Memo

Date:	Monday, March 22, 2021
Project:	Little Cottonwood Canyon EIS
To:	UDOT
From:	HDR
Subject:	March 2021 New Rail Alignments from Stadler

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Introduction

On March 3, 2021, the Utah Department of Transportation (UDOT) met with Stadler Rail, the Central Wasatch Commission (CWC), and the Utah Transit Authority (UTA) to discuss differences in the cost estimates presented by Stadler and UDOT for the alignments. In the meeting, Stadler suggested new rail alignments that could reduce cost as well as an option to use hybrid rail cars (which could run on both batteries and overhead catenary). The purpose of this memorandum is to evaluate the new rail alignments and hybrid rail cars to determine whether they are reasonable to be considered in the Environmental Impact Statement (EIS). Following is a summary of the items considered in this memorandum.

- **South-side Alignment.** This alignment would operate on the south side of State Route (S.R.) 210 (the UDOT alternative is on the north side) from the cog rail base station at LaCaille to Snowbird Entry 3.
- **Snowbird Entry 3 and Bypass Road Alignment.** This alignment would enter the Snowbird Resort at Entry 3, pass in front of and have a station at the Cliff Lodge, and then use a single-track segment along the Bypass Road to access the Alta Resort at either the Wildcat parking lot or the Albion parking lot.
- **North-side Rail Alignment to Snowbird and Shuttle Bus to Alta Resort.** This alignment would follow UDOT's north-side alignment, but the cog rail tracks would stop at the Snowbird Resort. Skiers going on to the Alta Resort would need to transfer from the cog rail to a shuttle bus to Alta.
- **At-grade Crossing of S.R. 210 at LaCaille.** This alignment would be the mostly same as UDOT's north-side alignment. However, instead of using a structure to cross over S.R. 210 as proposed by UDOT, Stadler's option would use an at-grade crossing.
- **North-side Station at LaCaille** –This alignment would keep UDOT's north-side alignment. However, instead of using a structure to cross S.R. 210 as proposed by UDOT, the cog rail tracks would stop about 1,100 feet southeast of the parking structure,

requiring cog rail users to walk to the station from the parking structure and cross under S.R. 210 to access the cog rail base station.

- **Hybrid Rail Cars.** Initially, Stadler proposed using diesel-electric rail cars. At the March 3, 2021 meeting, Stadler suggested using hybrid rail cars that would use overhead catenary along segments of the alignment to charge the on-board batteries.

Evaluation

South-side Alignment

This alignment would operate on the south side of S.R. 210 (the UDOT alternative is on the north side) from the cog rail base station at LaCaille to Snowbird Entry 3. UDOT reviewed this alignment and found the following:

- **Section 4(f) Impacts.** The alignment would require removing one residence at 5002 Little Cottonwood Road. This residence was evaluated as a historic structure, making the property a Section 4(f) resource. A Section 4(f) use must be avoided unless there are no prudent or feasible alternatives to the use. UDOT's north-side alignment would avoid use of this Section 4(f) property and would have no other full Section 4(f) uses.

- **Rail Maintenance Yard.** The UDOT north-side alignment locates the rail maintenance yard at the existing Little Cottonwood Canyon park-and-ride lot. There are no locations for a rail maintenance yard on the south side, so a south-side alignment would require crossing S.R. 210 to access the proposed north-side maintenance yard. Because of the way the maintenance yard is oriented (paralleling S.R. 210), this option would require two at-grade crossings of S.R. 210 near the S.R. 209/S.R. 210 intersections. At-grade crossings at this location would be difficult because of the proximity to the intersection and potential for vehicle conflicts in this congested area.

- **Road Snow Removal.** UDOT uses primarily snow plows to remove most snow from S.R. 210. Snow plows heading up Little Cottonwood Canyon push snow to the right onto the south-side embankment and into the canyon ravine. Snow plows heading down the canyon push snow toward the canyon wall. After snow accumulates on the north side of the road, UDOT uses blowers and graders to remove snow from the north side (mountain side) of the road to the south side, and the snow is then pushed down the embankment (canyon ravine side). Snow is moved from the north side to the south side of S.R. 210 to prevent snow from building up on the north side, because this snow would eventually encroach onto the vehicle travel lanes. A south-side rail alignment would prevent UDOT from removing snow as is currently done and would eliminate snow storage areas, making winter snow-removal operations more difficult. In addition, if an avalanche flow hits S.R. 210, UDOT uses plows, front-end loaders, and blowers to remove the snow from the roadway and then pushes the snow onto the south side of the road. A south-side cog rail alignment could slow avalanche removal since more care would be needed to avoid damaging the cog rail tracks.

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Based on the impact to the Section 4(f) property, the lack of a location for a south-side maintenance yard, and impacts to UDOT's snow-removal operations, a south-side alignment was eliminated from further consideration.

Snowbird Entry 3 and Bypass Road Alignment

For this alignment, UDOT started with the alignment provided by Stadler and performed additional preliminary design for the track engineering to determine curve radii and resulting travel speeds. UDOT also prepared an approximate timetable (see attachment A) to determine whether the required 15-minute headways could be maintained through this segment of the cog rail system. Stadler proposed two options for the terminal station at Alta Ski Resort: one location just south of the Wildcat parking lot and a second location along S.R. 210 just before the Albion parking lot. These options would be mostly single track along the by-pass road to reduce impacts to homes. UDOT reviewed this alignment and found the following:

- **Impacts to Snowbird Resort.** The alignment would pass over the Snowbird summer-use alpine slide and the winter-use Chickadee ski run. The alpine slide could be placed under the rail alignment to allow continued use. However, the Chickadee ski run would be affected; either the Chickadee ski run would need to be removed from use or the ski lift would need to be raised higher over the rail alignment and the rail alignment placed on a structure over the ski run. This latter option might require a tall structure in order to pass above the accumulated snow on the ski run. The cog rail station would be placed in front of the Cliff Lodge between the lodge and Little Cottonwood Creek. Because of the limited space, the walkway in front of the lodge would no longer be usable, eliminating an important winter connection between parking along the Bypass Road and the main ski area.

- **Wetland and Riparian Habitat Conservation Area Impacts at the Wildcat Lot.** The alignment that would terminate at the Alta Wildcat parking lot would fill about 1 acre of identified wetland and a U.S. Department of Agriculture Forest Service–designated Riparian Habitat Conservation Area along Little Cottonwood Creek. The area is a part of the Little Cottonwood Creek riparian corridor and has extensive riparian vegetation. Both the Clean Water Act and the Forest Service's Riparian Habitat Conservation Area policy require avoiding impacts to this area if there are other reasonable alternatives. UDOT's north-side alignment would avoid impacts to this area. Finally, the alignment on the Bypass Road would likely require that Little Cottonwood Creek be placed in a culvert for about 220 feet just west of the bridge over the creek on the east end of the Bypass Road.

- **Impacts to the Alta Peruvian Lodge**. The Bypass Road alignment that ends at the Albion parking lot would go through the Peruvian Lodge parking lot which would result in the loss of about 20% of the parking. Guest parking is an important part of the lodge.

- **Section 4(f) Impacts.** The Bypass Road alignment that ends at the Albion parking lot would remove the entrance and main access to the Alta Lodge on the south side of

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S.R. 210. The Alta Lodge is a historic structure and are therefore a 4(f) property. The impact to the main entrance would likely be an adverse effect to the historic lodge and a Section 4(f) uses. A Section 4(f) use must be avoided unless there are no prudent or feasible alternatives to the use. UDOT's north-side alignment would avoid use of the Section 4(f) property and would have other full Section 4(f) uses.

The proposed alignment on the Bypass Road would include the Snowbird Resort rail station directly in front of the main Snowbird lodge. The station would block the ski in ski out access to the lodge which was one of the factors in the design of the Snowbird Resort historic complex as noted in a book by Margaret Smith – "*Kiley's major suggestion proved important: connect the base lodge and the tram building sited north of the creek to the mountain by a skier's bridge, which would extend the runout at the base of the very steep mountain*". Change to the ski in ski access could be an adverse effect to this 4(f) property. If this alignment were selected an additional evaluation would have to be conducted.

- **Timetable Scheduling.** The approximate timetable in Attachment A shows that the required 15-minute headways could not be maintained. For example, assuming a 5-minute load time (dwell time, which was recommended by UTA) at the Alta station and given the tight curves and slow speeds in this segment, the travel times between Alta to Snowbird are not fast enough to clear a train from this segment of single track. This is represented by the crossing lines within the timetable charts. This would require the Alta bound cog train that is waiting at the Snowbird station to wait an additional 1-2 minutes before disembarking for Alta. The wait time and any additional delays at the station would compound and affect the schedule making it difficult to maintain 15-minute headways.

- **At-grade Crossing of S.R. 210 at Snowbird Entry 3.** UDOT conducted an analysis of the traffic impacts of an at grade railing crossing from the north side of S.R. 210 into Snowbird Entry 3. With the cog rail 15 minute headways the rail crossing would occur 8 times per hour. In AM peak travel period traffic modeling indicated an uphill vehicle back up distance for vehicles waiting at the rail crossing of about 450 feet. This would not block access into Snowbird Entry 2. In the PM peak travel period the vehicle backup for downhill traffic would be about 650 feet as vehicles wait for the train to pass. This backup would not extend up to the Bypass Road.

Based on the rail line not being able to meet 15 minute headways, the impacts to the Section 4(f) properties, wetlands and associated riparian habitat, and the Riparian Habitat Conservation Area, the Snowbird Entry 3 and Bypass Road alignment was eliminated from further consideration.

North-side Rail Alignment to Snowbird and Shuttle Bus to Alta Resort

This alignment would follow the same north-side cog rail alignment as UDOT's alignment. However, the cog rail tracks would stop at the Snowbird Resort to avoid the need for snow

sheds past the Superior and Hellgate avalanche zone. Skiers going on to the Alta Resort would need to transfer from the cog rail system to a shuttle bus for the ride to the Alta Resort, a distance of about 1.2 miles, or 3 minutes 30 seconds of travel time at 25 miles per hour. Adding the transfer from the train to the bus, the total travel time would likely be about 7 to 8 minutes, which would be similar to the cog rail travel time from Snowbird to Alta. The shuttle buses would need to operate at headways to match the arrival of the trains (every 15 minutes). Assuming that up to 500 riders would go to Alta during the peak hour, about 12 bus trips would be needed (assuming a 42-person bus capacity). Assuming that 50% of the arriving passengers (about 125 people per train) are proceeding to Alta, and assuming that a train arrives every 15 minutes, about three buses would need to be available at the cog rail station for the trip to Alta. UDOT expects that a total of about six to eight buses would be needed for the operation of the shuttle service at a cost of about $3.5 million to $4.5 million.

The purpose of this alternative 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.

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 line 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 LaCaille parking (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 Snowbird would not be delayed by snow or traffic congestion.

At-grade Crossing of S.R. 210 at LaCaille

UDOT conducted an analysis of the traffic impacts of an at grade railing crossing from the eastside of S.R. 210 to the west side of S.R.210 to determine if a structure over S.R. 210 was warranted to mitigate traffic impacts. The at grade crossing was located as not to place the rail adjacent to the backyard of homes on the southside of S.R. 210 and avoid the area where Little Cottonwood Creek is immediately adjacent to S.R. 210. With the cog rail 15 minute headways the rail crossing would occur 8 times per hour. In AM peak travel period traffic modeling indicated an uphill vehicle back up distance for vehicles waiting at the rail crossing of about 1,000 feet. This would block access into the proposed LaCaille Station parking area and access into a residential area on the west side of S.R. 210. In the PM peak travel period the vehicle backup for downhill traffic would be about 350 feet as vehicles wait for the train to pass. This backup would not block any access points.

Because the AM traffic backup would block access into the LaCaille station up to 8 times per hour and block a residential access UDOT thought it was prudent to provide a grade separated structure at this location.

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North-side Station at LaCaille

To avoid a rail crossing of S.R. 210, this alignment would place the cog rail station at LaCaille on the east side of S.R. 210 about 1,100 feet from the parking garage. The purpose of this Stadler alternative is avoid building an approximately $33-million rail structure over North Little Cottonwood Road. The station on the east side of S.R. 210 would require users of the cog rail to walk about 1,100 feet from the parking structure to the cog rail station. Given that users would be carrying ski gear and some wearing ski boots, this could be an unpopular option. With the ski gear and ski boots and assuming a walking speed of 2 to 3 miles per hour, it would take 4 to 6 minutes to walk the 1,100-foot distance (in addition to the walk through the parking garage), which would factor into the total travel time. The additional travel time would make the cog rail have the longest overall travel time of any action alternative. Because of the inconvenience of requiring cog rail users walk about 1,100 feet with winter gear and some in ski boots (the walk would be difficult for families with small children) and the additional travel time UDOT did not move forward with a North-side station at LaCaille.

Hybrid Rail Cars

Initially, Stadler proposed using diesel-electric rail cars to avoid the need for overhead catenary and power substations, since these elements would need to be protected in large parts of Little Cottonwood Canyon from avalanches (these elements would require longer snow sheds and therefore more costly snow sheds than UDOT's alternative). At the March 3, 2021, meeting, Stadler suggested using hybrid rail cars that could operate on both on-board batteries and electricity from an overhead catenary. According to Stadler, the cost would be about $9 million more for the hybrid rail cars and about $4.6 million more for the overhead catenary (note that UDOT did not verify the catenary cost or check that it includes electrical substations). Stadler believes that the overhead catenary could be placed outside the avalanche zones, and that within the avalanche zones the cog rail vehicles could run on their batteries.

Because of the lower cost for and less visual impacts from diesel-electric rail cars, UDOT decided to continue to evaluate diesel-electric rail cars in the EIS. If the Cog Rail Alternative is selected as the preferred alternative, UDOT will further evaluate hybrid rail cars between the release of the Draft and Final EISs to determine whether hybrid rail cars are suitable for the project. If so, UDOT will revise the cost estimates to include this option.

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