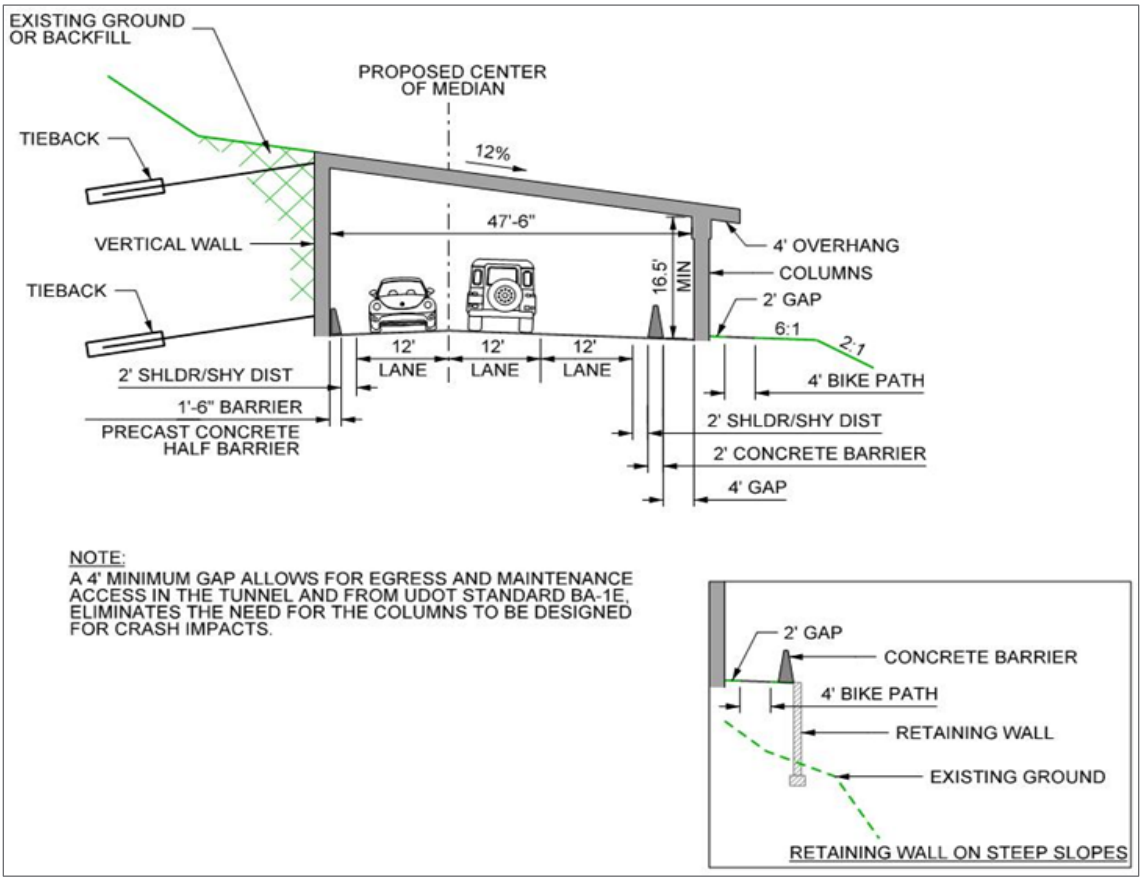
This alternative includes the use of earthen guiding berms at the two eastern snow sheds to direct avalanche flows over the shed and shorten the required length of the snow shed structure, which would reduce costs. The guiding berms would be about 300 feet long and 10 feet wide. The berms would be constructed up the mountain side from the tops of the shed portals and would extend along the avalanche paths to help direct avalanche flows across the tops of the sheds. The berm geometry was assumed to be 20 feet high and 10 feet wide at the top, with 1.5:1 (horizontal:vertical) side slopes. Figure 2.6-8 shows a typical cross-section of the earthen guiding berm.

Figure 2.6-8. Earthen Berm Cross-section



As shown in Figure 2.6-9, the snow shed design would accommodate a bicycle path on the outside of the snow shed; cyclists would also be allowed in the snow sheds. The tie-backs shown in Figure 2.6-9 would be used where the snow shed is close to the mountain. When the snow shed is not close to the mountain, engineered fill would be placed behind the snow shed to allow the avalanche flow to run over the top of the snow shed. The snow shed tie-backs would be placed in the engineered fill.

Figure 2.6-9. Snow Shed Design with Bicycle Path



The snow sheds in Little Cottonwood Canyon could include the following operational elements, subject to a detailed engineering analysis and coordination with the authorities having jurisdiction (Unified Fire Authority, Utah Highway Patrol, UDOT, USDA Forest Service, and Salt Lake City Department of Public Utilities):

1. Traffic-control devices at the approaches to the snow sheds and within the snow sheds
2. Fire-detection and alarm systems
3. Two-way communications
4. A water connection to local water infrastructure
5. Dry pipeline and dry standpipes in the snow sheds
6. Portable fire extinguishers
7. Fixed water-based fire-fighting systems (sprinklers)
8. Tunnel drainage systems
9. Means of egress and signage
10. Electrical systems for lighting the inside of the snow shed

A water supply and standpipes would need to be provided to the snow sheds for fixed fire protection. Because the water lines would be subject to freezing conditions, and to eliminate the need to circulate the water and to install heat tracing tape and insulation, the water system would be "dry." With a dry system, when a fire occurs, water is turned on at a source and would be delivered to all hose connections within 10 minutes or less to meet standards.

What is a standpipe?

A standpipe is a vertical pipe extending from a water supply main.

An agreement with the Salt Lake City Department of Public Utilities would be required to deliver water to the snow sheds from Canyon Water District. Canyon Water District believes it has adequate storage capacity and infrastructure to supply fire flows (1,000 gallons per minute for about 2 hours) to the snow sheds. The snow shed drainage system would be designed to contain water used in a fire emergency. An emergency response plan would be developed in consultation with the Salt Lake City Department of Public Utilities, UDOT, and the local fire authority to address spills and how water contained from use of the emergency fire-suppression system is removed from the containment system.

Assuming a connection near Snowbird Entry 1, a 1.75-mile-long water line would be needed to supply water to the sheds and would be constructed in the existing S.R. 210 roadway. To fill the line in 10 minutes or less, about a 4-to-6-inch water line would be required. A detailed hydraulic analysis would be required to define the fire flows, size the water main and standpipe systems (and/or sprinklers), and confirm the existing system's capacity.

A tunnel drainage and containment system would be designed to capture spills of hazardous or flammable liquids so that they cannot spread or cause flame propagation. The tunnel drainage system would be provided with an oil and fuel separator and a storage containment sufficient for the design spill rate for hazardous liquids, the size of which is a function of the size of hazardous or flammable transport vehicles. A tunnel drainage containment system would be implemented given the proximity of Little Cottonwood Creek.

2.6.2.4.2 Snow Sheds with Realigned Road Alternative

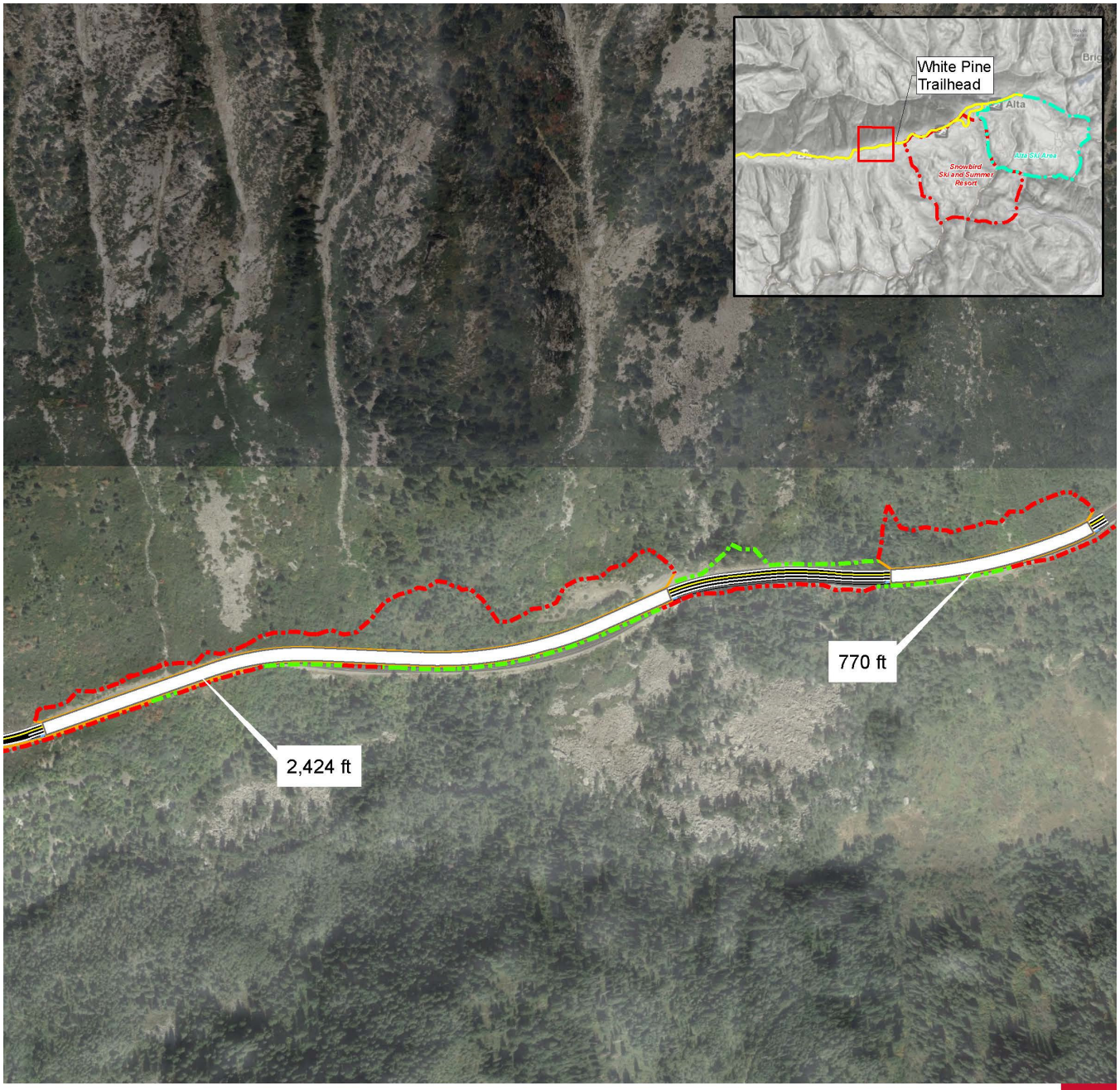
The Snow Sheds with Realigned Road Alternative includes two snow sheds. The White Pine Chutes and White Pine snow shed would be 2,424 feet long, and the Little Pine snow shed would be 770 feet long to help ensure that avalanche flows pass over the top of the shed. The existing road would be realigned to be closer to the mountain side in order to reduce the amounts of fill needed behind the snow sheds as well as to improve curve radii and sight distances inside the snow sheds.

The sight distances on the existing alignment inside the sheds would be suitable for a 30-mph design speed. The realigned road with snow sheds would be suitable for a 35-mph design speed. However, the Snow Sheds with Realigned Road Alternative would require UDOT to fully reconstruct the roadway cross-section and potentially relocate all utilities in the project area, including between the sheds and along the roadway leading up to the snow shed zone. Figure 2.6-10 shows this layout.

Moving the road toward the mountain side would also reduce the amount of fill or walls required on the downhill or stream side of the road. The old portions of the road alignment could be used for cyclists outside of the snow sheds, as shown above in Figure 2.6-9, Snow Shed Design with Bicycle Path. The geotechnical composition and bedrock locations of the new roadway area were not evaluated.

The operational requirements for the Snow Sheds with Realigned Road Alternative would be the same as for the Snow Sheds with Berms Alternative.

Figure 2.6-10. Avalanche Mitigation Alternatives – Snow Sheds with Realigned Road Alternative



2.6.2.5 Trailhead Parking Alternatives

Three trailhead parking alternatives are being considered:

- Trailhead Improvements and No S.R. 210 Roadside Parking within ¼ Mile of Trailheads Alternative
- Trailhead Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative
- No Trailhead Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative

If the Enhanced Bus Service Alternative is selected, one of the three trailhead parking alternatives would be identified as the preferred trailhead parking alternative.

Table 2.6-2 shows how each trailhead parking alternative would change the existing number of parking spaces in Little Cottonwood Canyon from the S.R. 209/S.R. 210 intersection to Snowbird Entry 1. None of the alternatives would increase the number of parking spaces above the existing conditions. The new Grit Mill Trailhead has been constructed in Little Cottonwood Canyon, and part of the implementation is to include no parking along S.R. 210 west of the trailhead to the Little Cottonwood Canyon park-and-ride lot. Therefore, the Grit Mill Trailhead was not included in the analysis. All trailheads with the exception of the Gate Buttress Trailhead are on NFS lands.

Table 2.6-2. Trailhead Parking Alternatives – Total Parking Spaces from S.R. 209/S.R. 210 to Snowbird Entry 1 by Trailhead Alternative

Parking Area	Number of Parking Spaces[a]			
	Existing Parking	Improve Trailhead Alternatives		No Improvement to Trailhead Alternative
		No Roadside Parking ¼ Mile from Trailhead	No Roadside Parking to Snowbird Entry 1	No Roadside Parking to Snowbird Entry 1
Roadside parking	429	290	0	0
Gate Buttress Trailhead	30 (in formal dirt lot)	21	21	30 (in formal dirt lot)
Bridge Trailhead	Not applicable (roadside parking only)	15	15[b]	0
Lisa Falls Trailhead	17 (north and south dirt pullouts)	41	41	17 (north and south dirt pullouts)
White Pine Trailhead	52	144	144	52
Total parking spaces[a]	**528**	**511**	**221**	**99**

[a] The total number of parking spaces shown in this table does not capture all of the smaller available pullouts along S.R. 210, so the total number of existing parking spaces is higher. The Grit Mill Trailhead parking area was built in 2020 and was not included as part of the analysis. For more information regarding existing and proposed parking, see Chapter 4, Community and Property Impacts.

2.6.2.5.1 Trailhead Improvements and No S.R. 210 Roadside Parking within ¼ Mile of Trailheads Alternative

This alternative would improve the Gate Buttress, Lisa Falls, and White Pine Trailheads parking and create a new trailhead at the Bridge Trail. Figure 2.6-11 shows the location of each trailhead. All trailhead improvements would include restrooms per USDA Forest Service guidelines based on the number of parking spaces and appropriate water quality buffers and treatment. With this alternative, all roadside parking within ¼ mile of the improved or new trailhead parking area would be eliminated. To eliminate parking, No Parking signs would be placed along S.R. 210. In all, the total number of parking spaces from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1 would be reduced from the existing 528 spaces to 511 spaces (a reduction of 17 spaces).

Figure 2.6-12 through Figure 2.6-15 show the trailhead parking configurations and number of spaces.

2.6.2.5.2 Trailhead Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative

With this alternative, the trailhead parking improvements would be the same as for the Trailhead Improvements and No S.R. 210 Roadside Parking within ¼ Mile of Trailheads Alternative. However, with this alternative, all roadside parking in Little Cottonwood Canyon would be eliminated from the entrance to the canyon to Snowbird Entry 1. To eliminate parking, No Parking signs would be placed along S.R. 210. In all, the total number of parking spaces from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1 would be reduced from the existing 528 spaces to 221 spaces (a reduction of 307 spaces).

2.6.2.5.3 No Trailhead Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative

With this alternative, there would be no improvements to trailhead parking, and all roadside parking would be eliminated from the S.R. 209/S.R. 210 intersection to Snowbird Entry 1. To eliminate parking, No Parking signs would be placed along S.R. 210. In all, the total number of parking spaces from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1 would be reduced from the existing 528 spaces to 99 spaces (a reduction of 429 spaces).

2.6.2.6 No Winter Parking Alternative

One no winter parking alternative is being considered. With the No Winter Parking Alternative, about 230 roadside parking spots would be eliminated during the winter near the ski resorts. Figure 2.6-16 shows the locations where new no-parking areas would be located. Roadside parking is used during winter peak days when the main ski area parking lots are at capacity. With the action alternatives, there would be sufficient parking in the valley to accommodate users. There would be no change to roadside parking below the ski areas.

Figure 2.6-11. Trailhead Parking Alternatives – Trailhead Locations

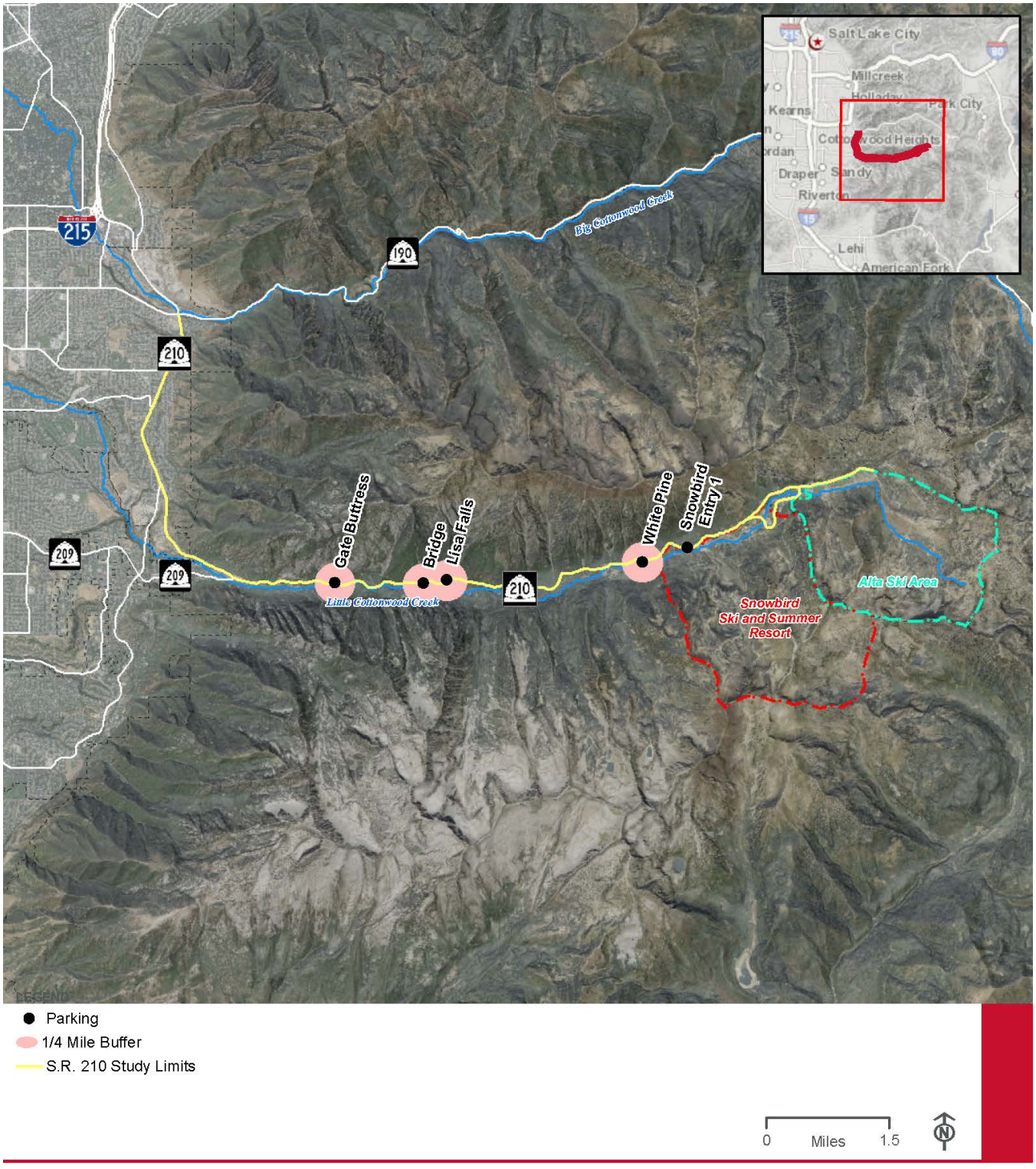


Figure 2.6-12. Trailhead Parking Alternatives – Gate Buttress Trailhead (21 Spaces)

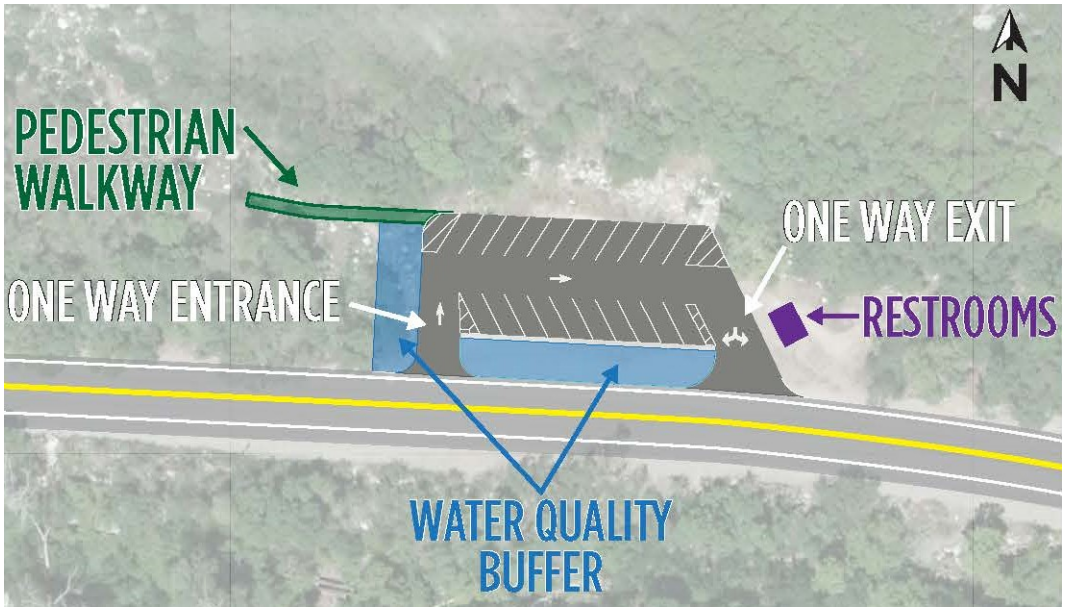


Figure 2.6-13. Trailhead Parking Alternatives – Bridge Trailhead (15 Spaces)

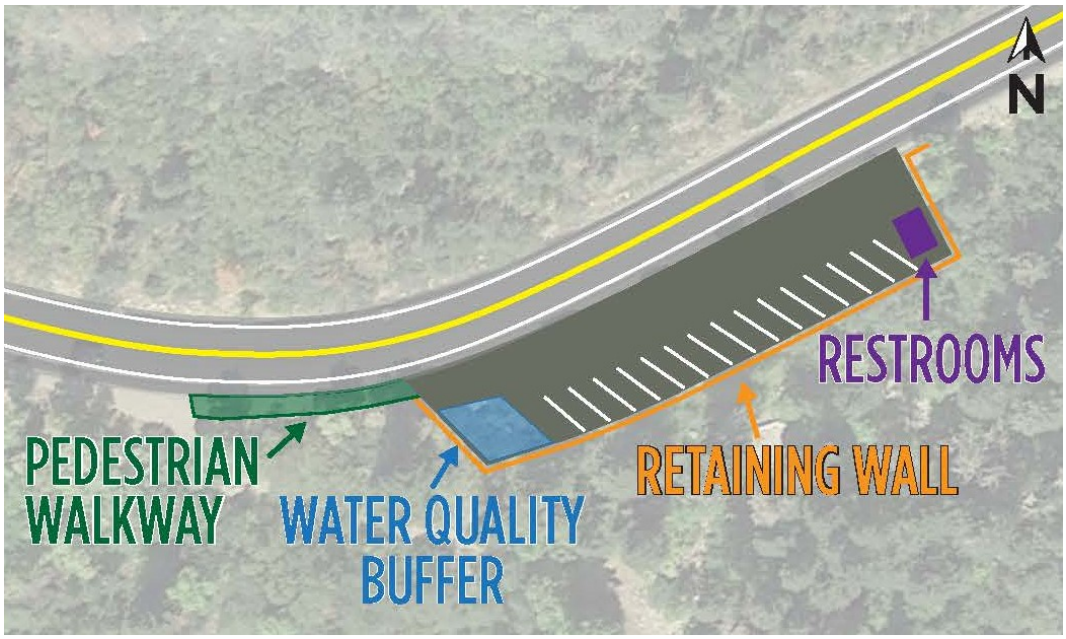
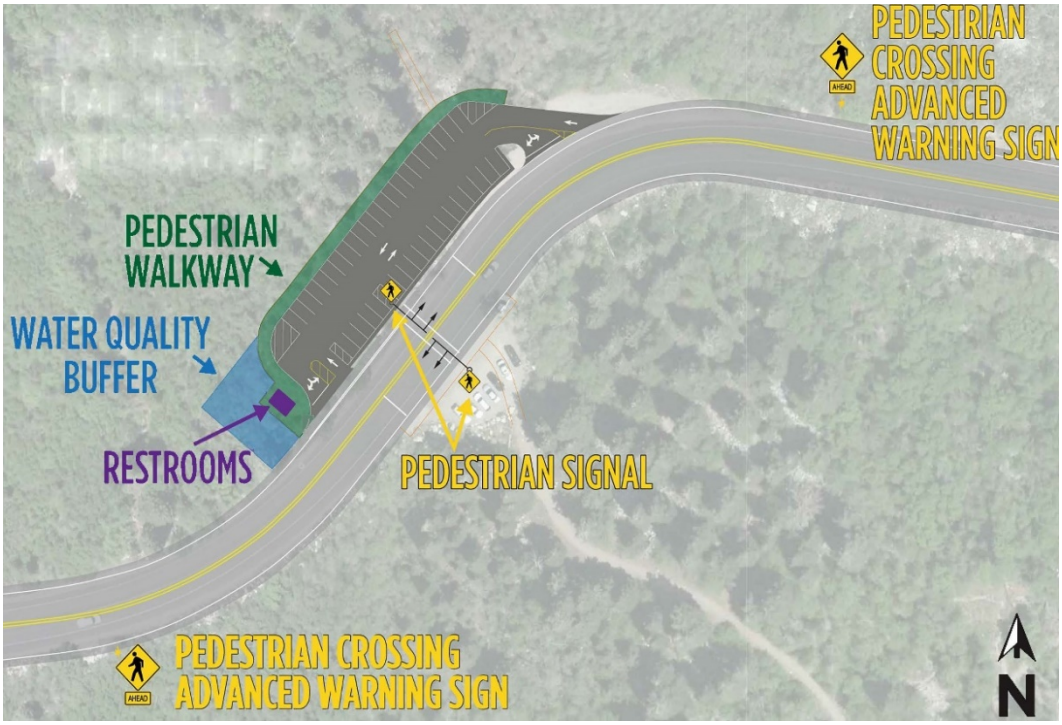


Figure 2.6-14. Trailhead Parking Alternatives – Lisa Falls Trailhead (41 Spaces)



With the Lisa Falls Trailhead improvements, the dirt lot on the east side of S.R. 210 would be eliminated.

Figure 2.6-15. Trailhead Parking Alternatives – White Pine Trailhead (144 Spaces)

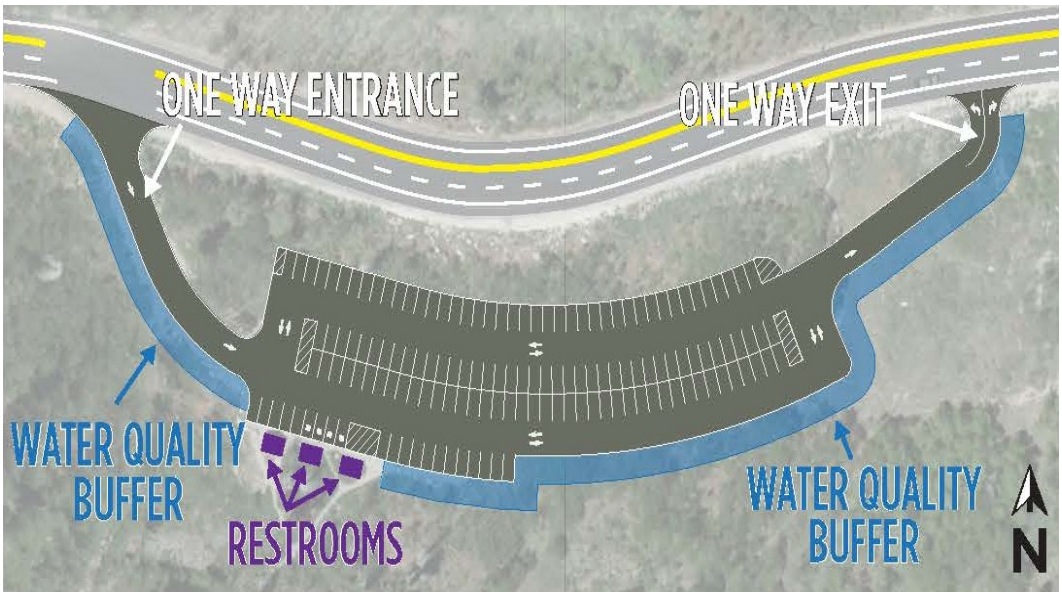
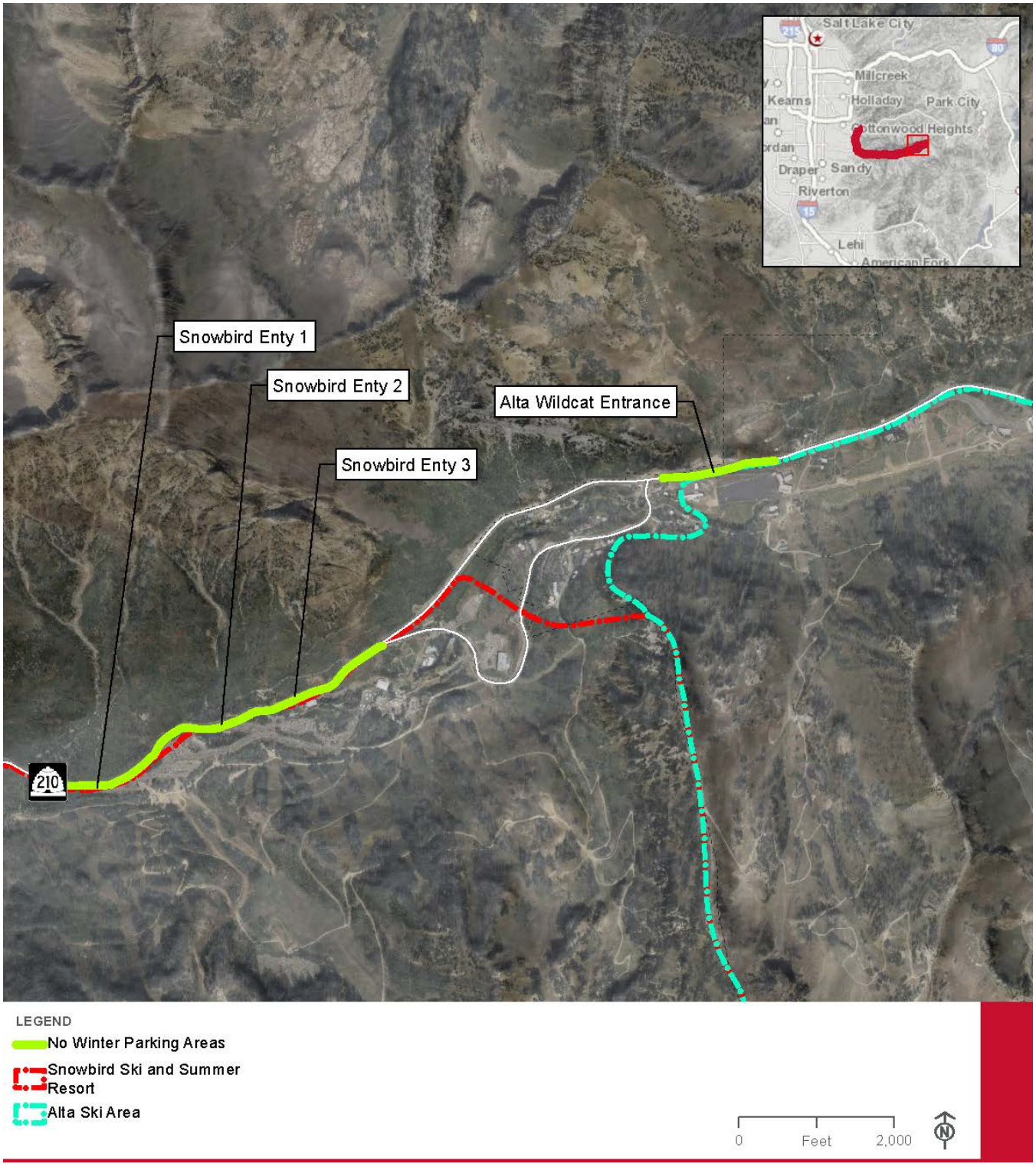


Figure 2.6-16. No Winter Parking Alternative – Eliminated Parking Areas



2.6.3 Enhanced Bus Service in Peak-period Shoulder Lane Alternative

The Enhanced Bus Service in Peak-period Shoulder Lane Alternative is summarized in Figure 2.6-17. This alternative includes frequent bus service from two mobility hubs, improvements to Wasatch Boulevard, snow sheds, improvements to trailheads, and no winter parking. Each of these elements is described below. Appendix 2D, Enhanced Bus Service in Peak-period Shoulder Lane Alternative Plans, shows the engineering plans for this alternative.

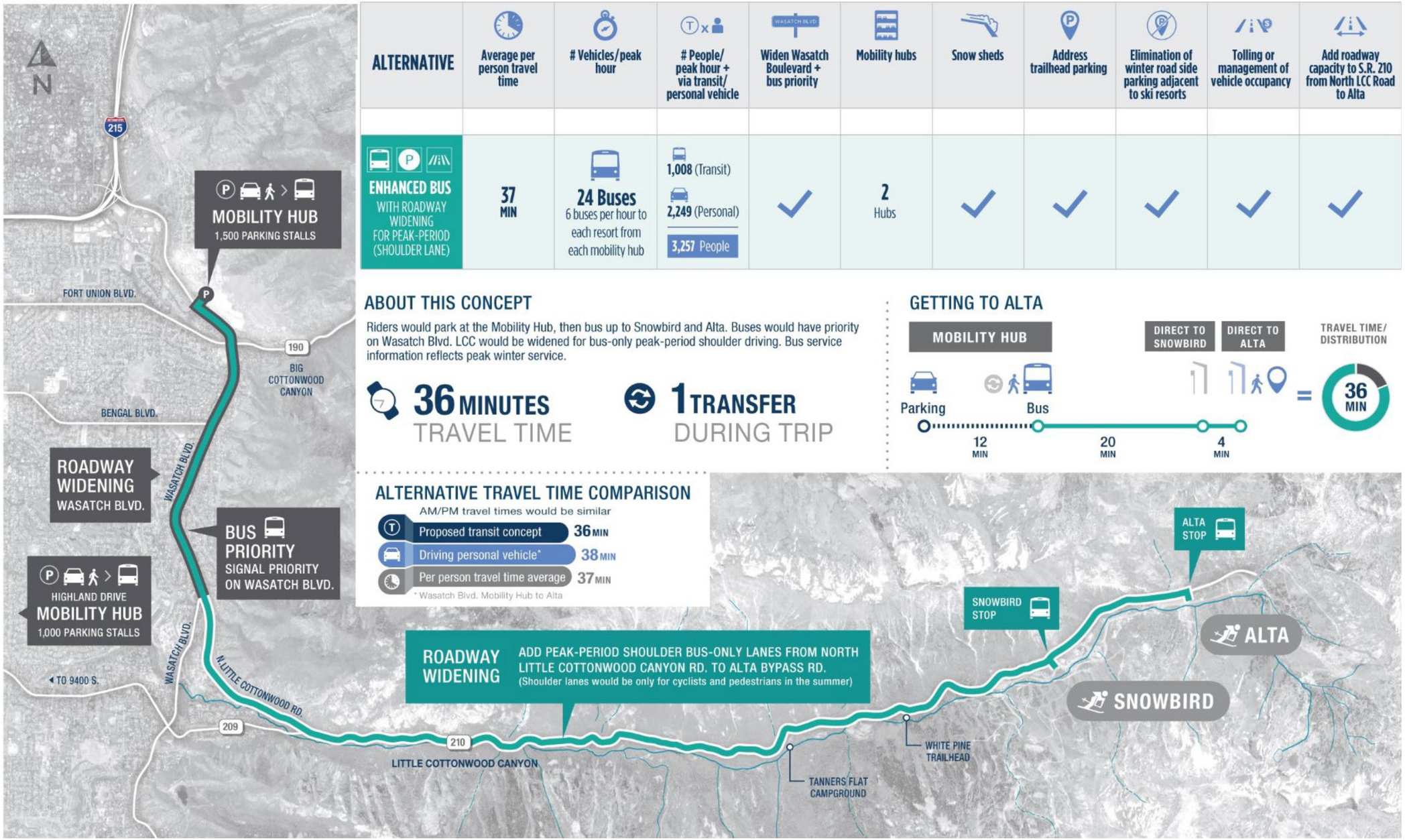
The goal of this alternative is to reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon on a busy ski day during the peak hours (7 AM to 10 AM) by about 30%. To reduce personal vehicle use, a toll or a ban on single-occupant vehicles would be in place to incentivize travelers to the ski resorts to use the enhanced bus service. The cost of using the enhanced bus service, including parking at the mobility hubs, has not been determined. However, to incentivize use, the cost of using the enhanced bus service would be substantially less than a toll.

Summer bus service is currently not provided in Little Cottonwood Canyon, and it is not evaluated in this EIS because it is not necessary to meet the project's purpose. If UDOT were to implement summer bus service as part of this alternative, the price of a bus ride would be substantially higher than during the winter when the bus service is needed to reduce congestion in Little Cottonwood Canyon. Given a more expensive bus fare, canyon visitors would be unlikely to use the summer bus service since it would have longer travel times and greater cost than their personal vehicles. If a public or private entity wants to implement summer bus service in Little Cottonwood Canyon, the entity would need to work with the USDA Forest Service and any other agency with jurisdiction to determine any permitting and environmental document requirements.

2.6.3.1 Bus Service

The bus service with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative. The only difference between the alternatives is that this alternative includes widening S.R. 210 from North Little Cottonwood Road to the Alta Bypass Road to add peak-period shoulder lanes. These lanes would be for buses only to improve bus travel times over that of personal vehicles. About 45 buses would be purchased for the Enhanced Bus Service in Peak-period Shoulder Lane Alternative.

Figure 2.6-17. Enhanced Bus Service in Peak-period Shoulder Lane Alternative – Overview



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2.6.3.2 Peak-period Shoulder Lanes

A peak-period shoulder lane (PPSL) is an upgraded roadway shoulder that functions as a bus-only travel lane during periods of peak congestion. During non-peak times, it functions as a shoulder. PPSLs are a way to provide additional traffic capacity within a constrained right of way and improve mobility during periods of peak congestion without adding another lane. In the event of an emergency or blocking vehicle, the PPSL is closed until the lane is cleared.

What are peak periods?

Peak periods are the periods of the day with the greatest amount of traffic. For the S.R. 210 Project, the AM peak period is 7 to 10 AM, and the PM peak period is 3 to 5 PM.

PPSLs would be implemented both eastbound and westbound on S.R. 210 for 8.6 miles from the intersection with Wasatch Boulevard (milepost 2.2) to the Alta Bypass Road (milepost 10.8) as shown in Figure 2.6-18.

Figure 2.6-19 shows the typical section for PPSLs. S.R. 210 would be widened to include two 11-foot-wide shoulders with 2 feet of pavement beyond the shoulder stripe. The total pavement width would be 50 feet. The clear zone would be measured from the edge of the PPSL, for a total roadway width of 78 feet. In areas near Little Cottonwood Creek and with steep canyon walls or dropoffs, it might not be reasonable to have a full clear zone width because of the potential environmental impacts. The final design of this alternative might increase the shoulder width to 12 feet and reduce the personal vehicle lane width to 11 feet. This would not change the overall width of the roadway.

What is a clear zone?

A clear zone is an unobstructed, traversable roadside area that allows a driver to stop safely or regain control of a vehicle that has left the roadway.

The uphill PPSL on the south side of S.R. 210 would be open to eastbound bus traffic during the morning peak and the downhill PPSL on the north side of S.R. 210 open to westbound traffic during the evening peak on peak traffic days (weekends, holidays, and busy ski days during the winter season) in the winter from late November through mid-April. When not in use on non-busy winter days and between mid-April through late November, the PPSLs would be available to cyclists and pedestrians. The transition areas at the beginning and end of each PPSL would be fairly straightforward. Lane-use signs would alert bus drivers as to whether the PPSL is open or closed.

Lane-use signs would be placed so that bus drivers have a clear indication whether the PPSL is open. The recommended spacing ranges from ⅓ to ⅔ mile (CDOT 2014). About 27 signs spaced at ⅓ mile (about 54 signs total) would be required on S.R. 210 in each direction between the intersection with Wasatch Boulevard and the Alta Bypass Road. Compared to lane-control signs and signals for reversible lanes, the lane-use signs for PPSLs would be less intrusive because they would be placed adjacent to the shoulders, not over every lane.

There is a risk that personal vehicle drivers would use the PPSL when the lane is closed to pass slow-moving vehicles. This could cause problems, especially in the summer when there could be pedestrian and cyclist traffic in the PPSL. Enforcement would be necessary to keep drivers from using the PPSLs when the lanes are not open. The presence of the PPSL would not allow roadside parking on S.R. 210 at any time of year between North Little Cottonwood Road and the Alta Bypass Road. The PPSLs could be used for emergency pull-offs or other emergency incidents.

Figure 2.6-18. Enhanced Bus Service in Peak-period Shoulder Lane Alternative – Locations of Peak-period Shoulder Lanes

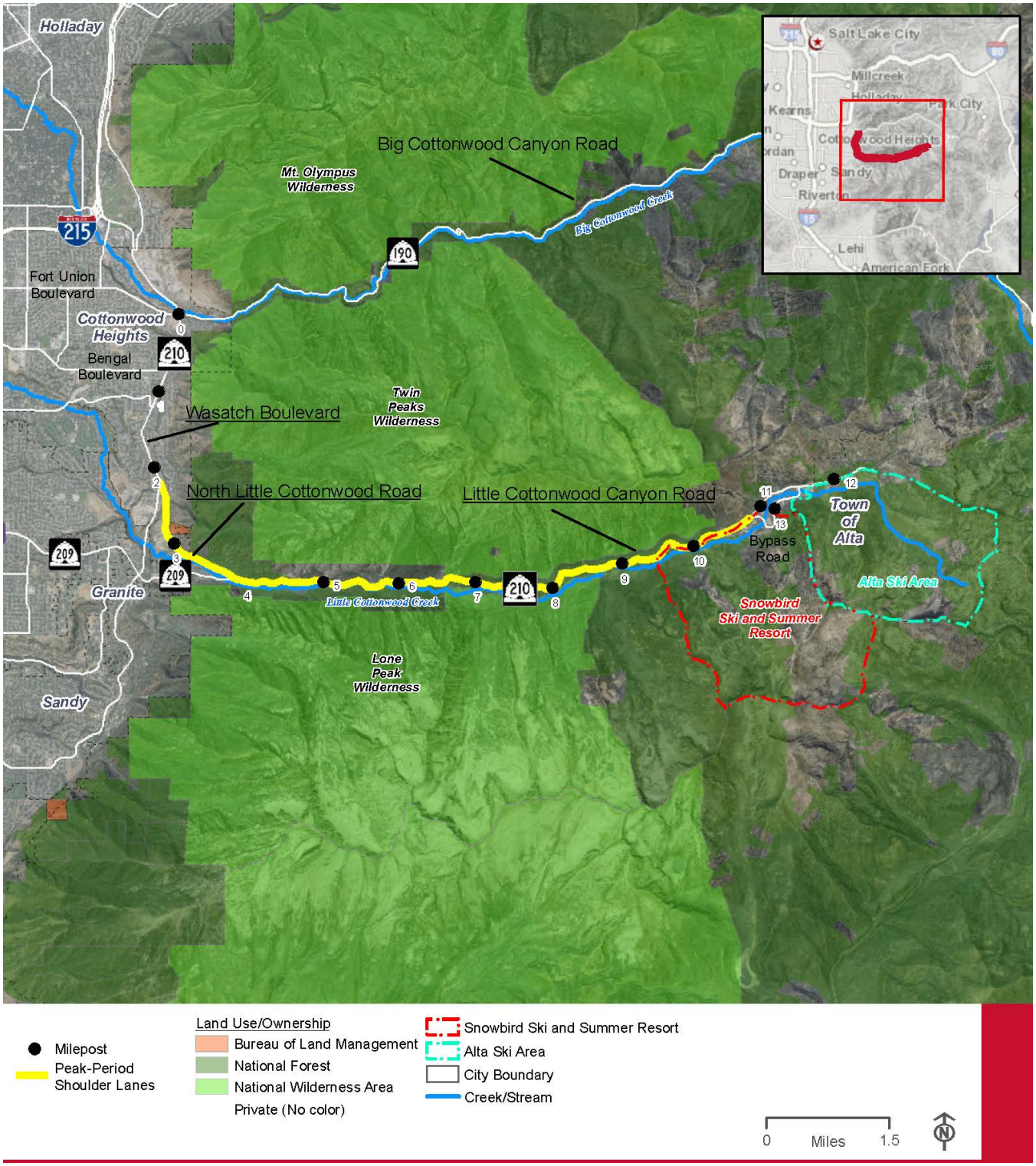
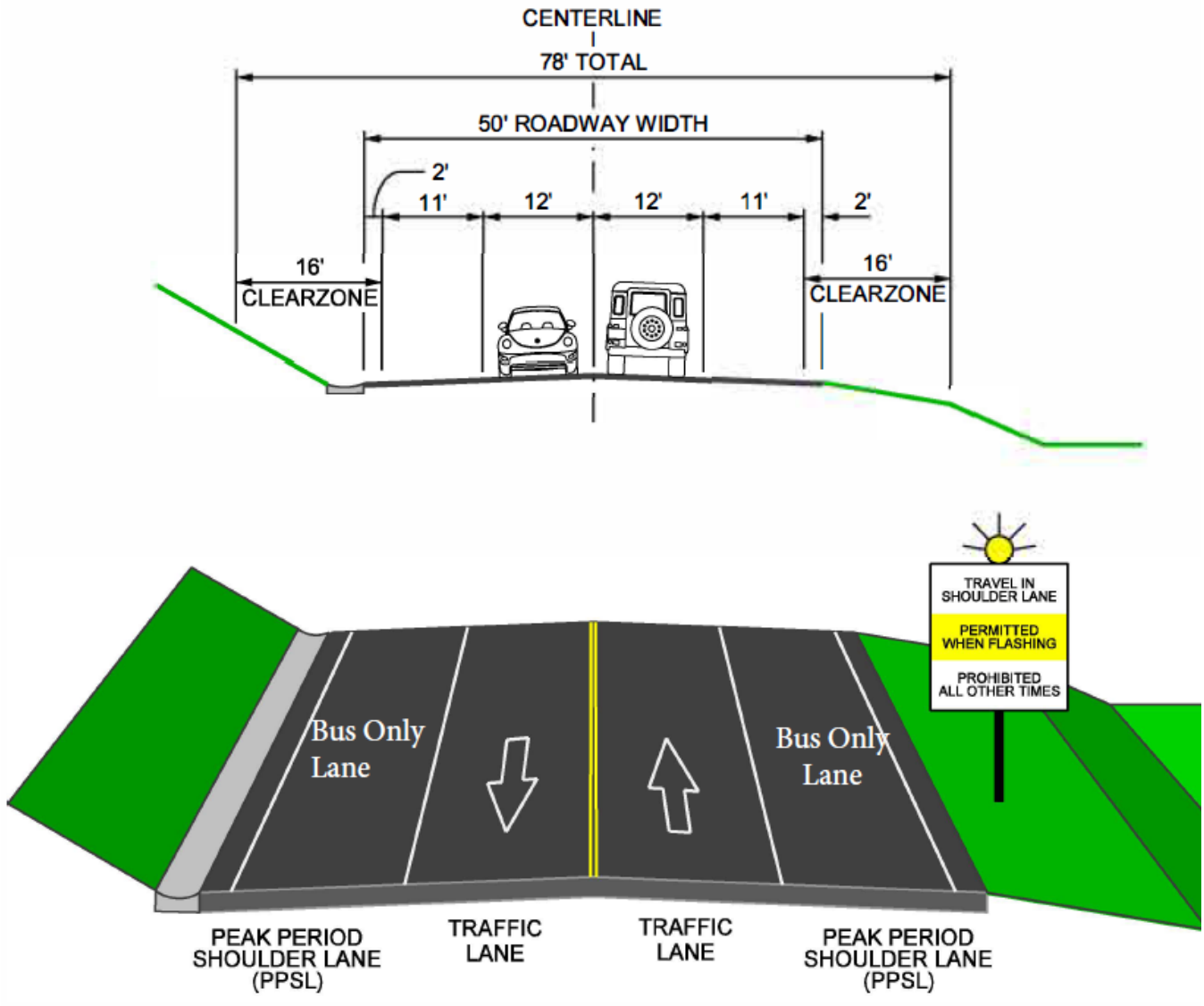


Figure 2.6-19. Enhanced Bus Service in Peak-period Shoulder Lane Alternative – Typical Section



2.6.3.3 Mobility Hubs Alternative

The mobility hubs with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative.

2.6.3.4 Wasatch Boulevard Alternatives

The Wasatch Boulevard alternatives with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative.

2.6.3.5 Avalanche Mitigation Alternatives

The avalanche-mitigation alternatives with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative.

2.6.3.6 Trailhead Parking Alternatives

The trailhead parking alternatives with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative.

2.6.3.7 No Winter Parking Alternative

The No Winter Parking Alternative with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative.

2.6.4 Gondola Alternative A (Starting at Canyon Entrance)

Gondola Alternative A is summarized in Figure 2.6-20. Gondola Alternative A would include a gondola alignment from the intersection of S.R. 209/S.R. 210 to both the Snowbird and Alta ski resorts. The alternative would include frequent bus service from two mobility hubs to the gondola base station, improvements to Wasatch Boulevard, snow sheds, improvements to trailheads, and no winter parking. Each of these elements is described below. Appendix 2E, Gondola Alternatives Plans, shows the engineering plans for this alternative.

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 during the peak hours (7 AM to 10 AM) by about 30%. To reduce personal vehicle use, a toll or a ban on single-occupant vehicles would be put in place to incentivize travelers to the ski resorts to use the gondola. The cost of using the gondola, including parking at the mobility hub at the gravel pit or 9400 South and Highland Drive, has not been determined. However, to incentivize use, the cost of using the gondola would be substantially less than a toll.

The gondola service could be operated by a public agency or a private vendor. If Gondola Alternative A is selected and would be operated by a private vendor, a special-use permit from the USDA Forest Service might be required and would be based on the analysis in this EIS.

What are terminal, base, and angle stations and towers?

As used in the discussions of the gondola alternatives, the term *terminal station* refers to the first and last stations on a passenger's gondola trip. Passengers board and disembark the gondola cabins at the terminal stations.

The *base station* is the terminal station at the bottom of the canyon, and a *destination station* is a terminal station at a ski resort.

The gondola alternatives also include *angle stations*, which are needed to adjust the horizontal direction of the gondola cabins.

Towers support the gondola cable.

Figure 2.6-20. Gondola Alternative A – Overview

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2.6.4.1 Gondola Service

Figure 2.6-21 shows the gondola alignment and the approximate locations of the base station, angle station, towers, and destination stations. The gondola would be a tri-cable gondola (3S) system since this system provides the greatest capacity and shortest travel times. The gondola would stop at the Snowbird and Alta ski resorts only.

2.6.4.1.1 Winter Gondola Service

Although the exact hours of operation have not been determined, it is likely that 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. More gondola cabins could be added to reduce the need for users to stand during the gondola trip to the resorts. Top speeds would be about 17 to 18 mph, making the travel time about 24 minutes to Snowbird. For gondola riders continuing to Alta, an additional distance of about 1½ miles, the additional travel time would be about 9 minutes (33 minutes total), which consists of a 3½-minute gondola transfer time at Snowbird plus a 6-minute gondola ride from Snowbird to Alta. Depending on the final gondola system, at Snowbird, the Alta users might need to exit the gondola cabin and transfer within the same station to another gondola cabin for the final 1½-mile ride. This transfer would be required only if the final gondola segment to Alta is on a separate gondola system to improve overall reliability.

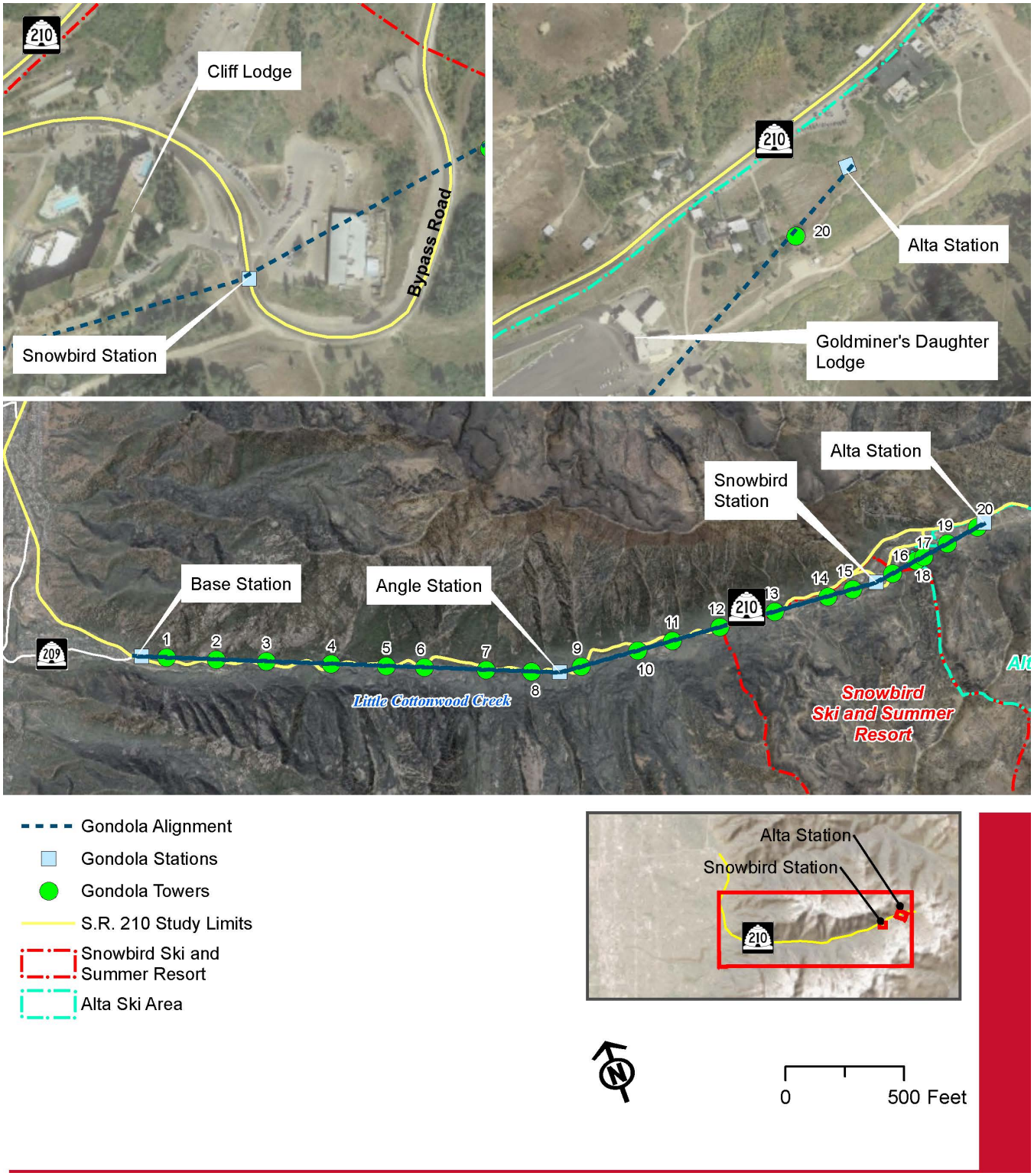
The gondola would not operate if artillery is being used for avalanche mitigation since the artillery shells would pass over the gondola towers and cable (up to six times per year with snow sheds in place). As soon as the avalanche mitigation using artillery is completed, the gondola would begin to operate even if S.R. 210 is closed to remove snow from the avalanche mitigation. Some of the gondola towers and parts of the alignment would be within an area where there might be artillery shell fragments. The gondola cabins would not be on the cable within the fragmentation zone when artillery is being used (gondola cabins can be stored at the nearest station). After avalanche mitigation using artillery is completed, the cables would be inspected by cameras and magnetic imaging devices, and the towers would be inspected by video, to ensure that no damage has occurred. To reduce the need for avalanche mitigation using artillery, snow sheds have been included with Gondola Alternative A (see Section 2.6.4.4, Avalanche Mitigation Alternatives). Snow sheds could reduce the need for avalanche mitigation using artillery by 80%.

An interlodge event occurs when snow levels are so great and the avalanche danger is so extreme that patrons and employees of the Alta and Snowbird resorts are confined to resort buildings during avalanche-mitigation operations. During interlodge events, road access on S.R. 210 is shut down as well while UDOT performs avalanche mitigation. During these events, people are not allowed outside in the upper canyon and so, to avoid delivering passengers into a hazardous condition, the gondola would not operate.

What is an interlodge event?

An interlodge event occurs when snow levels are so great and the avalanche danger is so extreme that patrons and employees of the Alta and Snowbird resorts are confined to resort buildings during avalanche-mitigation operations.

Figure 2.6-21. Gondola Alternative A – Alignment and Station Locations



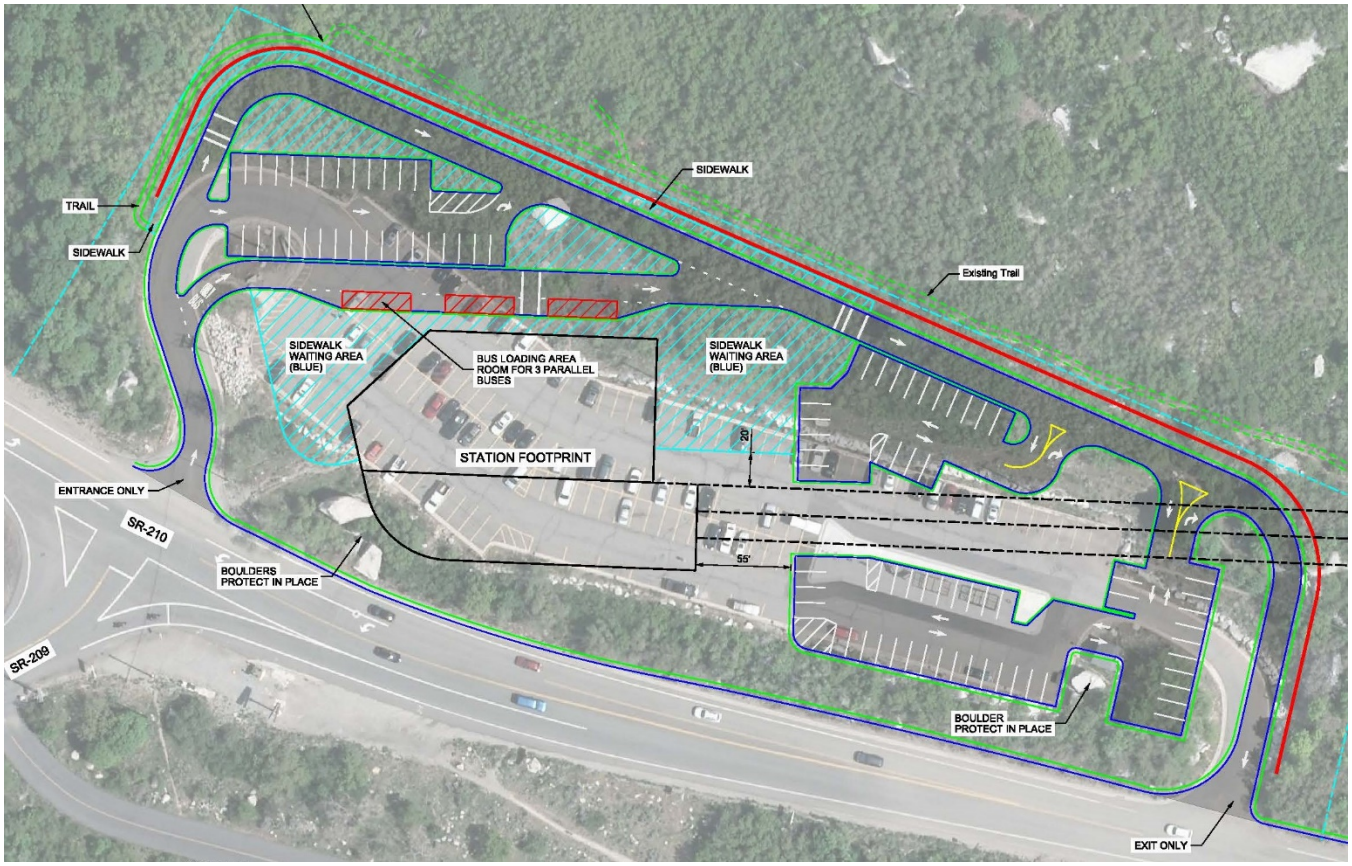
2.6.4.1.2 Summer Gondola Service

During the summer, the gondola operating times would likely be between 8 AM and 8 PM (the final hours would be determined once the system is operational), outside the Tanners Flat Campground noise restriction times (10 PM to 7 AM). With regard to accommodations for cyclists, there are currently no formal NFS trails directly connecting the ski areas to the entrance to the canyon. For this reason, to minimize the potential for cyclists to develop and use unauthorized trails, bicycles would be prohibited from being brought into the gondola cabins until the USDA Forest Service makes an administrative decision regarding the construction of NFS trails below the ski areas for bicycle use.

2.6.4.1.3 Base Station

The base station for Gondola Alternative A 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 2.6-22). As proposed, the base station would not allow users to park their personal vehicles at the station or drop off skiers at the station because this could create traffic congestion. Users of the gondola service would need to take an express bus to the base station.

Figure 2.6-22. Gondola Alternative A – Base Station Layout



The base station for Gondola Alternative A would include a platform for buses to pull in and drop off skiers, who would then walk across the platform to access the gondola cabins.

The base station for Gondola Alternative A would also include an administrative and maintenance facility, restrooms, and parking for employees only. A similar gondola system at Whistler Blackcomb Ski Resort in British Columbia, Canada, has a 12,000-square-foot terminal that houses the drive motors and backup diesel generators. The system also includes a 14,000-square-foot terminal building to store the gondola cabins.

For Gondola Alternative A, an emergency diesel generator with diesel fuel tank would be on site including appropriate spill containment. The generator would operate only during emergencies and for routine maintenance. The total size of the gondola platform facility for this alternative would be about 30,000 square feet and would fit mostly within the existing park-and-ride lot.

The existing Little Cottonwood Canyon park-and-ride lot is used as an access point for the Alpenbock Loop Trailhead. To accommodate use of the trailhead, about 95 parking spaces, some of which would be designated for the trailhead, would be placed within the gondola base station complex. The trailhead improvements would include restrooms for trailhead users.

2.6.4.1.4 Alignment

Figure 2.6-21 above, Gondola Alternative A – Alignment and Station Locations, shows the alignment for Gondola Alternative A. Gondolas require straight alignment segments between stations because gondolas can turn only very small angles at towers. A maximum 7-degree deflection can be made at towers but that is not desired, so angle stations are needed to turn sharper angles. Cabins are also detached and slowed as they approach an angle station. Cabins traverse through the angle station with a separate propulsion system (and therefore the angle station also needs to be powered), and then cabins are accelerated before being reconnected to the full-speed haul cable for the next alignment segment.

Table 2.6-3 shows the alignment for Gondola Alternative A with regard to land ownership.

Table 2.6-3. Gondola Alternative A – Gondola Alignment Land Ownership

Facility	Private Land	National Forest Service Land	Total
Gondola cable system (linear feet)	9,455	31,310	40,765
Towers (number)	5	15	20
Stations (number)[a]	1	3	4

[a] Stations include terminal stations at the Little Cottonwood Canyon park-and-ride lot, Snowbird, and Alta, and one angle station.

2.6.4.1.5 Angle Station

The angle station for Gondola Alternative A would be located about 0.25 mile west of the Tanners Flat Campground. The angle station would be located on the south side of S.R. 210 immediately adjacent to the road so as to avoid constructing an access road. The angle station would need power and would include an emergency diesel generator with a diesel fuel tank. The diesel fuel tank containment system would be able to contain 100% of the volume of the fuel in the tank if a spill were to occur. The generator would operate only in emergencies and for routine maintenance. UDOT would investigate a leak-detection system and alarm for the fuel tank. The station would be designed to handle an appropriate avalanche risk for this area, including personnel and equipment protection.

At the angle station, the gondola cabins would move into the station near ground level. For this reason, vegetation would be cleared around the station for cabin access into the angle station. Figure 2.6-23 shows the area in which trees would need to be cleared, which would be about 2 to 3 acres depending on the final site layout. The area would be planted with native vegetation that would not obstruct the gondola cabins.

2.6.4.1.6 Towers

A total of 20 gondola towers would be needed for Gondola Alternative A. The tower spacing depends on the topography under the alignment, the elevation gain needed in each segment, and the vertical clearance required from obstacles (including snow and avalanche flows) below the alignment. The weights of the loaded gondola cabins and cables cause the line to sag between towers. To maintain vertical clearance requirements, tower heights would be between 131 and 230 feet (see Figure 2.6-21 above, Gondola Alternative A – Alignment and Station Locations, and Table 2.6-4 below). The tower locations were optimized to reduce impacts from avalanche flow paths and their potential powder blast. As shown in Table 2.6-4 below, the tower construction would use a helicopter or a crane from S.R. 210. In the immediate area around the base of a tower, security fencing or cameras might be required to prevent unauthorized tower access.

If Gondola Alternative A is selected, the Federal Aviation Administration (FAA) would need to review the towers and gondola alignment. FAA's review is required for any construction that is more than 200 feet above ground level. Three of the proposed gondola towers are above 200 feet high. FAA's review might determine that aircraft warning lights are required on some or all of the towers. For more information, see Chapter 24, Permits, Reviews, Clearances, and Approvals.

If aircraft obstruction lighting is required, UDOT would use an aircraft detection lighting system (ADLS). ADLS is an all-weather, day-and-night, low-voltage, radar-based obstacle-avoidance system that uses current obstruction-lighting products and does not require additional equipment in an aircraft. ADLS activates obstruction lighting and audio signals to alert pilots of potential collisions with obstacles. The obstruction lights and audio warnings are inactive when there is no air traffic in the area of the obstacle.

Figure 2.6-23. Gondola Alternative A – Area of Cleared Vegetation for Angle Station

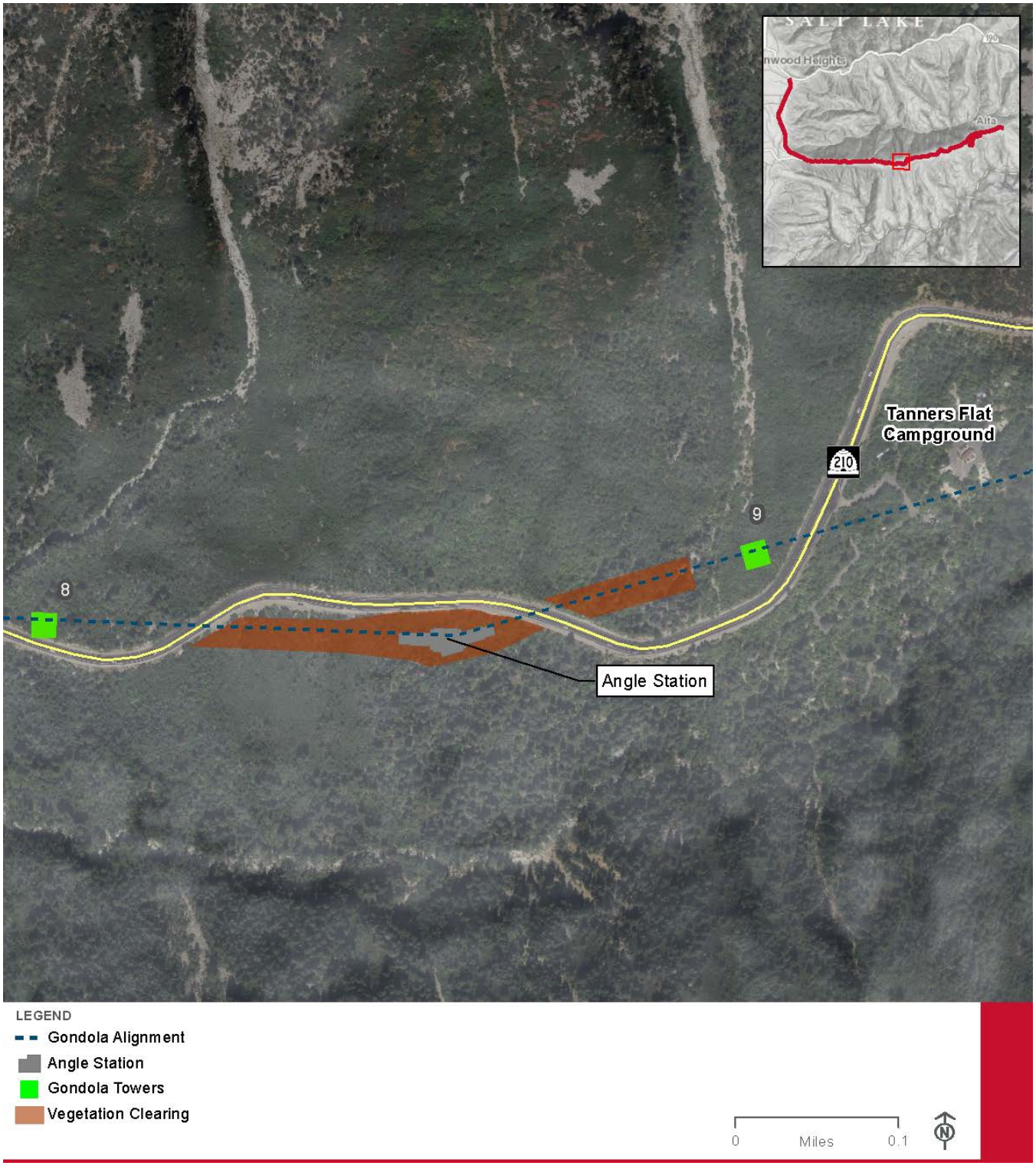


Table 2.6-4. Gondola Alternative A – Tower Height and Construction Method

Tower Number	Tower Height (feet)	Proposed Construction Access
1	131	Helicopter
2	164	Helicopter and crane from Granite Mountain Storage Facility
3	197	Helicopter
4	164	Road access through existing dirt road
5	164	Helicopter and crane from S.R. 210
6	197	Helicopter and crane from S.R. 210
7	197	Helicopter and crane from S.R. 210
8	186	Road access; adjacent to S.R. 210
Angle station	Not applicable	Crane from S.R. 210
9	131	Crane from S.R. 210
10	197	Helicopter
11	197	Helicopter and crane from S.R. 210
12	230	Crane from S.R. 210
13	230	Crane from S.R. 210
14	197	Road access; near Snowbird access road
15	164	Road access; near Snowbird access road
Snowbird station	Not applicable	Road access
16	131	Road access; near Alta Bypass Road
17	131	Helicopter
18	180	Helicopter
19	230	Road access from Alta ski resort
20	131	Road access from Alta ski resort
Alta station	Not applicable	Road access from S.R. 210

Figure 2.6-24 shows various types of towers that could be used. Lattice towers are typically used for gondola systems, but stronger pole towers might be required in some avalanche paths if the towers are placed adjacent to or within the avalanche zone. If Gondola Alternative A is selected, the final tower type would be determined during the final design process. Pole towers could be used in some areas, such as at the ski resorts, to reduce their footprint and visual impact. To reduce visual impacts to the Snowbird Ski Resort Iron Blosam Lodge and the Cliff Lodge and the Alta Lodge (all are considered historic structures), pole towers would be used.

Figure 2.6-24. Gondola Alternative A – Example of Gondola Towers

Example lattice tower (left) and pole tower (right).

2.6.4.1.7 Snowbird and Alta Ski Resort Destination Stations

Figure 2.6-21 above, Gondola Alternative A – Alignment and Station Locations, shows the proposed locations of the destination stations at the Snowbird and Alta ski resorts. Based on final design, the locations could change. The destination stations would be about 28,000 square feet and would require between 0.5 and 1 acre of land. The Snowbird destination station would be located over the Alta Bypass Road to reduce impacts to existing operations. The Alta destination station would be located east of the Goldminer's Daughter Lodge. Each destination station would require an emergency diesel generator with a diesel fuel tank. The diesel fuel tank would be able to contain 100% of the volume of the fuel in the tank if a spill were to occur. The generator would operate only during emergencies and for routine maintenance.

2.6.4.1.8 Emergency Gondola Egress

Ground-based evacuation of tri-cable (3S) gondolas is uncommon. The lifts are equipped with a variety of integrated rescue systems that essentially pull the gondola cabins to the nearest station or tower where passengers can descend to the ground. As a result of this, except where the cabins need to drop below the tree canopy (for example, when entering or exiting a terminal or angle station), the trees under the gondola alignment would not need to be removed. Cabins would also be outfitted with emergency essentials (water and sanitary bags).

2.6.4.1.9 Bus Service

With Gondola Alternative A, gondola riders would park their vehicles at either the gravel pit mobility hub or the 9400 South and Highland Drive mobility hub, take an express bus to the gondola base station at the entrance to the canyon, and then transfer to the gondola. As proposed, the base station would not allow uses to park their personal vehicles at the station or drop off skiers at the station because this could create traffic congestion. Users of the gondola service would need to take an express bus to the base station.

Whereas the gondola system would offer nearly constant service during the winter (a gondola cabin would arrive about every 2 minutes), the express buses would arrive at longer intervals, and the wait time for a bus could be longer than for a gondola cabin. The bus service would use standard UTA buses. During the peak hours, about 26 buses per hour, or a bus every 2.5 minutes, would travel between the mobility hubs and the gondola base station. Wasatch Boulevard and 9400 South would be designed to include bus priority at signalized intersections. A total of about 30 buses would be required for this alternative. If this alternative is selected, UDOT would evaluate the use of electric or hybrid buses instead of diesel buses.

2.6.4.2 Mobility Hubs Alternative

The mobility hubs with Gondola Alternative A would be the same as with the Enhanced Bus Service Alternative.

2.6.4.3 Wasatch Boulevard Alternatives

The Wasatch Boulevard alternatives with Gondola Alternative A would be the same as with the Enhanced Bus Service Alternative.

2.6.4.4 Avalanche Mitigation Alternatives

The avalanche mitigation alternatives with Gondola Alternative A would be the same as with the Enhanced Bus Service Alternative.

2.6.4.5 Trailhead Parking Alternatives

The trailhead parking alternatives with Gondola Alternative A would be the same as with the Enhanced Bus Service Alternative.

2.6.4.6 No Winter Parking Alternative

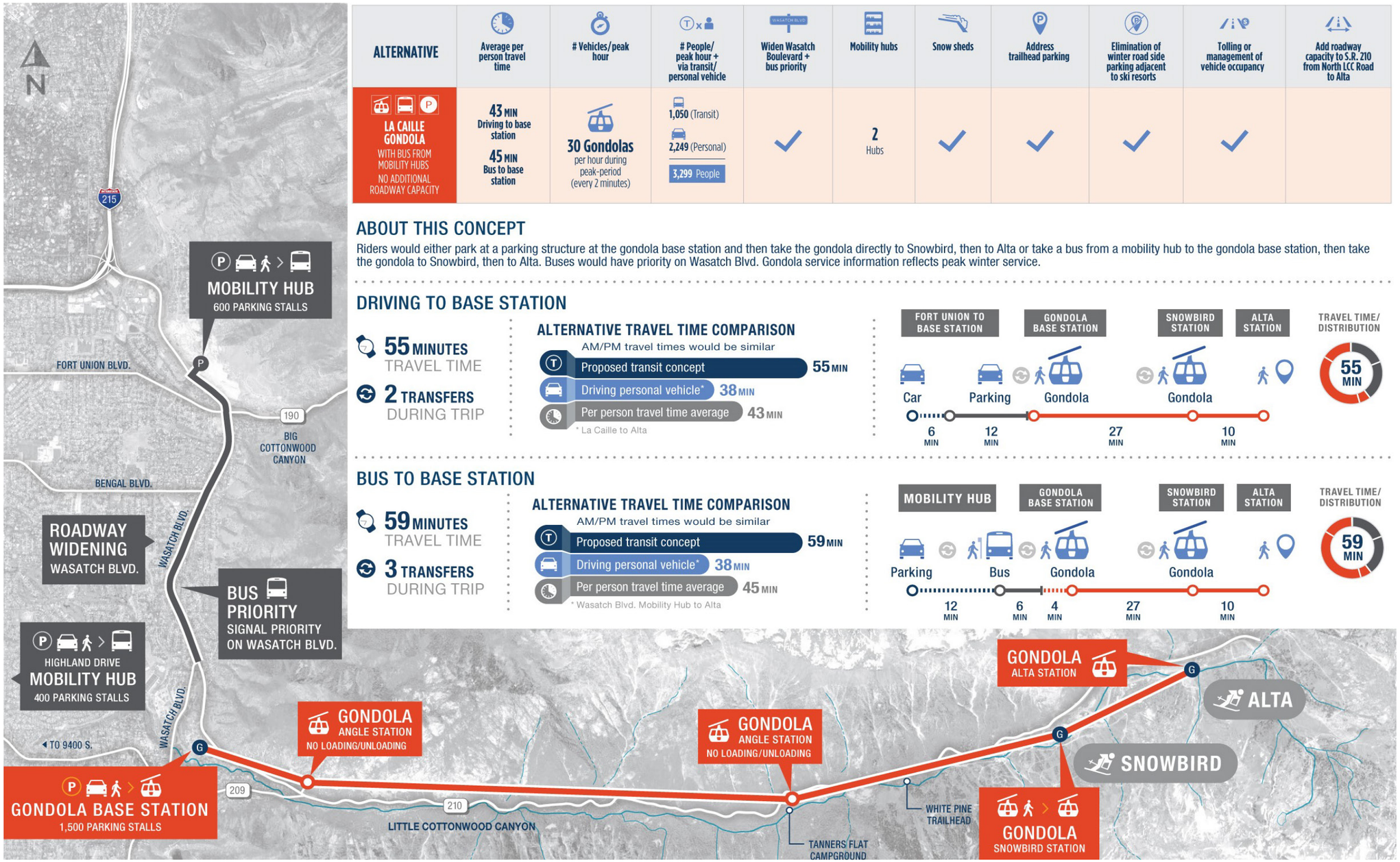
The No Winter Parking Alternative with Gondola Alternative A would be the same as with the Enhanced Bus Service Alternative.

2.6.5 Gondola Alternative B (Starting at La Caille)

Gondola Alternative B would be similar to Gondola Alternative A, but the base station would be located at a proposed development west of North Little Cottonwood Road, east of the La Caille restaurant, and about 0.75 mile northwest of the intersection of S.R. 209 and S.R. 210 (see Appendix 2E, Gondola Alternatives Plans). An additional segment of the gondola alignment would run for about 0.75 mile from the base station to the Little Cottonwood Canyon park-and-ride lot (Figure 2.6-25). Gondola Alternative B would be the same as Gondola Alternative A except for the following differences:

- The base station would be located at a proposed development south of North Little Cottonwood Road east of the La Caille restaurant and adjacent to S.R. 210.
- A 1,500-space parking structure would be built at the base station to allow personal vehicles to park at the base station.
- There would be 600 parking spaces at the gravel pit mobility hub and 400 parking spaces at the 9400 South and Highland Drive mobility hub, with express bus service provided from both mobility hubs to the base station.
- The gondola alignment would extend for an additional 0.75 mile southeast from the base station to the Little Cottonwood Canyon park-and-ride lot at the intersection of S.R. 209 and S.R. 210 (Figure 2.6-25).
- Twenty-two gondola towers would need to be constructed along with an angle station at the Little Cottonwood Canyon park-and-ride lot.

Figure 2.6-25. Gondola Alternative B – Overview



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2.6.5.1 Gondola Service

The gondola service for Gondola Alternative B would be the same as for Gondola Alternative A except that it would have longer travel times (3 minutes longer than Gondola Alternative A). From the base station, the travel time to Snowbird would be about 27 minutes. For gondola riders continuing to Alta, an additional distance of about 1½ miles, the additional travel time would be about 10 minutes (37 minutes total), which consists of a 3½-minute gondola transfer time at Snowbird plus a 6-minute gondola ride from Snowbird to Alta. Depending on the final gondola system, at Snowbird, the Alta users might need to exit the gondola cabin and transfer within the same station to another gondola cabin for the final 1½-mile ride. This transfer would be required only if the final gondola segment to Alta is on a separate gondola system to improve overall reliability.

2.6.5.1.1 Base Station

The base station for Gondola Alternative B would be located about 0.75 mile northwest of the entrance to Little Cottonwood Canyon (Figure 2.6-26 and Figure 2.6-27). As proposed, the base station would include a 1,500-space parking structure and would allow users to park their personal vehicles at the base station or drop off skiers at the station. The express bus service from the mobility hubs would also bring users of the gondola service to the base station.

To improve traffic circulation on S.R. 210 to and from the base station, UDOT would make several improvements to S.R. 210.

- Two southbound travel lanes from Wasatch Boulevard would continue to the base station with the right lane becoming the dedicated access to the base station. The access would enter into the second level of the parking structure. The extra lane would require a stormwater detention basin (Figure 2.6-26).
- A northbound exit ramp from the parking structure under S.R. 210 would connect to the east side of S.R. 210.
- A signalized intersection would be constructed on S.R. 210 at the base station.

Figure 2.6-26. Gondola Alternative B – Base Station Layout North

Figure 2.6-27. Gondola Alternative B – Base Station Layout South

2.6.5.1.2 Alignment

Figure 2.6-28 shows the gondola alignment for Gondola Alternative B. The alignment would be the same as with Gondola Alternative A except for the additional 0.75-mile segment from the base station at La Caille to the Little Cottonwood Canyon park-and-ride lot.

Table 2.6-5 shows the alignment for Gondola Alignment B with regard to land ownership.

Table 2.6-5. Gondola Alternative B – Gondola Alignment Land Ownership

Facility	Private Land	National Forest Service Land	Total
Gondola cable system (linear feet)	12,975	32,393	45,368
Towers (number)	5	17	22
Stations (number)[a]	2	3	5

[a] Stations include terminal stations at La Caille, Snowbird, and Alta and two angle stations.

2.6.5.1.3 Angle Stations

Gondola Alternative B would require two angle stations: one at the Little Cottonwood Canyon park-and-ride lot at the entrance to Little Cottonwood Canyon and a second adjacent to S.R. 210 west of the Tanners Flat Campground. The second angle station would be the same as for Gondola Alternative A. Figure 2.6-29 shows the general layout of the angle station at the Little Cottonwood Canyon park-and-ride lot. The angle station at the park-and-ride lot would include an emergency diesel generator with a diesel fuel tank with a 100% spill containment system. The generator would operate only during emergencies and for routine maintenance.

The existing Little Cottonwood Canyon park-and-ride lot is used as an access point for the Alpenbock Loop Trailhead. To accommodate use of the trailhead, about 95 parking spaces would be available. Gondola passengers would not board or exit the gondola cabins at the angle stations. The trailhead improvements would include restrooms for trailhead users.

Figure 2.6-28. Gondola Alternative B – Alignment and Terminal Station Locations

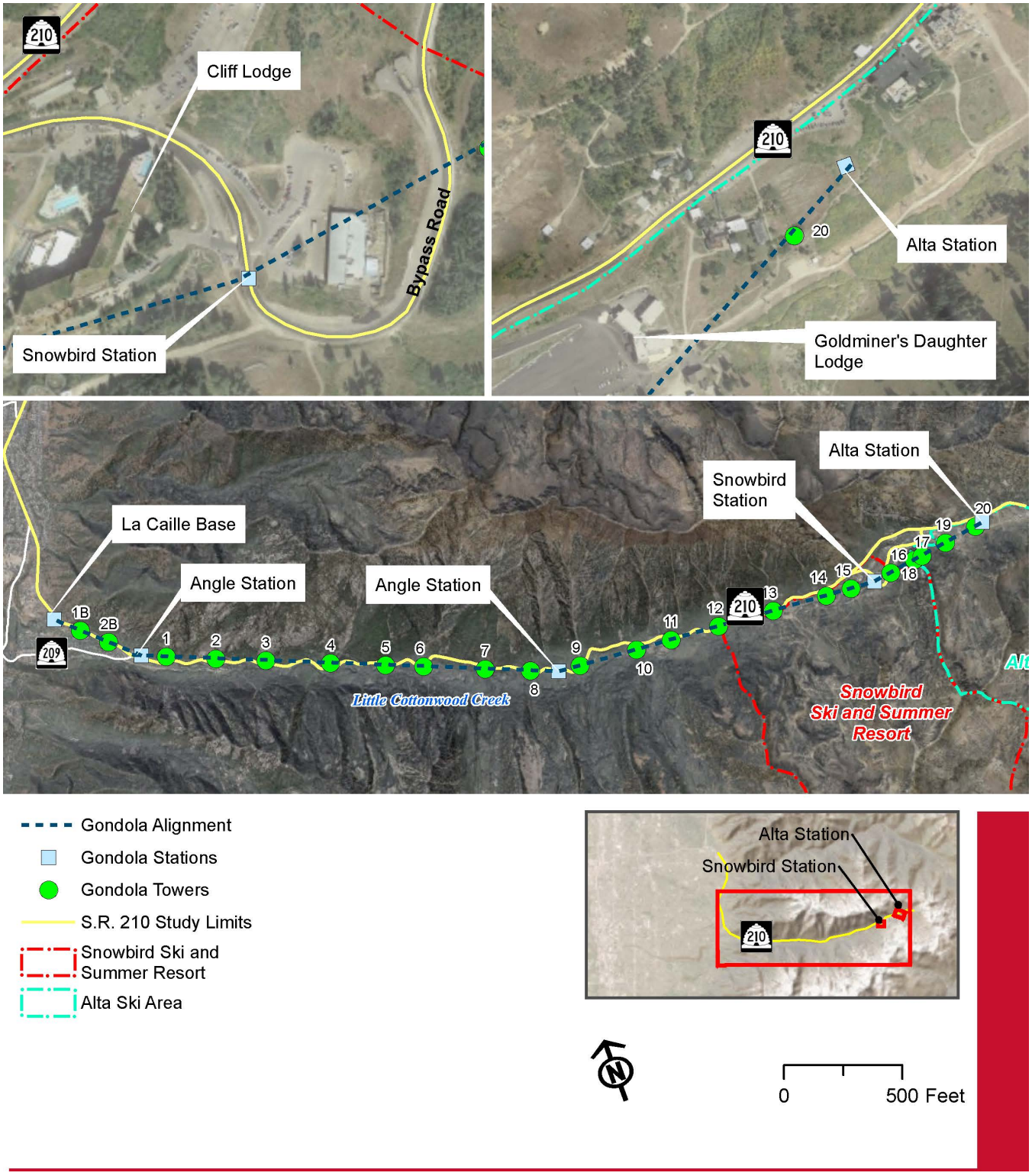
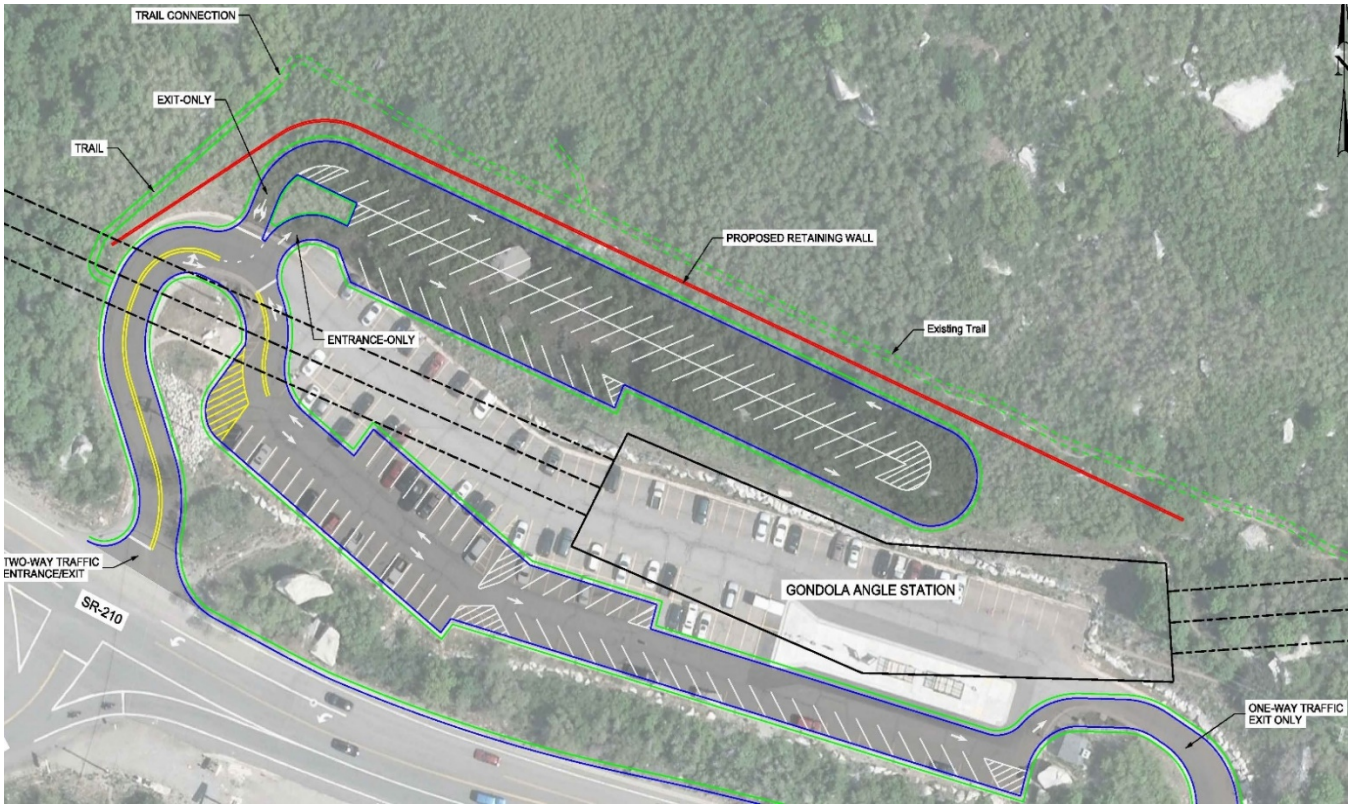


Figure 2.6-29. Gondola Alternative B – Little Cottonwood Canyon Park-and-ride Angle Station



2.6.5.1.4 Towers

The gondola towers for Gondola Alternative B would be the same as for Gondola Alternative A except that two additional towers (towers 1B and 2B) would be required, as shown in Table 2.6-6.

Table 2.6-6. Gondola Alternative B – Tower Height and Construction Method

Tower Number[a]	Tower Height (feet)	Construction Access
1B	262	Road access; adjacent to S.R. 210
2B	236	Road access; adjacent to S.R. 210
Angle station	Not applicable	At Little Cottonwood Canyon park-and-ride lot
1	131	Helicopter
2	164	Helicopter and crane from Granite Mountain Storage Facility
2	197	Helicopter
4	164	Road access through existing dirt road
5	164	Helicopter and crane from S.R. 210
6	197	Helicopter and crane from S.R. 210
7	197	Helicopter and crane from S.R. 210
8	186	Road access; adjacent to S.R. 210
Angle station	Not applicable	Road access; adjacent to S.R. 210
9	131	Crane from S.R. 210
10	197	Helicopter
11	197	Helicopter and crane from S.R. 210
12	230	Crane from S.R. 210
13	230	Crane from S.R. 210
14	197	Road access; near Snowbird access road
15	164	Road access; near Snowbird access road
Snowbird station	Not applicable	Road access
16	131	Road access; near Alta Bypass Road
17	131	Helicopter
18	180	Helicopter
19	230	Road access from Alta ski resort
20	131	Road access from Alta ski resort
Alta station	Not applicable	Road access from S.R. 210

[a] Gondola towers 1B and 2B would be constructed for Gondola Alternative B only. Towers 1–20 apply to both Gondola Alternatives A and B.

2.6.5.1.5 Snowbird and Alta Ski Resort Destination Stations

The Snowbird and Alta ski resort destination stations for Gondola Alternative B would be the same as for Gondola Alternative A.

2.6.5.1.6 Emergency Gondola Egress

Emergency egress for Gondola Alternative B would be the same as for Gondola Alternative A.

2.6.5.1.7 Bus Service

With Gondola Alternative B, there would be 1,500 parking spaces at the base station. To accommodate the number of users, 600 parking spaces would be needed at the gravel pit mobility hub and 400 parking spaces at the 9400 South and Highland Drive mobility hub. Gondola users using the bus service would park their vehicles at either the gravel pit mobility hub or the 9400 South and Highland Drive mobility hub, take an express bus to the gondola base station, and then transfer to the gondola.

The bus service would use standard UTA buses. The bus service would operate at about 6 buses per hour (10-to-15-minute intervals) from 7 AM to 7 PM. The bus frequency might be adjusted depending on actual ridership. Wasatch Boulevard and 9400 South would be designed to include bus priority at signalized intersections. A total of about 17 buses would be required for this alternative. The buses would operate on a circular route as shown in Figure 2.6-30. If this alternative is selected, UDOT would evaluate the use of electric or hybrid buses instead of diesel buses.

2.6.5.2 Mobility Hubs Alternative

To support personal vehicle parking for Gondola Alternative B, there would be 1,500 parking spaces at the base station, 400 parking spaces at the 9400 South and Highland Drive mobility hub, and 600 parking spaces at the gravel pit mobility hub. The total of about 2,500 parking spaces would meet the goal of shifting about 30% of ski resort users in Little Cottonwood Canyon to the gondola system.

The amount of land required for the gravel pit mobility hub would be similar to that required for the Enhanced Bus Service Alternative (see Section 2.6.2.2, Mobility Hubs), but the number of stories for the parking structure would be reduced to two or three stories (with the Enhanced Bus Service Alternative, the parking structure would be three or four stories). In addition, since the parking structure at the gravel pit mobility hub would be smaller, there would be a signalized intersection at the Wasatch Boulevard entrance to the base station instead of an interchange as with the enhanced bus service alternatives and Gondola Alternative A. The 9400 South and Highland Drive mobility hub would need a two-story parking structure.

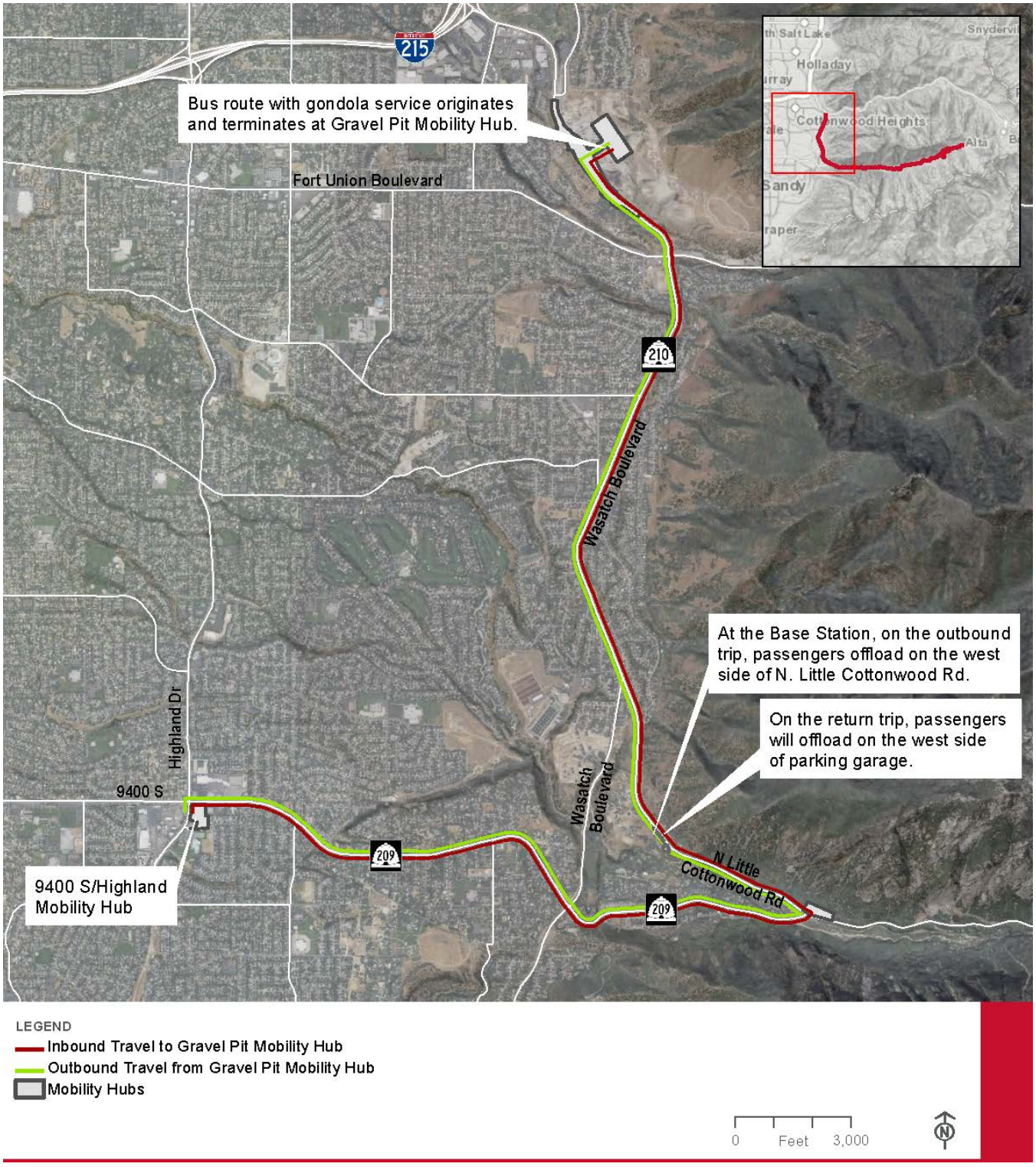
2.6.5.3 Wasatch Boulevard Alternatives

The Wasatch Boulevard alternatives with Gondola Alternative B would be the same as with the Enhanced Bus Service Alternative.

2.6.5.4 Avalanche Mitigation Alternatives

The avalanche mitigation alternatives with Gondola Alternative B would be the same as with the Enhanced Bus Service Alternative.

Figure 2.6-30. Gondola Alternative B – Bus Service Route to and from the Mobility Hubs



2.6.5.5 Trailhead Parking Alternatives

The trailhead parking alternatives with Gondola Alternative B would be the same as with the Enhanced Bus Service Alternative.

2.6.5.6 No Winter Parking Alternative

The No Winter Parking Alternative with Gondola Alternative B would be the same as with the Enhanced Bus Service Alternative.

2.6.6 Cog Rail Alternative (Starting at La Caille)

The Cog Rail Alternative is summarized in Figure 2.6-31. The Cog Rail Alternative would start at a base station located at a proposed development south of North Little Cottonwood Road near the La Caille restaurant, about 0.75 mile northwest of the intersection of S.R. 209 and S.R. 210, and would travel on the north side of S.R. 210 to both the Snowbird and Alta ski resorts. The alternative would include frequent bus service from two mobility hubs to the cog rail base station, improvements to Wasatch Boulevard, snow sheds, improvements to trailheads, and no winter parking. Each of these elements is described below. Appendix 2F, Cog Rail Alternative Plans, shows the engineering plans for this alternative.

What are terminal and base stations?

As used in the discussions of the Cog Rail Alternative, the term *terminal station* refers to the first and last stations on a passenger's cog rail trip. Passengers board and disembark the cog rail cars at the terminal stations.

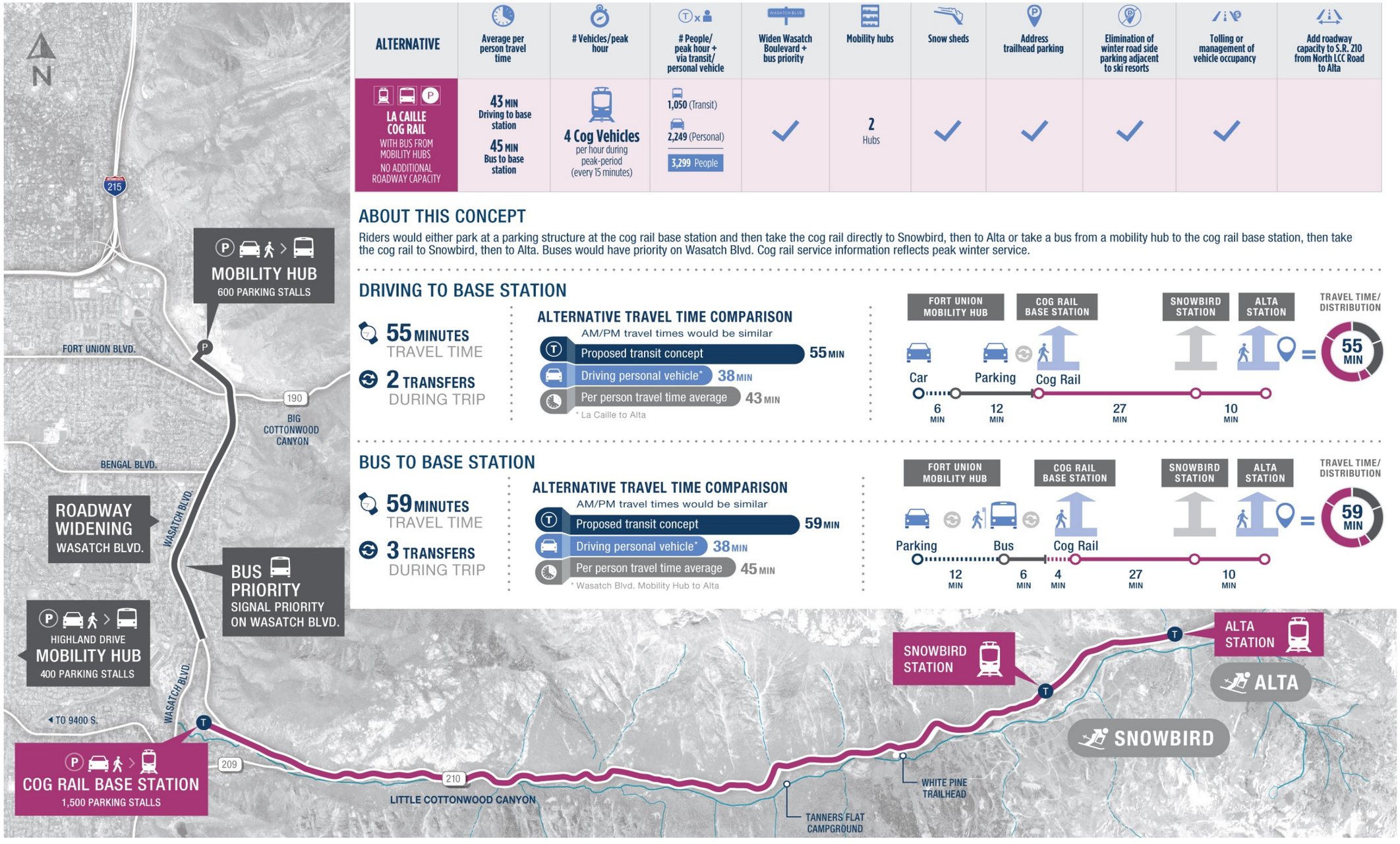
The *base station* is the terminal station at the bottom of the canyon, and a *destination station* is a terminal station at the top of the canyon.

The goal of the Cog Rail Alternative is to reduce personal vehicle use on S.R. 210 in Little Cottonwood Canyon on a busy ski day during the peak hours (7 AM to 10 AM) by about 30%.

To reduce personal vehicle use, a toll or a ban on single-occupant vehicles would be put in place to incentivize travelers to the ski resorts to use the cog rail. The cost of using the cog rail, including parking, has not been determined. However, to incentivize use, the cost of using the cog rail would be substantially less than a toll.

The cog rail system could be operated by a public agency or a private vendor. If the Cog Rail Alternative is selected and would be operated by a private vendor, a special-use permit from the USDA Forest Service might be required and would be based on the analysis in this EIS.

Figure 2.6-31. Cog Rail Alternative – Overview



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2.6.6.1 Cog Rail Service

Figure 2.6-32 shows the cog rail alignment and the approximate locations of the terminal stations. The cog rail system would use a diesel-electric locomotive and therefore would not require an overhead catenary. The cog rail would stop at the Snowbird and Alta ski resorts only.

What is an overhead catenary?

An overhead catenary is a system of overhead wires used to supply electricity to a locomotive, tram (streetcar), or light-rail vehicle.

2.6.6.1.1 Winter Cog Rail Service

Although the exact hours of operation have not been determined, it is likely that the cog rail would operate from 7 AM to 7 PM 7 days per week during the winter. During peak periods (7 AM to 10 AM and 3 PM to 6 PM), the cog rail would operate every 15 minutes with a total hourly person-capacity of about 1,000 people. During off-peak periods (10 AM to 3 PM), the cog rail would operate every 30 minutes with an hourly person-capacity of about 500 people. Operating times could be changed based on demand.

The average speed in the canyon would be about 18 mph. Although cog rail trains can travel faster than 18 mph, the tight canyon curves and steep grade in Little Cottonwood Canyon would reduce the speeds.

The travel time from the base station to Snowbird would be about 27 minutes. For users continuing to Alta, an additional distance of about 1½ miles, the additional travel time would be about 10 minutes (37 minutes total), which consists of a 4-minute stop at the Snowbird station to load and unload passengers.

Similar to vehicle traffic on S.R. 210, the cog rail would not operate during avalanche-mitigation operations. If an avalanche flow does cover the rail line, it would need to be cleared of snow and debris before operations could proceed. Snow sheds would be constructed in areas with a high avalanche risk to reduce the potential for rail operations to be delayed by avalanche mitigation (Figure 2.6-32).

What is a rolling closure?

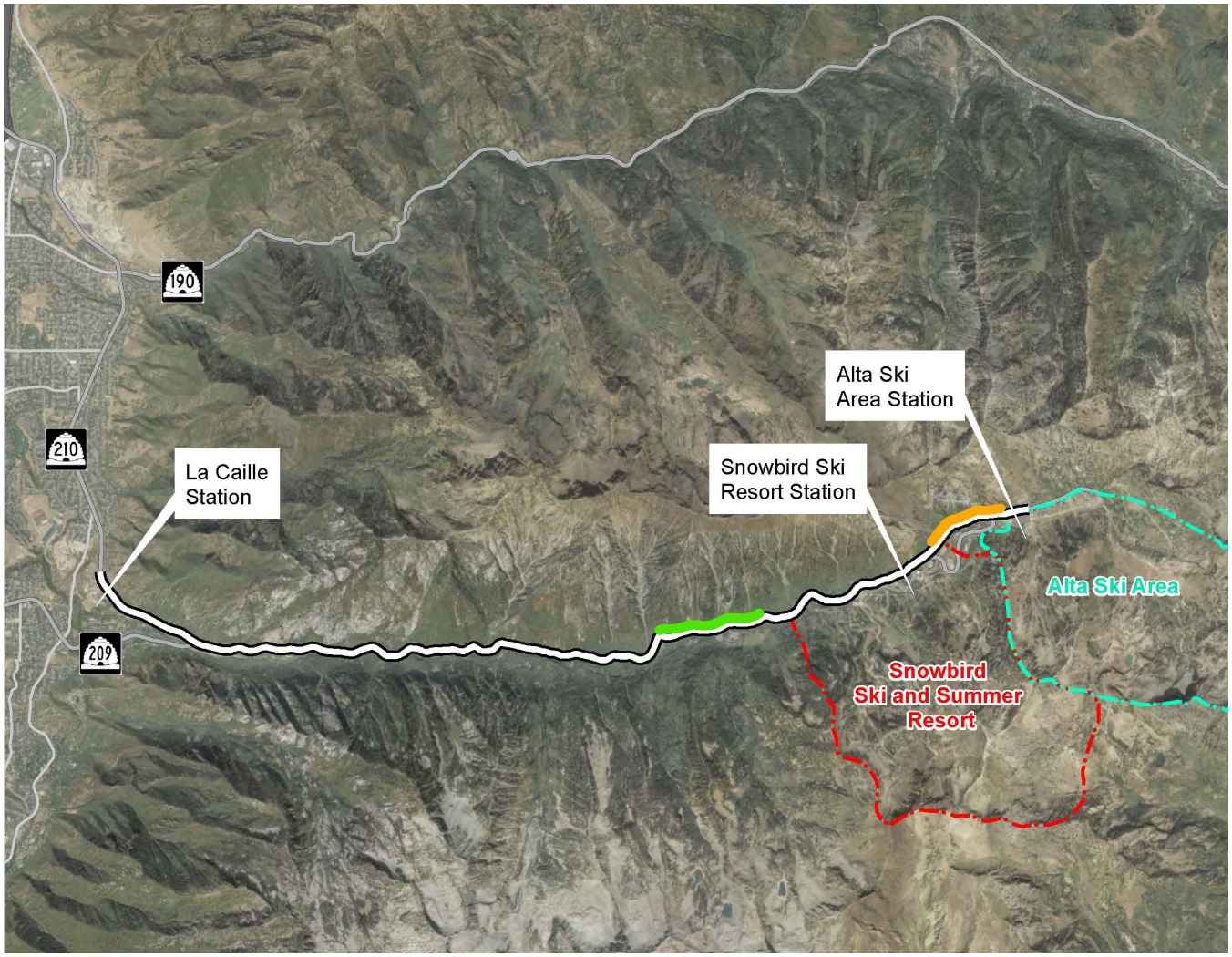
A rolling closure is a temporary road closure in which progressive segments of road are closed ahead of a snow-removal operation and reopened after the snow-removal operation has passed.

During snowplow operations on S.R. 210, UDOT's operators would need to take care to not push snow into the rail snow storage area or onto sections of embedded track. If snow must be blown from the rail line to the road side of the canyon, UDOT's operators would need to clear the road following the rail-clearing event. When using a rail rotary blower, UDOT would need to implement a rolling closure of S.R. 210 since snow could not be blown onto S.R. 210 when vehicles are on the road. UDOT believes that this could be done with a rolling closure as the road snowplow follows the rail rotary blower up or down the canyon.

Overall, the combined snow-removal operations would require more time and operational cost to remove snow from both the rail and S.R. 210 than from S.R. 210 alone. This would also likely result in additional road closures, with most occurring during off-peak periods. Removing avalanche flows from both the rail and the road could result in additional closure times for S.R. 210.

To avoid delivering passengers into a hazardous condition, the cog rail would not operate during interlodge events.

Figure 2.6-32. Cog Rail Alternative – Alignment and Station Locations



2.6.6.1.2 Summer Cog Rail Service

Although the exact hours of operation have not been determined, it is likely that during the summer the cog rail would operate between 8 AM and 8 PM to the Snowbird and Alta ski resorts outside the Tanners Flat Campground noise restriction times (10 PM to 7 AM). Final hours would be determined once the cog rail is operational. There would be no intermediate stops at trailheads in Little Cottonwood Canyon. Given the likelihood of reduced demand during the summer, the cog rail might operate only every 30 minutes. With regard to accommodations for cyclists, there are currently no formal NFS trails directly connecting the ski areas to the entrance to the canyon. For this reason, to minimize the potential for cyclists to develop and use unauthorized trails, bicycles would be prohibited from being brought into the cog rail vehicles until the USDA Forest Service makes an administrative decision regarding the construction of NFS trails below the ski areas for bicycle use.

2.6.6.1.3 Stations

The cog rail base station would be located about 0.75 mile northwest from the entrance to Little Cottonwood Canyon (Figure 2.6-33 and Figure 2.6-34). As proposed, the base station would include a 1,500-space parking structure and would allow users to park their personal vehicles at the base station or drop off skiers at the base station. The express bus service from the mobility hubs would also bring users of the cog rail service to the base station. The cog rail alignment would cross from the east side to the west side of S.R. 210 on a structure over the roadway. The structure would be about 20 feet high over the roadway.

To improve traffic circulation on S.R. 210 to and from the base station, UDOT would make several improvements to S.R. 210.

- Two southbound travel lanes from Wasatch Boulevard would continue to the base station with the right lane becoming the dedicated access to the base station. The access would enter into the second level of the parking structure. The extra lane would require a stormwater detention basin (see Figure 2.6-33).
- A northbound exit ramp from the parking structure under S.R. 210 would connect to the east side of S.R. 210.
- A signalized intersection would be constructed on S.R. 210 at the base station.

Figure 2.6-35 shows the proposed destination stations at Snowbird and Alta. If the Cog Rail Alternative is selected, these stations would be further refined during the final design process.

2.6.6.1.4 Operations and Maintenance Facility

The Cog Rail Alternative would require an operations and maintenance facility located along the rail alignment. As shown in Figure 2.6-36, the facility would be located at the Little Cottonwood Canyon park-and-ride lot. The facility would include administrative and operations offices, equipment storage, an enclosed vehicle maintenance facility, a fueling station, restrooms, and parking for employees. The operations and maintenance facility would likely be two stories to accommodate servicing cog rail vehicles. The fueling station would include an approximately 20,000-gallon, double-walled fuel tank with secondary containment and areas to detain stormwater runoff. For cog rail vehicle and worker safety and security, the operations and maintenance facility would have outside overhead lights and fencing.

Figure 2.6-33. Cog Rail Alternative – Base Station Layout North

Figure 2.6-34. Cog Rail Alternative – Base Station Layout South

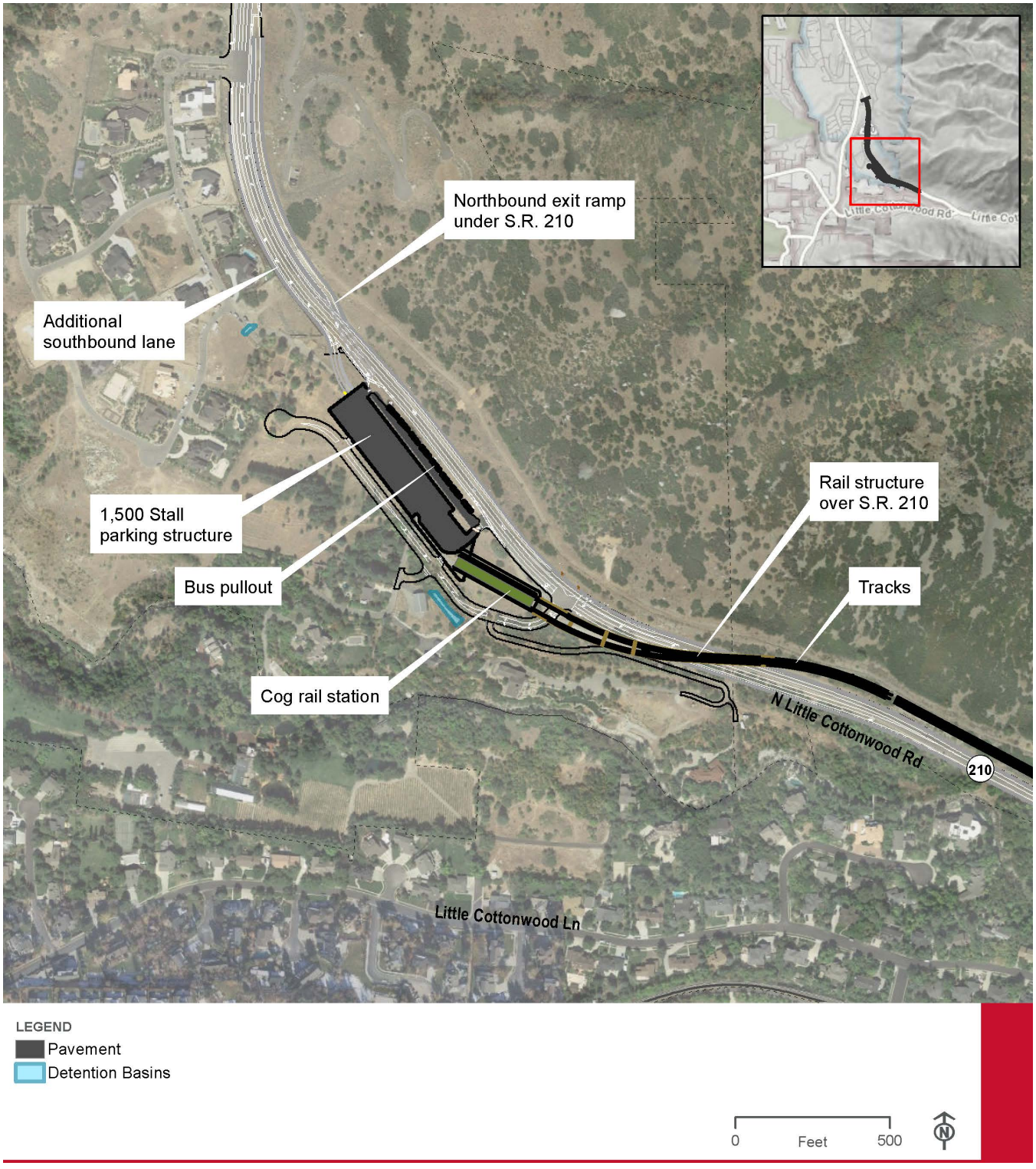


Figure 2.6-35. Cog Rail Alternative – Snowbird and Alta Stations

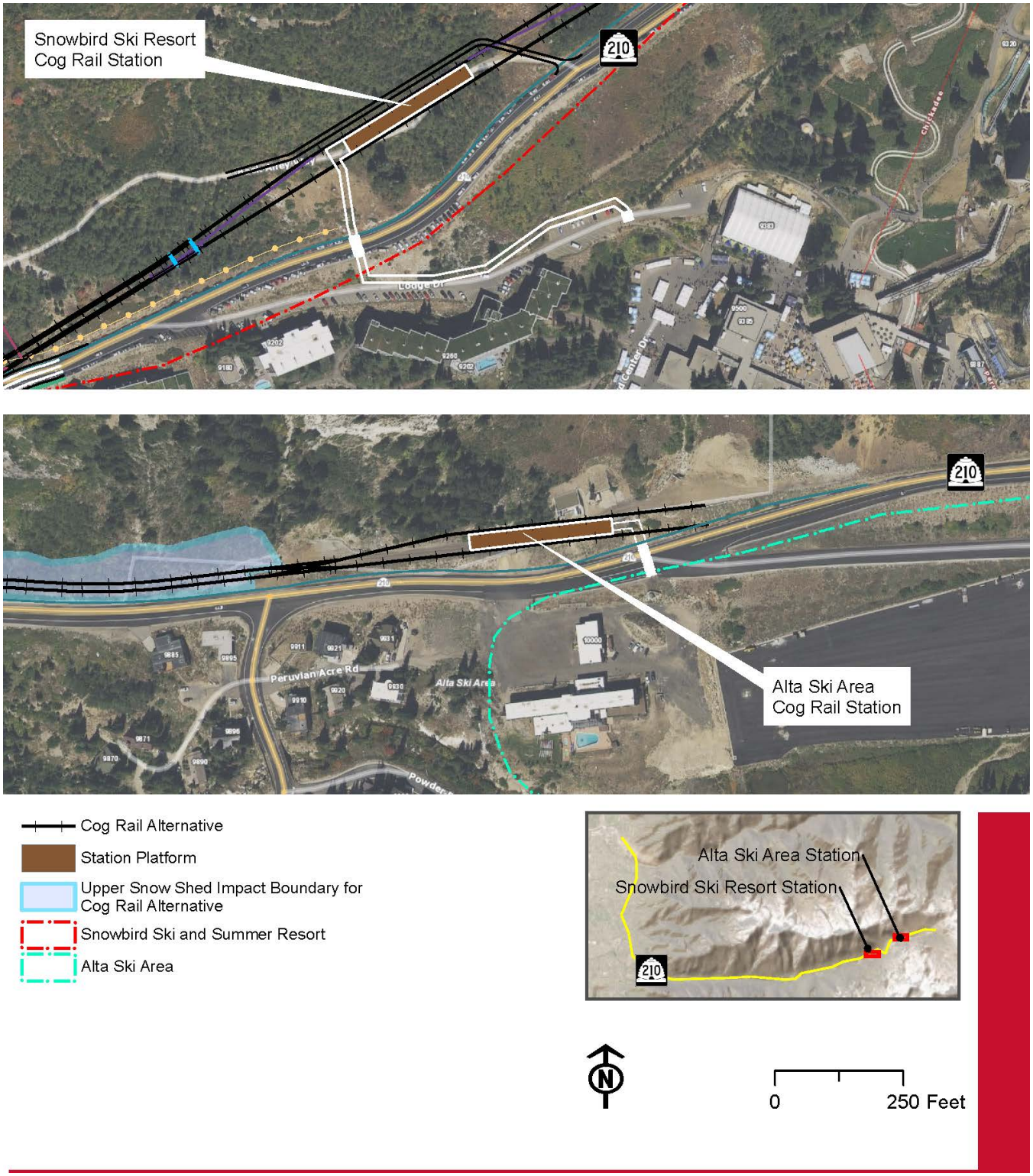
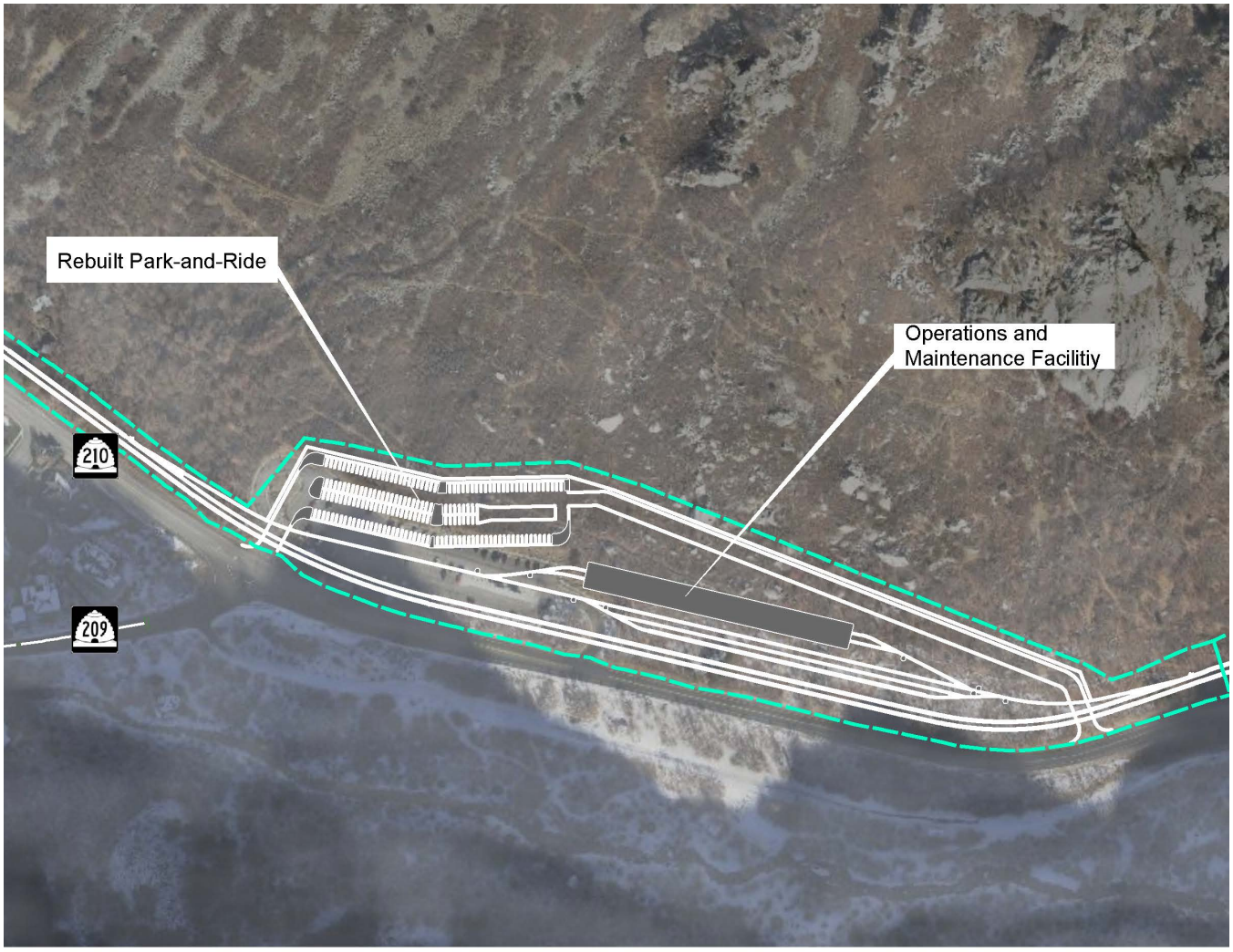
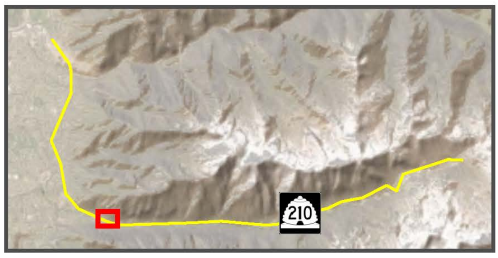


Figure 2.6-36. Cog Rail Alternative – Operations and Maintenance Facility and Little Cottonwood Canyon Park-and-ride Lot



Cog Rail Alternative Impact Boundary



N

0 500 Feet

The existing Little Cottonwood Canyon park-and-ride lot is used as an access point for the Alpenbock Loop Trailhead. As part of the Cog Rail Alternative, about 150 parking spaces, some of which would be designated for the trailhead, would be maintained adjacent to the operations and maintenance facility. The trailhead improvements would include restrooms for trailhead users.

2.6.6.1.5 Alignment and Operations

Cog Rail Alignment and Track Configuration

As shown in Figure 2.6-32 above, Cog Rail Alternative – Alignment and Station Locations, the cog rail alignment would operate on the north side of S.R. 210 (Figure 2.6-37). The cog rail would include both single- and double-track sections as well as ballasted and embedded track. The single-track section, about 2.2 miles, would be located in sections of the canyon where it would reduce impacts to the Grit Mill, Gate Buttress, and Lisa Falls Trailheads. The double-track sections would be about 12 miles total (two tracks over a total of 6 miles). There would be an 8-foot-wide shoulder with a concrete barrier between the roadway travel lane and the rail alignment to keep vehicles from entering the tracks.

What are ballasted and embedded track?

Ballasted track is placed on aggregate or stones that support the track. Embedded track is laid in the roadway so that vehicles can cross the track.

Figure 2.6-38 shows both single- and double-track ballasted and embedded track cross-sections. There are a total of about 16 miles of ballasted track. Embedded track requires less space but is more costly to construct than ballasted track. To reduce impacts to buildings and at vehicle crossings, about 3,000 feet (1,800 single track and 1,200 feet double track) of the cog rail line would be embedded into the road in areas with limited space.

UDOT assumed that the cog rail system would follow State of Utah safety regulations. There would be eight vehicle crossing points over cog rail alignment at trailheads (two crossings at the Alpenbock Trailhead and one each at the Gate Buttress, Grit Mill, and Lisa Falls Trailheads), two crossings for businesses in the lower canyon, and one crossing for a residential property. Each of these crossings would have safety gates that would make an audible noise when in use. Cog rail trains would not sound a train horn at these gates except during emergencies (to warn vehicles or pedestrians on the track). The cog rail locomotive would make an audible sound when leaving and entering a station.

Revision to Trailheads

The cog rail alignment would remove portions of the Gate Buttress, Grit Mill, and Lisa Falls Trailheads. To reduce the impacts to the trailheads, UDOT used a single-track design adjacent to the trailheads; however, even with the single-track section, portions of the trailheads would be removed. Therefore, as part of the Cog Rail Alternative, the three trailheads would need to be reconfigured to maintain their use. Figure 2.6-39 shows the redesign of the trailheads. With the improvements, the Gate Buttress Trailhead would be redesigned from 31 parking spaces in a dirt parking area to 21 paved spaces, the number of parking spaces at the Grit Mill Trailhead (21) would not change, and the Lisa Falls Trailhead would be reconfigured from about 58 parking spaces, including adjacent roadside parking within ¼ mile of the trailhead, to 41 paved spaces at the trailhead. All of these improvements would include no parking within ¼ mile of the trailheads and appropriate site drainage and restroom facilities.

2.6.6.2 Bus Service

The bus service with the Cog Rail Alternative would be the same as with Gondola Alternative B.

Figure 2.6-37. Cog Rail Alternative – Track Configuration

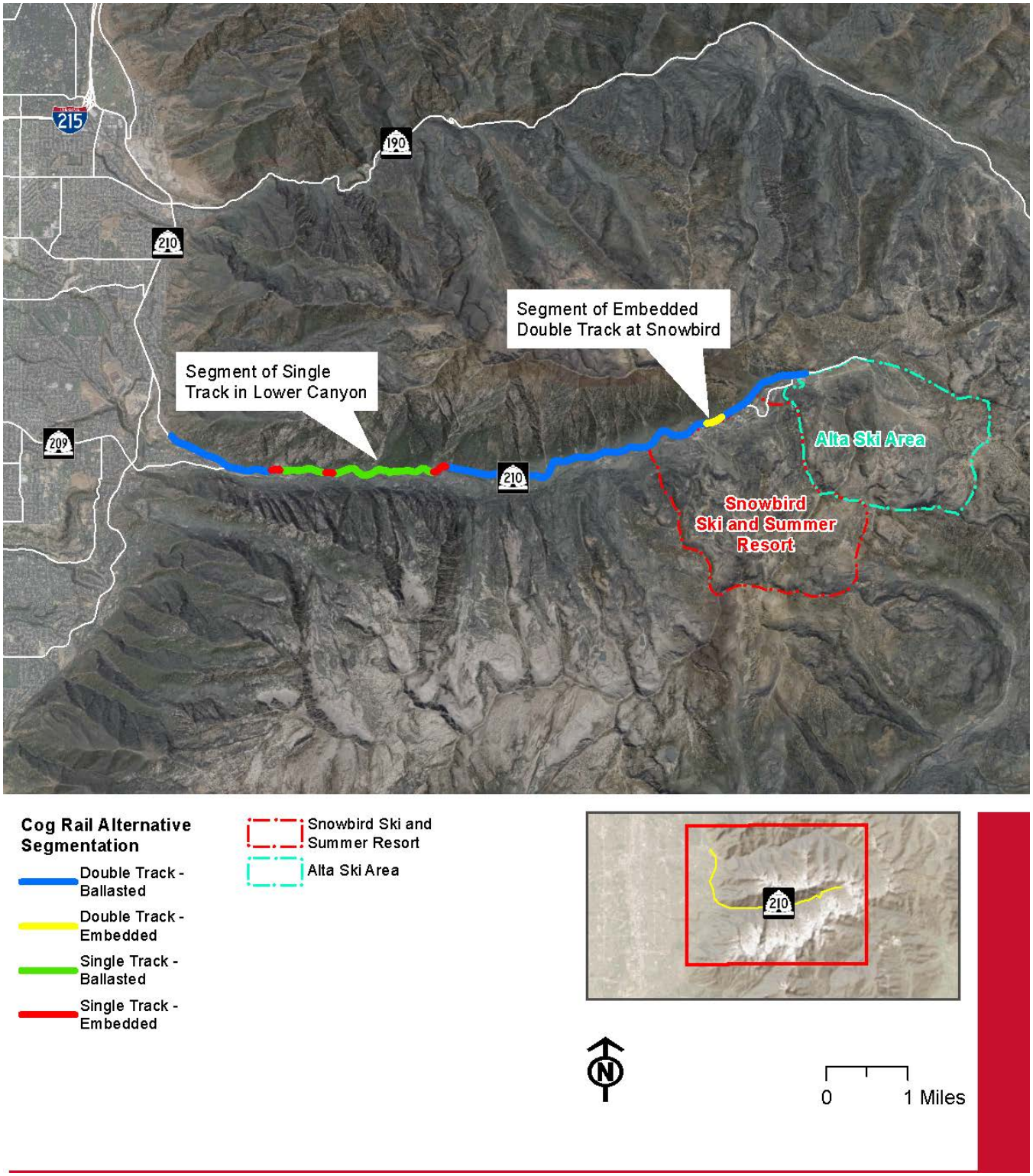


Figure 2.6-38. Cog Rail Alternative – Cross-section

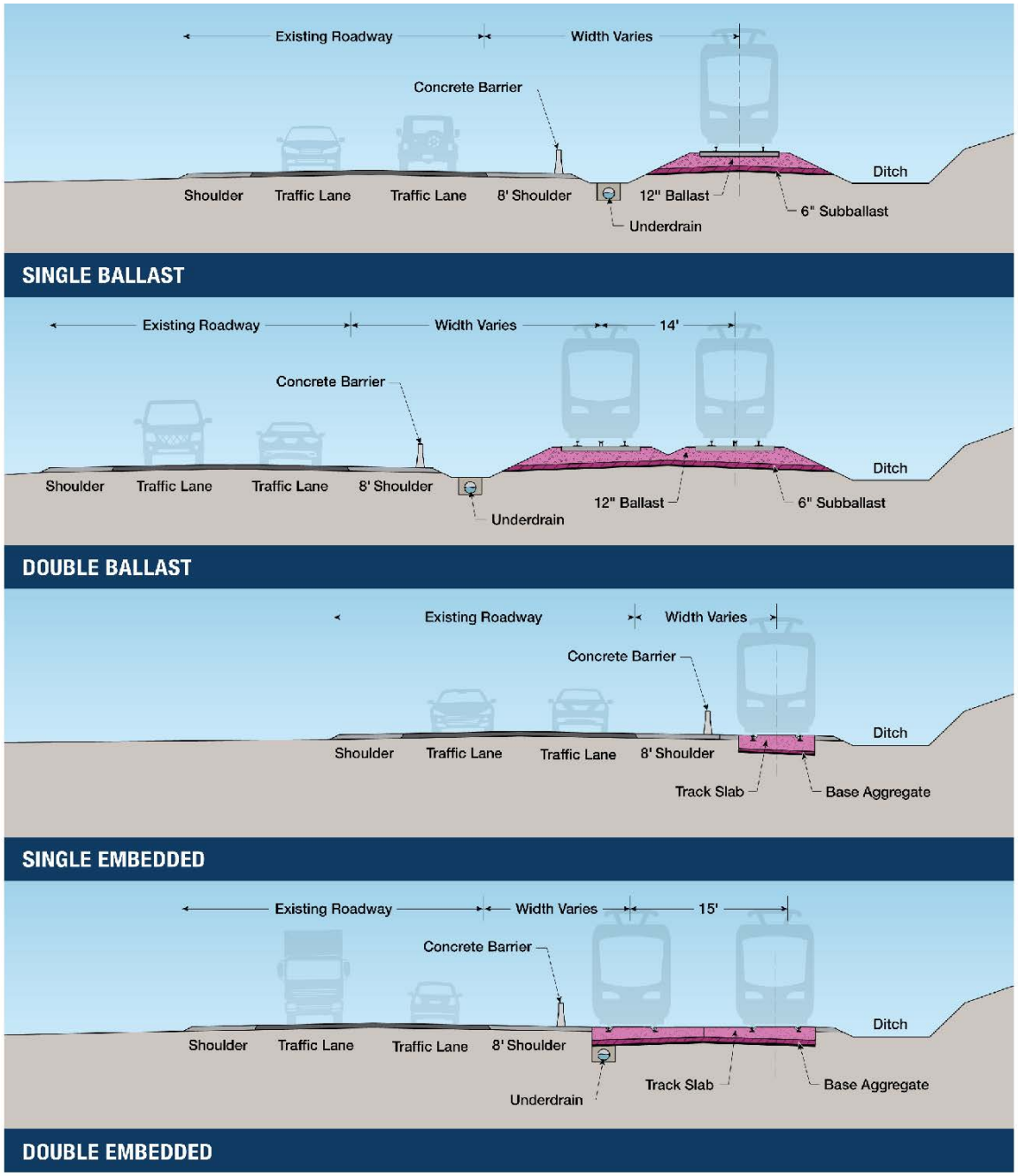
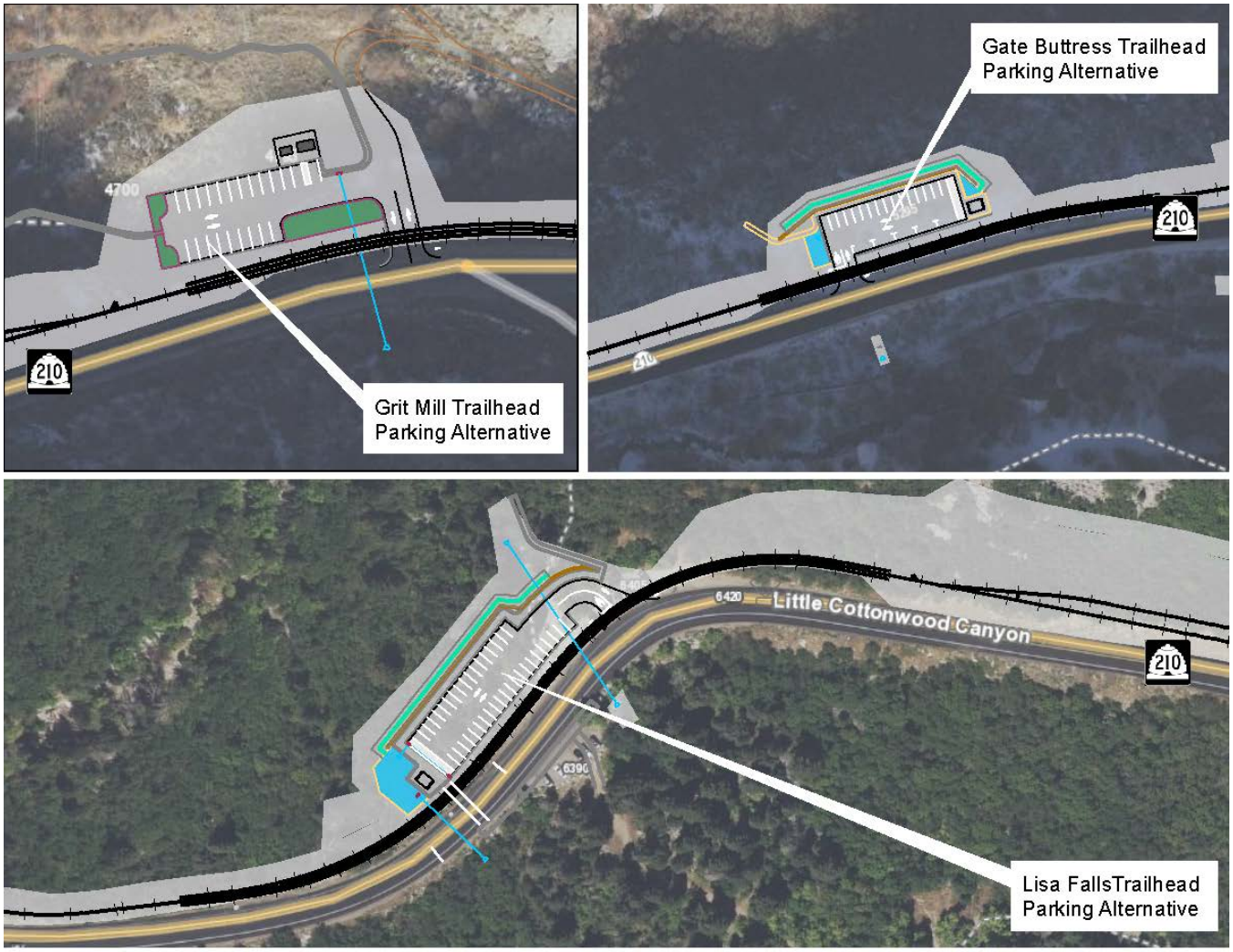
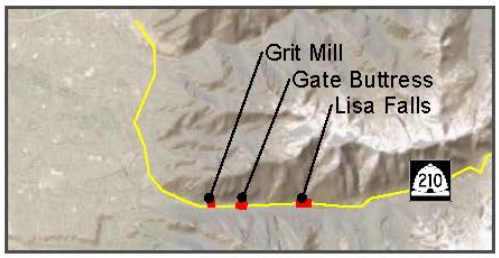


Figure 2.6-39. Cog Rail Alternative – Trailhead Improvements



Cog Rail Alternative

Cog Rail Alternative Impact Boundary



N

0 200 Feet

2.6.6.3 Wasatch Boulevard Alternatives

The Wasatch Boulevard alternatives with the Cog Rail Alternative would be the same as with the Enhanced Bus Service Alternative.

2.6.6.4 Mobility Hubs Alternative

The mobility hubs with the Cog Rail Alternative would be the same as with Gondola Alternative B.

2.6.6.5 Avalanche Mitigation Alternatives

The general design of the avalanche mitigation alternatives and operation would be similar to those with the Enhanced Bus Service Alternative. However, the two snow sheds in mid-canyon would be slightly wider to accommodate both the cog rail tracks and vehicles on the roadway. The Cog Rail Alternative would also require an additional snow shed in the upper canyon.

With the avalanche mitigation alternatives, there would be less need for active avalanche mitigation, such as the use of artillery to trigger avalanches. Under UDOT's current avalanche-mitigation program, from 2004 to 2017, an average of 153 artillery shells per ski season were fired into the avalanche paths where the snow sheds would be placed. UDOT anticipates that, with the avalanche mitigation alternatives, artillery use in the avalanche paths protected by the snow sheds could be reduced by 80% to about 31 artillery shells per season (Dynamic Avalanche Consulting 2019).

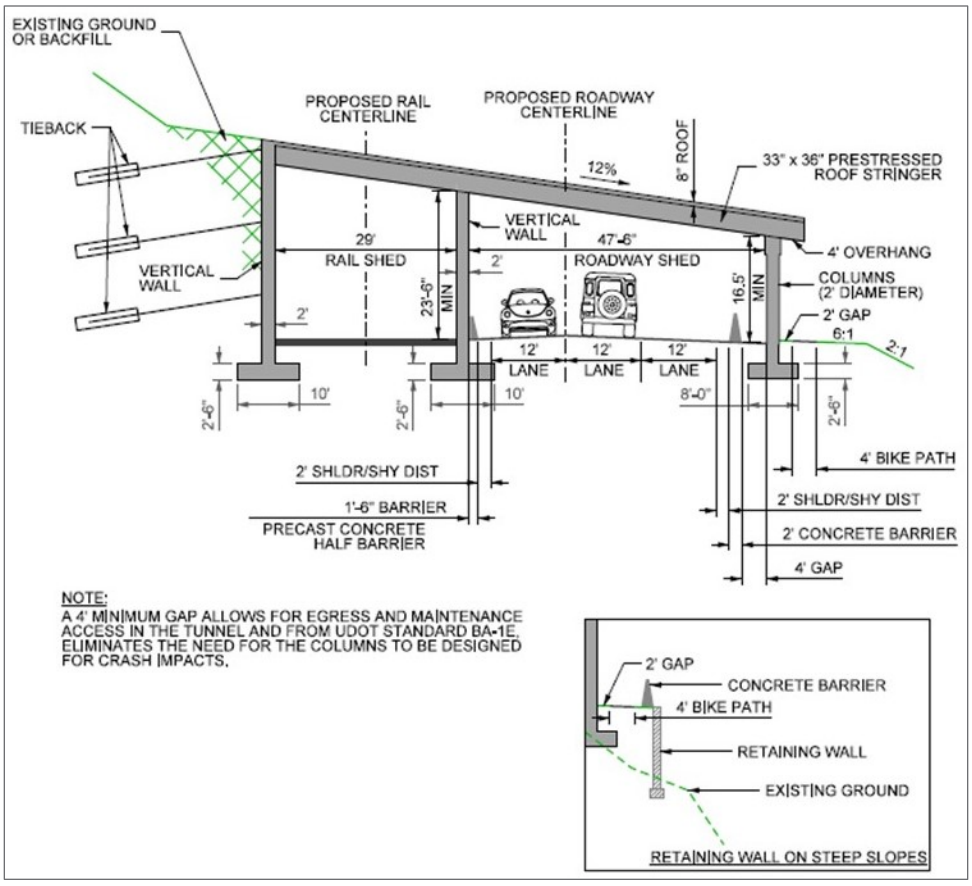
2.6.6.5.1 Snow Sheds with Berms Alternative

Mid-canyon Snow Sheds

The Snow Sheds with Berms Alternative includes three separate snow sheds as shown in Figure 2.6-7 above, Avalanche Mitigation Alternatives – Snow Sheds with Berms Alternative. The locations of the mid-canyon snow sheds are shown in Figure 2.6-32 above, Cog Rail Alternative – Alignment and Station Locations. Snow sheds over three main avalanche paths (White Pine Chutes 1–4, a snow shed about 1,360 feet long; White Pine, a snow shed about 640 feet long; and Little Pine, a snow shed about 465 feet long) offer the most avalanche risk reduction and would help keep S.R. 210 open more often. The berm with the snow sheds would be the same as with the Enhanced Bus Service Alternative.

Figure 2.6-40 shows the proposed snow shed design with the cog rail system for the mid-canyon snow sheds. As shown, the snow shed design would accommodate a bicycle path on the outside of the snow shed. The tie-backs would be used where the snow shed is close to the mountain. Where the snow shed is not close to the mountain, engineered fill would be placed behind the snow shed to allow the avalanche flow to run over the top of the snow shed. The snow shed tie-backs would be placed in the engineered fill.

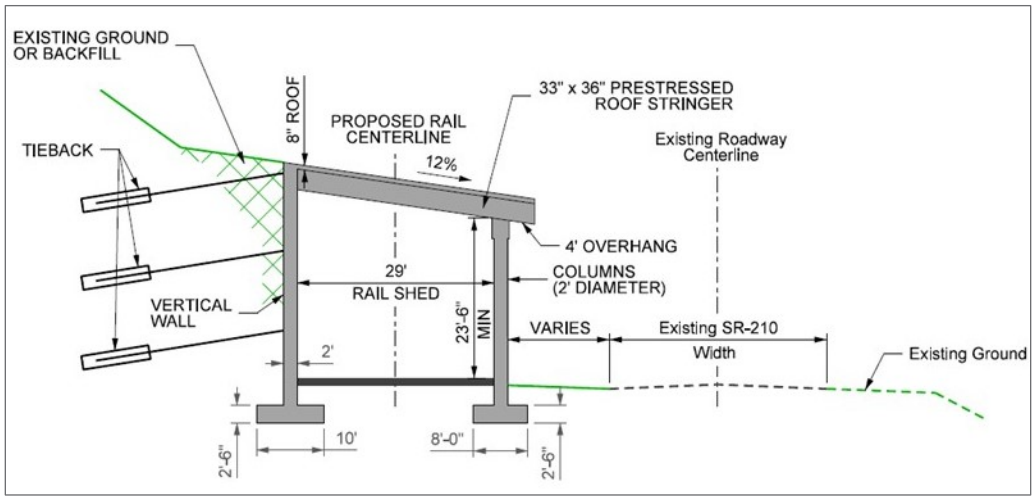
Figure 2.6-40. Cog Rail Alternative – Mid-canyon Snow Shed Design



Upper-canyon Snow Sheds

The locations of the upper-canyon snow sheds are shown in Figure 2.6-32 above, Cog Rail Alternative – Alignment and Station Locations. The snow sheds are required to mitigate the high avalanche risk associated with the Superior, Little Superior, and Hilton avalanche paths. As shown in Figure 2.6-41, the snow shed design would accommodate only the cog rail tracks, since vehicles can use the Alta Bypass Road to avoid this high-avalanche-risk area when necessary. As shown in Figure 2.6-42, one 2,100-foot-long snow shed would be required in the Superior, Little Superior, and Hilton avalanche paths and one 1,545-foot-long snow shed in the East Hellgate avalanche path.

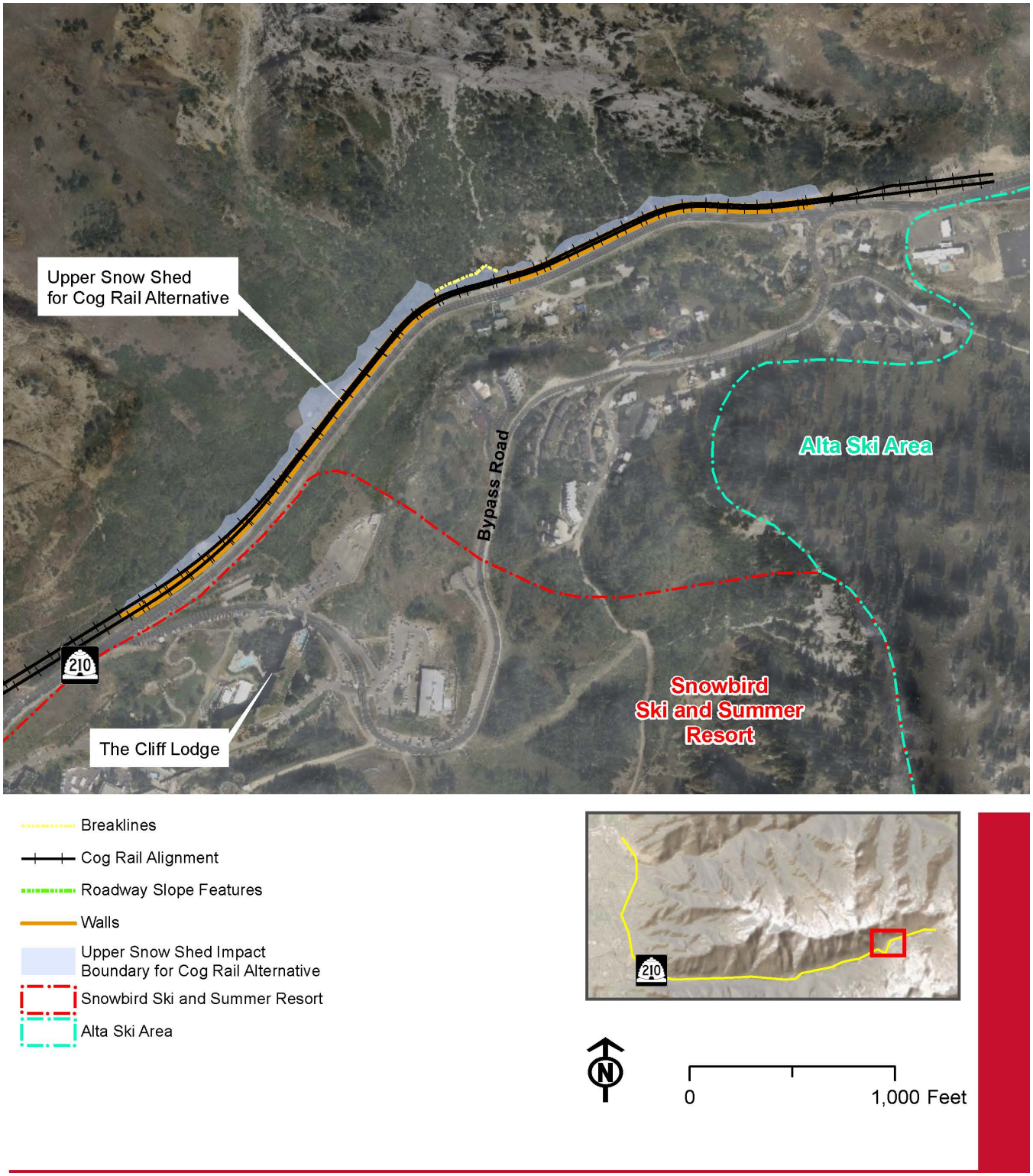
Figure 2.6-41. Cog Rail Alternative – Upper-canyon Snow Shed Design



2.6.6.5.2 Snow Sheds with Realigned Road Alternative

With the Cog Rail Alternative, the Snow Sheds with Realigned Road Alternative would apply only to the mid-canyon snow sheds. This alternative would be the same as with the Enhanced Bus Service Alternative except that it would include space for the cog rail tracks as shown in Figure 2.6-40 above, Cog Rail Alternative – Mid-canyon Snow Shed Design. The upper-canyon snow sheds would be the same as described in Section 2.6.6.5.1, Snow Sheds with Berms Alternative.

Figure 2.6-42. Cog Rail Alternative – Upper-canyon Snow Sheds



2.6.6.6 Trailhead Parking Alternatives

Three trailhead parking alternatives are being considered:

- Trailhead Improvements and No S.R. 210 Roadside Parking within ¼ Mile of Trailheads Alternative
- Trailhead Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative
- No Trailhead Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative

If the Cog Rail Alternative is selected, one of the three trailhead parking alternatives would be identified as the preferred trailhead parking alternative with the modifications discussed in Sections 2.6.6.6.1 through 2.6.6.6.3 below.

2.6.6.6.1 Trailhead Improvements and No S.R. 210 Roadside Parking within ¼ Mile of Trailheads Alternative

With the Cog Rail Alternative, the Grit Mill, Gate Buttress, and Lisa Falls Trailheads would need to be reconstructed as part of the cog rail alignment, and these are considered to be reconstructed or new trailheads, not improved trailheads. Therefore, with this trailhead parking alternative, the only improved trailheads would be the Bridge and White Pine Trailheads. The design of these two trailheads would be the same as with the Enhanced Bus Service Alternative. With this trailhead parking alternative, all roadside parking within ¼ mile of the improved or new trailhead parking areas, including those that would be improved with the Cog Rail Alternative design, would be eliminated. To eliminate parking, No Parking signs would be placed along S.R. 210. In all, the total number of parking spaces from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1, including the trailheads reconstructed as part of the cog rail design, would be reduced from the existing 528 spaces to 511 spaces (a reduction of 17 spaces).

2.6.6.6.2 Trailhead Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative

With this trailhead parking alternative, the trailhead parking improvements would be the same as with the Trailhead Improvements and No S.R. 210 Roadside Parking within ¼ Mile of Trailheads Alternative with the Cog Rail Alternative. However, with this trailhead parking alternative, all roadside parking in Little Cottonwood Canyon would be eliminated from the entrance to the canyon to Snowbird Entry 1. To eliminate parking, No Parking signs would be placed along S.R. 210. In all, the total number of parking spaces from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1, including the trailheads reconstructed as part of the cog rail design, would be reduced from the existing 528 spaces to 221 spaces (a reduction of 307 spaces).

2.6.6.6.3 No Trailhead Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative

With this trailhead parking alternative, there would be no improvements to trailhead parking at the Bridge and White Pine Trailheads. The Grit Mill, Gate Buttress, and Lisa Falls Trailheads would still be reconstructed as part of the cog rail design. To eliminate parking, No Parking signs would be placed along S.R. 210. In all, the total number of parking spaces from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1, including the trailheads reconstructed as part of the cog rail design, would be reduced from the existing 528 spaces to 114 spaces (a reduction of 414 spaces).

2.6.6.7 No Winter Parking Alternative

The No Winter Parking Alternative with the Cog Rail Alternative would be the same as with the Enhanced Bus Service Alternative.

2.6.7 Preliminary Cost Estimates and Construction Implementation

To help compare the action alternatives, UDOT developed preliminary cost estimates (Table 2.6-7) and the yearly cost to operate and maintain each alternative. These estimates are based on the preliminary engineering conducted and include the total project cost for construction, right-of-way acquisition, utility relocation, design engineering, and the equipment needed to operate the alternative, equipment such as buses, gondola cabins, and cog rail vehicles. The cost estimates are based on 2020 dollars. The actual cost of construction would change depending on the year of construction, but the cost is expected to change proportionally for all alternatives.

The cost of maintaining the S.R. 210 roadway would be the same for all alternatives (including the No-Action Alternative) and is therefore not included in the operational cost. The additional cost for snowplowing with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative and Cog Rail Alternative is included in the operational cost.

The S.R. 210 Project is included in the Wasatch Front Regional Council's 2019–2050 *Long-range Transportation Plan* for construction of the Wasatch Boulevard alternatives in Phase 1 (2019–2030) and improvements from North Little Cottonwood Road to Alta in Phase 2 (2031–2040).

2.6.8 Comparison of Alternatives

Table 2.6-8 lists the major advantages and disadvantages of each primary action alternative that is evaluated in detail in this EIS. Table 2.6-9 summarizes the environmental impacts of the No-Action and primary action alternatives. Because the impacts depend on which sub-alternative is selected, a range of impacts from low to high is provided. For detailed information about the environmental impacts of the alternatives, see the individual resource chapters of this EIS.

Table 2.6-7. Preliminary Construction Cost Estimate and Operation and Maintenance Cost

In 2020 dollars

Alternative	Cost Estimate (millions $)	Winter Operation and Maintenance Cost / Summer Operation and Maintenance Cost (millions $)
Primary Alternative[a,b]		
Enhanced Bus Service	338–355	14.0 / 0
Enhanced Bus Service in Peak-period Shoulder Lane	493–510	11.0 / 0
Gondola Alternative A	554–561	9.5 / 5.0
Gondola Alternative B	575–592	7.6 / 3.0
Cog Rail Alternative	1,092–1,106	7.0 / 2.2
Sub-alternatives Part of Primary Alternatives		
Wasatch Boulevard • Imbalanced-lane Alternative • Five-lane Alternative	 59 62	Operation and maintenance cost is not provided since it would be the same for all primary alternatives.
Mobility Hubs Enhanced Bus Service and Gondola A Alternatives • 9400 South and Highland Drive • Gravel pit (includes interchange on Wasatch Boulevard) Gondola B and Cog Rail Alternatives • 9400 South and Highland Drive • Gravel pit (includes Intersection on Wasatch Boulevard) • La Caille parking structure	 21 78 8 29 32	
Avalanche Mitigation Enhanced Bus Service and Gondola A and B Alternatives • Snow Sheds with Berms • Snow Sheds with Realigned Road Cog Rail Alternative • Mid-canyon Snow Sheds with Berms • Mid-canyon Snow Sheds with Realigned Road • Upper-canyon snow sheds	 72 86 131 141 109	
Trailhead Parking Enhanced Bus Service and Gondola A and B Alternatives • Improvements and no parking within ¼ mile • Improvements and no parking in Little Cottonwood Canyon • No improvements and no parking Cog Rail Alternative • Improvements and no parking within ¼ mile • Improvements and no parking in Little Cottonwood Canyon • No improvements and no parking	 5.8 5.8 0.0 2.0 2.0 0.0	
No Winter Roadside Parking	0.0	
Tolling Infrastructure	5.0	

[a] The cost of the primary alternatives includes the alternatives that are part of the sub-alternatives and provides a range since each cost varies depending on the sub-alternative selected. Cost estimates also include noise walls and tolling infrastructure. Operation and maintenance cost includes total operations for the alternative, such as buses, personnel, maintenance, and snow removal for the peak-period shoulder lanes and Cog Rail Alternative. The enhanced bus service alternatives would not operate during the summer.

[b] The cost of all alternatives includes new buses, signal priority at intersections, fare-collection systems, communication equipment, and a bus maintenance and storage facility.

Table 2.6-8. Primary Advantages and Disadvantages of the No-Action and Primary Action Alternatives

Evaluation Factor	No-Action Alternative	Enhanced Bus Service Alternative	Enhanced Bus Service in Peak-period Shoulder Lane Alternative	Gondola Alternative A	Gondola Alternative B	Cog Rail Alternative
Primary advantages	• Few environmental impacts because no major improvements to S.R. 210 would be made • No additional impacts to the watershed • No change to rural character of Wasatch Boulevard	• Lowest capital cost • Least environmental impacts • Scalable service[a] • Potential for phased implementation • Low mechanical and operation concerns	• Second-lowest capital cost • Best travel times • Allows area for vehicles to pull off the road in an emergency • Potential for phased implementation • Low mechanical and operation concerns • Provides summer bicycle lanes	• High travel reliability • Minimal impact from road emergencies • Highest person-carrying capacity • Low construction impact in Little Cottonwood Canyon	• High travel reliability • Minimal impact from road emergencies • Highest person-carrying capacity • Low construction impact in Little Cottonwood Canyon • 1,500 parking spaces at gondola base station • Requires less-frequent bus service	• Lowest operational and maintenance cost • High travel reliability • Minimal impact from road emergencies • 1,500 parking spaces at gondola base station • Requires less-frequent bus service
Primary disadvantages	• Potential increase in emissions of air pollutants from personal vehicles with increased visitation in Little Cottonwood Canyon by 2050 • Would not be consistent with regional transportation plans • Substantial travel delays and vehicle backups in 2050 would not be addressed, resulting in poor mobility • Wasatch Boulevard would continue to operate at an unacceptable level of service • Would not provide economic benefit to the state from the potential in improved tourism • Would not address safety concerns with roadside parking in Little Cottonwood Canyon • Would not address avalanche mitigation delays and associated safety risk	• Highest operational and maintenance cost • Highest potential for disruption to travel times from congestion, roadway slideoffs, and accidents • Longest vehicle backups on S.R. 209 and S.R. 210 • Lowest overall travel reliability • Air pollutant emissions from buses in canyon • Change in rural character of Wasatch Boulevard	• Second-highest operational and maintenance cost • Highest amount of impervious surface and associated water quality impacts • Air pollutant emissions from buses in canyon • Reduces climber access in lower canyon • Moderate visual impact from roadway widening • Change in rural character of Wasatch Boulevard	• High visual impact • Greater potential for mechanical delays • Breakdowns could strand users in canyon • Requires all users to have two transfers (personal vehicle to bus, then bus to gondola) • Service is not scalable[a] • Does not allow personal vehicles to park or drop off passengers at base station • Haul rope must be inspected after artillery is used for avalanche mitigation • Required bus service could reduce summer use of gondola • Change in rural character of Wasatch Boulevard	• Second-highest capital cost • High visual impact • Greater potential for mechanical delays • Breakdowns could strand users in canyon • Service is not scalable[a] • Haul rope must be inspected after artillery is used for avalanche mitigation • Change in rural character of Wasatch Boulevard	• Highest capital cost • High visual impact with greatest length of snow sheds • High visual impact from the cog rail alignment • Greater potential for mechanical delays • Breakdowns could strand users in canyon • Service is not scalable[a] • Conflicts when removing snow from the cog rail tracks and S.R. 210 • Trains from Alta ski resort could be full when they arrive at Snowbird ski resort • Concrete barrier along the rail alignment could disrupt wildlife movement in the canyon • Change in rural character of Wasatch Boulevard

[a] Scalable service means that this alternative could be built in phases, starting with improvements to address the initial need and then ramping up to full build-out by 2050. For example, bus service could start with an initial, less-frequent service and build on that service as demand increases. The advantage of scalable service is that it would allow UDOT to start with a low initial upfront capital and operating cost and build up the system over time while taking into account future changes in transportation demand and technology.

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Table 2.6-9. Environmental Impacts of the No-Action and Primary Action Alternatives

Impact Category	Unit	No-Action Alternative	Enhanced Bus Service Alternative	Enhanced Bus Service in Peak-period Shoulder Lane Alternative	Gondola Alternative A	Gondola Alternative B	Cog Rail Alternative
Land converted to alternative use	Acres	0	115–120	151–156	127–132	158–163	212–217
Potential residential relocations	Number	0	1	1	1	1	1
Potential business relocations	Number	0	0	0	0	0	0
Recreation areas affected	Number	0	2	4	3	3	5
Community facilities affected	Number	0	1	1	1	1	1
Environmental justice impacts	Yes/no	No	No	No	No	No	No
Economic impacts	Yes/no	No	No	No	No	No	No
Existing Forest Service trails affected	Number	0	0	1	1	1	1
Climbing resources (existing boulders and trails affected)	Number	0	0	5	1	1	17
Air quality impacts above regulations	Yes/no	No	No	No	No	No	No
Receptors with modeled noise levels above criteria	Number	173	213–230	216–233	213–230	213–230	213–230
Increase in impervious surface[a]	Acres	0	15.6–16.8	37.6–38.8	15.6–16.8	22–23.2	52.2–53.4
Water quality standards exceeded[b]	Yes/no	No	No	No	No	No	No
Wildlife habitat impacted	Acres	0	9–13	42–46	13–17	21–25	84–88
Threatened and endangered species	Yes/no	No	No	No	No	No	No
Impacts to waters of the United States[c]	Acres	0	0	0	0	0	0.01
Impacts to intermittent, perennial, and ephemeral streams	Acres	0	0.03–0.17	0.32–0.46	0.03–0.17	0.03–0.17	0.35–0.49
Impacts to Riparian Habitat Conservation Areas	Acres	0	0.14–0.83	1.58–2.18	0.14–0.83	0.14–0.83	0.75–1.44
Adverse impacts to cultural resources	Number	0	1	1	2	2	2
Hazardous waste sites affected	Number	0	1	2	1	2	2

(*continued on next page*)

Table 2.6-9. Environmental Impacts of the No-Action and Primary Action Alternatives

Impact Category	Unit	No-Action Alternative	Enhanced Bus Service Alternative	Enhanced Bus Service in Peak-period Shoulder Lane Alternative	Gondola Alternative A	Gondola Alternative B	Cog Rail Alternative
Floodplain impacts	Acres	0	1.18–1.32	2.1–2.2	1.5–1.6	2.1–2.3	1.5–1.6
Visual change[d] (primary alternative/ supporting element)	Category	None	Negligible/high	Moderate/high	High/high	High/high	High/high
Section 4(f) uses (with greater–than–*de minimis* impact)[e]	Number	0	1	1	1	1	1

[a] Range captures the increase in impervious surface from the Wasatch Boulevard Imbalanced-lane Alternative or the Five-lane Alternative. Range does not include new impervious surface at the gravel pit or 9400 South and Highland Drive mobility hubs, These locations were not included in the quantitative water quality analysis because they are outside the Little Cottonwood Creek watershed. Range includes the impervious surface at the gondola and cog rail base stations at La Caille.

[b] Based on water quality modeling, numeric water quality standards in Little Cottonwood Creek would not be exceeded for any alternative for most storm events.

[c] The impact would be to a seep from the upper-canyon snow sheds as part of the Cog Rail Alternative.

[d] Visual change includes landscape character change at key observation points. The visual change is for the primary alternative and supporting elements such as snow sheds.

[e] The greater–than–*de minimis* Section 4(f) use would occur with the avalanche mitigation alternatives. Section 4(f) is an element of law and U.S. Department of Transportation regulation that requires a project to avoid the use of eligible or potentially eligible historic properties and significant publicly owned parks, recreation areas, and wildlife or waterfowl refuges unless there is no feasible and prudent alternative to such use or unless the use would have a *de minimis* impact. For historic properties, a *de minimis* impact means that UDOT has determined, in accordance with 36 Code of Federal Regulations Part 800, that the historic property in question would not be affected by the project or that the project would have "no adverse effect" on the historic property. For recreation areas, a *de minimis* impact is one that would not adversely affect the features, attributes, or activities that qualify the property for protection under Section 4(f). A temporary occupancy is an occupancy of land so minimal as to not constitute a use within the meaning of Section 4(f). For more information, see Chapter 26, Section 4(f) and Section 6(f) Evaluation.

2.6.9 Basis for Identifying the Preferred Alternatives

Which alternatives does UDOT prefer?

UDOT prefers the Enhanced Bus Service in Peak-period Shoulder Lane Alternative for providing the best overall mobility and Gondola Alternative B for providing the best overall reliability.

For the Draft EIS, UDOT has narrowed down the five primary alternatives to the two primary alternatives that it considers preferable at this time. A purpose of identifying these two primary Preferred Alternatives is to seek public input that can be considered in making a final selection of one of the primary alternatives in the Record of Decision for the S.R. 210 Project.

Based on the analysis presented in this Draft EIS, UDOT has identified the **Enhanced Bus Service in Peak-period Shoulder Lane Alternative** as the primary Preferred Alternative in the Draft EIS for providing the best overall mobility and **Gondola Alternative B** as the primary Preferred Alternative in the Draft EIS for providing the best overall reliability. UDOT identified the following sub-alternatives as the supporting elements of the primary Preferred Alternatives in the Draft EIS:

- **Five-lane Alternative** (Wasatch Boulevard alternative)
- **Snow Sheds with Realigned Road Alternative** (avalanche mitigation alternative)
- **Trailhead Improvements and No Roadside Parking within ¼ Mile Alternative** (trailhead parking alternative)
- **No Winter Parking Alternative**

Appendix G, Preferred Alternative Technical Memorandum, provides more information regarding UDOT's reasoning for selecting the Preferred Alternatives. The following sections summarize UDOT's decision.

2.6.9.1 Primary Alternatives Evaluation

This section identifies and provides UDOT's basis for identifying its preferred primary alternatives in the Draft EIS. A single preferred primary alternative will be identified by UDOT before the Final EIS is published or in the Final EIS. The final selection of a primary alternative will be made by UDOT in the Record of Decision for the S.R. 210 Project.

For the Draft EIS, UDOT has narrowed down the five primary alternatives to two primary alternatives that are being considered as its preference. A purpose of identifying two primary Preferred Alternatives in the Draft EIS is to seek public input on the two alternatives that can be considered in identifying a single primary Preferred Alternative in the Final EIS and making a final selection of one of the alternatives in the Record of Decision.

UDOT identified the preferred primary alternatives based on their transportation performance, cost, and impacts to the natural and human environment. As part of identifying the preferred primary alternatives, UDOT considered public and agency input during the scoping process and the alternatives development, screening, and refinement process.

Note that there are strengths and weaknesses for each primary alternative. No primary alternative had the best transportation performance, the lowest cost, and the fewest impacts to all resources.

Based on the evaluation, UDOT has identified the **Enhanced Bus Service in Peak-period Shoulder Lane Alternative** and **Gondola Alternative B** as its preferred primary alternatives. UDOT primarily based the decision on the Enhanced Bus Service in Peak-period Shoulder Lane Alternative providing the best overall **mobility** of the five primary action alternatives and Gondola Alternative B providing the best overall **reliability**. Other factors in making the decision are described below.

2.6.9.1.1 Enhanced Bus Service in Peak-period Shoulder Lane Alternative

The Enhanced Bus Service in Peak-period Shoulder Lane Alternative would provide the following benefits:

- **Overall Per-person Peak-hour Travel Time.** The alternative would have the best overall travel time at 35 to 40 minutes in 2050, which is 10 minutes faster than the next-best alternative.
- **Transit Mode Travel Time.** The alternative would have the best transit travel time at 24 minutes and the best transit travel time with transfers at 36 minutes. These travel times are 10 minutes and 18 minutes faster, respectively, than the next-best alternatives.
- **Low Mechanical Complexity.** The alternative has a low mechanical complexity. If a bus is pulled from service, a spare bus can replace it without stopping the entire bus system
- **Scalable Service Capability.** The alternative could initially start with a smaller bus fleet and fewer mobility hub parking spaces. This would allow UDOT to build on the bus service as demand grows and adjust the service in the future based on its operational characteristics.
- **Travel Reliability.** Because a separate travel lane would be available, buses could operate around most vehicle slideoffs and accidents.
- **Support for Active Transportation.** The peak-period shoulder lanes would become pedestrian and cyclist lanes on S.R. 210 during the summer and when not in use during the winter.
- **Environment.** Of the five primary alternatives, the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would have the second-highest impacts to wildlife habitat, but most of the area with impacts would be immediately adjacent to the existing road. In addition, the additional road cuts required for the shoulder lanes would cause a visual impact, but UDOT believes that these impacts would be less than with either the gondola alternatives or the Cog Rail Alternative.
- **Cost.** The alternative has the second-lowest construction cost.

Overall, UDOT believes that the Enhanced Bus Service in Peak-period Shoulder Lane Alternative best meets the project purpose of improving **mobility** by providing the best overall and transit travel times at the second-lowest cost. The separate bus lane would make the bus service attractive to people in personal vehicles because the buses would pass them during congested conditions. Combined with a toll for personal vehicles, the visibly faster bus service would likely provide an incentive for people to switch from personal vehicles to the bus service. Another mobility advantage with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative is that it would reduce traffic on Wasatch Boulevard before this traffic enters the main residential portion of Cottonwood Heights, thereby improving mobility during busy ski periods for the residents. Bus users would use the mobility hub at the gravel pit north of the residential area, which would reduce traffic by about 250 vehicles during the peak morning hour.

The scalable service was also an important factor. UDOT could initially start with just the enhanced buses without the shoulder lanes and determine how the service operates, thereby delaying the cost of the peak-period shoulder lanes until they are needed. This delay would allow UDOT to adjust the bus service before making the large capital investment in the shoulder widening.

UDOT also considered the importance of the scenic value and watershed that Little Cottonwood Canyon provides. UDOT believes that the additional cuts into the canyon walls with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would cause less of a visual impact than the impacts from the gondola towers or the cog rail alignment. In addition, UDOT could further reduce visual impacts by providing walls to reduce the size of the cuts.

UDOT acknowledges that the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would add additional impervious roadway surface area, which would increase the amount of impervious surface in the Little Cottonwood Canyon watershed, an important drinking water supply for Salt Lake Valley residents. However, to reduce impacts, UDOT would improve the current stormwater system, implement best management practices to improve the quality of stormwater runoff, and place additional guardrails at key locations along S.R. 210 to keep vehicles from entering Little Cottonwood Creek if they depart the road. Water quality modeling showed that this alternative would have *de minimis* impacts to the water quality of Little Cottonwood Creek.

The Enhanced Bus Service in Peak-period Shoulder Lane Alternative would also have the greatest impacts to Riparian Habitat Conservation Areas because Little Cottonwood Creek runs immediately adjacent to S.R. 210 in certain locations. UDOT would work with the USDA Forest Service to mitigate any impacts to the riparian resource. The alternative would also require removing two boulders used for climbing (Parking Lot West and Stick boulders) and require relocating three trails used to access climbing areas. UDOT would work with the USDA Forest Service on potentially relocating the boulders and would realign the trails to maintain connectivity. The Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be consistent with the current USDA Forest Service *Revised Forest Plan: Wasatch-Cache National Forest* (USDA Forest Service 2003).

2.6.9.1.2 Gondola Alternative B

Gondola Alternative B would provide the following benefits:

- **Travel Reliability.** The alternative would have a high travel reliability because it would be on a separate alignment from the road. Snow, vehicle slideoffs and accidents, and snow- and avalanche-removal operations would not affect the gondola service. If S.R. 210 were closed because of an avalanche or heavy snow, the gondola could still operate and be used as an alternate to personal vehicle use. With the Cog Rail Alternative, the cog rail service could be delayed if an avalanche flow covers the rail alignment, similar to that of the road being covered by an avalanche flow.
- **Transit Mode Travel Time.** The alternative would have a better transit mode travel time with transfers than Gondola Alternative A (4 to 8 minutes) and the same travel time as the Cog Rail Alternative. The advantage of Gondola Alternative B over Gondola Alternative A is that the 1,500 parking spaces at the gondola base station at La Caille would reduce the need for an additional bus transfer and reduce the need for bus service to the base station and thus lower the operational and maintenance cost of this alternative by $2 million per year.

- **Delay Due to Snow Removal Operations.** The alternative would not delay or be delayed by UDOT's snow-removal operations. Both enhanced bus service alternatives could be delayed by snow-removal operations. For the Cog Rail Alternative, snow removed from the cog rail tracks would need to be blown onto S.R. 210, which would require UDOT to spend additional time for snow removal. In addition, when snow is blown off the tracks, this would temporarily close S.R. 210. The snow-blowing operation could occur during the early morning before peak travel periods. If an avalanche flow covers the rail tracks, cog rail operations would be delayed until the avalanche flow is cleared.
- **Environment.** Of the five primary alternatives, Gondola Alternative B would have lower impacts to wildlife habitat compared to the Enhanced Bus Service in Peak-period Shoulder Lane Alternative and the Cog Rail Alternative. The alternative would have the second-fewest impacts to climbing resources in Little Cottonwood Canyon and would have low impacts to the watershed because the amount of impervious surfaces in Little Cottonwood Canyon would not increase. The alternative would also have the lowest impact to Riparian Habitat Conservation Areas.
- **Cost.** The alternative has the second-highest construction cost but the second-lowest winter operational cost.

Overall, UDOT believes that Gondola Alternative B best meets the project purpose of improving **reliability** because it can operate independently of S.R. 210 and avoid delays related snow removal, avalanche removal, and traffic. In addition, UDOT believes that having a 1,500-space parking structure at the gondola base station would make Gondola Alternative B an attractive option to using personal vehicles. During congested traffic times related to snow and avalanche removal, the visibly faster gondola service would likely provide an incentive for people to switch from personal vehicles to the gondola service. UDOT also recognized the concerns of the residents in Cottonwood Heights that the proposed 1,500-car parking structure at the gondola base station would reduce mobility on busy ski days on Wasatch Boulevard. However, based on the proposed improvements to both Wasatch Boulevard and North Little Cottonwood Road and the results of traffic modeling, UDOT determined that traffic going to the Gondola Alternative B base station would not cause congestion or traffic backups on Wasatch Boulevard.

In addition, UDOT considered the importance of the scenic value and watershed that Little Cottonwood Canyon provides. UDOT believes that Gondola Alternative B would have the highest visual impacts of the primary action alternatives; however, the alternative would have the second-lowest impacts to the watershed (after the Enhanced Bus Service Alternative) because no substantial amount of impervious surfaces would be added in the watershed, thus reducing the potential for increasing stormwater runoff.

UDOT believes that Gondola Alternative B would not provide an additional barrier to wildlife movement since no additional travel lanes or rail alignment would be added to S.R. 210. The alternative would not affect climbing boulders in Little Cottonwood Canyon.

2.6.9.2 Sub-alternatives Evaluation

2.6.9.2.1 S.R. 210 – Wasatch Boulevard Alternatives

This section identifies and provides UDOT's basis for identifying its preferred Wasatch Boulevard alternative. The final identification of a Wasatch Boulevard alternative will be made by UDOT in the Record of Decision for the S.R. 210 Project. UDOT identified the preferred Wasatch Boulevard alternative based on its transportation performance, cost, and impacts to the natural and human environment. As part of identifying

the preferred Wasatch Boulevard alternative, UDOT considered public and agency input during the scoping process and the alternatives development, screening, and refinement process. Note that there are strengths and weaknesses for each Wasatch Boulevard alternative. Neither of the Wasatch Boulevard alternatives had the best transportation performance, the lowest cost, and the fewest impacts to all resources.

Based on the evaluation, UDOT has identified the **Five-lane Alternative** as its preferred Wasatch Boulevard alternative for the Draft EIS. The Five-lane Alternative would provide better transportation performance, with all segments of Wasatch Boulevard operating at LOS B or better compared to the Imbalanced-lane Alternative providing LOS C or better. In addition, the Five-lane Alternative would have only one intersection operating at LOS D, whereas the Imbalanced-lane Alternative would have three. Also, the travel times for the Five-lane Alternative in the northbound direction in the morning peak period would be 13% shorter with the Five-lane Alternative. Therefore, the Five-lane Alternative would have a higher degree of meeting the project purpose of improving mobility on Wasatch Boulevard.

Although the cost would be slightly greater with the Five-lane Alternative compared to the Imbalanced-lane Alternative ($62 million versus $59 million), UDOT believes that the better transportation performance outweighs the higher cost. The environmental impacts of the alternatives would be similar, with the main difference being that about 17 more residential receptors would have noise impacts from the Five-lane Alternative compared to the Imbalanced-lane Alternative.

Some residents of Cottonwood Heights wanted UDOT to minimize the footprint of any Wasatch Boulevard alternative being considered. Residents felt that a wider road would harm the rural nature of the community, cause greater safety concerns with pedestrians wanting to cross the road, and further increase vehicle speeds. In making its decision, UDOT considered the concerns of the residents and therefore would implement a phased approach for the Five-lane Alternative.

With the phased approach, UDOT would first construct the Imbalanced-lane Alternative but would purchase the right of way to accommodate the Five-lane Alternative in the future. The extra right of way would be maintained as open space on the east side of the road between the travel lane and multi-use trail until the additional northbound lane is needed. UDOT would base the need for the additional northbound lane on when the level of service on the roadway and/or intersections reaches LOS E or greater. According to the current traffic analysis, this might not occur until after 2050.

2.6.9.2.2 Mobility Hubs Alternative

UDOT identified two mobility hubs that would be built with all of the primary alternatives: a mobility hub at the gravel pit and a mobility hub at 9400 South and Highland Drive. No other locations were identified that would meet the project objectives. All of the primary alternatives require building both the gravel pit and 9400 South and Highland Drive mobility hubs in order to meet the project objectives. Therefore, both mobility hubs will be included as part of the Preferred Alternative.

2.6.9.2.3 Avalanche Mitigation Alternatives

This section identifies and provides UDOT's basis for identifying its preferred avalanche mitigation alternative. The final selection of an avalanche mitigation alternative will be made by UDOT in the Record of Decision for the S.R. 210 Project. UDOT identified the preferred avalanche mitigation alternative based on its transportation performance, cost, and impacts to the natural and human environment. As part of

identifying the preferred avalanche mitigation alternative, UDOT considered public and agency input during the scoping process and the alternatives development, screening, and refinement process. Note that there are strengths and weaknesses for each avalanche mitigation alternative.

Based on the evaluation, UDOT has identified the **Snow Sheds with Realigned Road Alternative** as its preferred avalanche mitigation alternative. The decision was based primarily on visual impacts. Both avalanche mitigation alternatives would equally meet the project purpose of improving safety and reliability by substantially decreasing the amount of time when S.R. 210 is closed for avalanche mitigation and by reducing the avalanche risk to roadway users. The environmental impacts of the two avalanche mitigation alternatives would be similar, with the main difference being that the Snow Sheds with Berms Alternative would have a greater visual impact because the berms would extend 300 feet up the mountainside at a height of up to 20 feet. In addition, the impacts to Riparian Habitat Conservation Areas would be 0.14 acre with the Snow Sheds with Realigned Road Alternative compared to 0.23 acre with the Snow Sheds with Berms Alternative.

Both alternatives would have the same greater–than–*de minimis* impact to a Section 4(f) resource (archaeological site 42SL419). However, as part of the least overall harm analysis, it was determined that the Snow Sheds with Realigned Road Alternative would have the least harm because the alternative would have less visual impact and impacts to Riparian Habitat Conservation Areas.

In its evaluation, UDOT did consider that the Snow Sheds with Realigned Road Alternative would cost about $14 million more than the Snow Sheds with Berms Alternative ($86 million versus $72 million); however, UDOT believes that the lesser visual impacts outweigh the greater cost.

2.6.9.2.4 Trailhead Parking Alternatives

This section identifies and provides UDOT's basis for identifying its preferred trailhead parking alternative. The final selection of a trailhead parking alternative will be made by UDOT in the Record of Decision for the S.R. 210 Project. UDOT identified the preferred trailhead parking alternative based on its transportation performance, cost, and impacts to the natural and human environment. As part of identifying the preferred trailhead parking alternative, UDOT considered public and agency input during the scoping process and the alternatives development, screening, and refinement process. Note that there are strengths and weaknesses for each trailhead parking alternative.

Based on the evaluation, UDOT has identified the **Trailhead Improvements and No Roadside Parking within ¼ Mile Alternative** as its preferred trailhead parking alternative. UDOT made this decision primarily because UDOT did not want to substantially reduce recreation access in areas that are currently used by recreationists and do not have designated parking areas. With the trailhead improvements, UDOT would add parking at the Bridge, Lisa Falls, and White Pine Trailheads equivalent to the number of spaces eliminated in the proposed no-parking areas ¼ mile on either side of the trailheads and would maintain the existing roadside parking outside the ¼ mile. Overall, this alternative would reduce parking in Little Cottonwood Canyon by 17 spaces, from 528 to 511.

All three trailhead alternatives would address the project need to reduce or eliminate traffic conflicts among roadside parked vehicles, cyclists and pedestrians, and vehicles moving in the S.R. 210 travel lanes. The Trailhead Improvements and No Roadside Parking in Little Cottonwood Canyon Alternative and the No Trailhead Improvements and No Roadside Parking Alternative would reduce these conflicts to a greater degree, but they would also eliminate roadside recreation access except at designated trailheads from the

intersection of S.R. 209/S.R. 210 to Snowbird Entry 1. UDOT decided that maintaining some roadside recreation access outside the main trailheads was important to many recreational users in Little Cottonwood Canyon. UDOT also decided that was important to improve the access to the existing trailheads at the Lisa Falls and White Pine Trailheads since they do not meet safety standards for sight distance. The No Trailhead Improvements and No Roadside Parking Alternative would not improve these safety deficiencies.

Of the three trailhead parking alternatives evaluated, the No Trailhead Improvements and No Roadside Parking Alternative would not cause any additional environmental impacts since there would be no improvements to trailhead parking. The Trailhead Improvements and No Roadside Parking within ¼ Mile Alternative would result in 7 acres of impacts to wildlife habitat; 0.14 acre of impacts to intermittent, perennial, or ephemeral streams; and 0.6 acre of impact to Riparian Habitat Conservation Areas. However, in discussions with the USDA Forest Service, UDOT decided that reducing roadside vehicle parking conflicts within ¼ mile of either side of the trailheads, improving safety for vehicles accessing the trailheads, and providing trailheads that would allow the USDA Forest Service to better manage access (appropriate restrooms, reduction in "spider web" trailheads, and water treatment measures) at the existing trailheads outweighed the environmental impacts.

Cost was not a factor in UDOT's decision process regarding improving trailheads.

2.6.9.2.5 No Winter Parking Alternative

The No Winter Parking Alternative would eliminate some winter roadside parking (about 230 spaces) adjacent to the ski resorts. The objective of this alternative is to reduce or eliminate roadside parking to improve the safety and operational characteristics of S.R. 210. No construction is required to implement this alternative, so it would have no construction-related environmental impacts or cost.

Based on the evaluation, UDOT selected the **No Winter Parking Alternative** as part of the Preferred Alternative. UDOT based its decision on the fact that removing winter roadside parking would reduce friction between parked vehicles and vehicles in the travel lanes and therefore improve overall mobility. In addition, removing roadside parked vehicles would allow UDOT to improve winter snow-removal operations since snow plows would not need to navigate around parked vehicles, and it would also provide more areas for storing snow.

2.7 References

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