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

Life Cycle Cost Analysis

Little Cottonwood Canyon Environmental Impact Statement Wasatch Boulevard to Alta

Lead agency:
Utah Department of Transportation

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1.0 Introduction

UDOT prepared a life cycle cost analysis (LCCA) for the alternatives presented in the *Draft Alternatives Development and Screening Report Addendum* (November 20, 2020) prepared for the Little Cottonwood Canyon Environmental Impact Statement (EIS). The purpose of this analysis was to compare alternatives based on a 30-year period considering estimates for both initial capital expenditures and annual operation and maintenance (O&M) costs.

The LCCA was updated for the Final EIS to account for refinements to Gondola Alternative B and the Cog Rail Alternative. UDOT increased the number of parking spaces at the gondola and cog rail base stations from 1,500 to 2,500. With these additional parking spaces, mobility hubs at the gravel pit and at 9400 South and Highland Drive are not needed. All users would drive directly to the base station and would not need to take a bus from a remote mobility hub to the gondola or cog rail base station.

Note that the original assumptions regarding the year of construction, inflation rates, and discount rates were not revised. A base year of 2020 was retained to match capital cost estimates prepared at that time. See Section 2.2, *Major Assumptions*, for the capital and operating LCCA inputs with these refined alternatives.

2.0 Analysis Approach

This LCCA is a simple economic model in that it does not include any revenues generated by the alternatives. The LCCA does not include any salvage value of assets or equipment (buses, light-rail vehicles, or trains, for example) or calculate the remaining service life of a fixed asset (roadway, snow shed, or rail track, for example) after the analysis period. The LCCA also does not quantify temporary user cost or the long-term benefits (travel time savings), nor does it consider environmental benefits or detriments and calculate the monetary value of these factors and the differences among the alternatives.

The LCCA applies cost estimates that were developed or refined for the *Draft Alternatives Development and Screening Report Addendum* (November 20, 2020) based on public comments on the *Draft Alternatives Development and Screening Report* (June 8, 2020) and the Draft EIS (June 2021). O&M costs have been updated since November 2020 based on ongoing coordination with the Utah Transit Authority (UTA) and other stakeholders. The general approach of the LCCA was to apply an inflationary factor to estimate the year-of-expenditure cost for both capital and winter-season O&M costs and then apply a discount rate to determine the present value of costs (in 2020 dollars) and sum those costs over a 30-year life cycle.

2.1 Alternatives Analyzed

The following are general descriptions of the alternatives analyzed in this LCCA.

- **Enhanced Bus Service Alternative.** The Enhanced Bus Service Alternative includes mobility hubs for about 2,500 cars split between the gravel pit mobility hub and 9400 South/Highland Drive mobility hub with point-to-point bus service to the Snowbird and Alta resorts. Considering the needed bus frequency, dwell time, and end-of-line time, about 65 buses would be needed for this alternative.
- **Enhanced Bus Service in Peak-period Shoulder Lane Alternative.** Same as the Enhanced Bus Service Alternative but with winter-bus-only, peak-period shoulder lanes from the North Little Cottonwood Road/Wasatch Boulevard intersection to the Alta Bypass Road. This alternative would require about 45 buses.
- **Gondola Alternative A (Starting at Canyon Entrance).** Gondola Alternative A is a gondola running from a base station at the entrance to Little Cottonwood Canyon to the Snowbird and Alta resorts. Gondola Alternative A includes mobility hubs for about 2,500 cars split between the gravel pit mobility hub and the 9400 South/Highland Drive mobility hub with bus service to the gondola base station. This alternative includes about 26 buses.
- **Gondola Alternative B (Starting at La Caille).** Gondola Alternative B is a gondola running from a base station located about 0.75 mile northwest of the entrance to Little Cottonwood Canyon to the Snowbird and Alta resorts. Gondola Alternative B includes a 2,500-space parking structure near the gondola base station at the La Caille property. Because all users would park at the base station, no buses or mobility hubs are required with this alternative.
- **Cog Rail Alternative.** The Cog Rail Alterative is a cog rail system (mountain rail or rack rail) from a cog rail base station near the entrance to Little Cottonwood Canyon at the La Caille property. The alignment would be side-running along the north side of State Route (S.R.) 210 in Little Cottonwood Canyon. The Utah Department of Transportation (UDOT) assumes that diesel-powered cog rail vehicles would be used. The Cog Rail Alternative includes a 2,500-space parking structure near the cog rail base station at La Caille. Because all users would park at the base station, no buses or mobility hubs are required with this alternative.

2.2 Major Assumptions

The following are the major assumptions used in the LCCA.

- **Construction.** Year 2023 was assumed as the first year of construction, and construction costs are assumed to occur over 2 years, in 2023 and 2024. Construction costs include materials, equipment, construction labor, project management, engineering, permitting, and construction management.
- **30-year Life Cycle Cost.** Assuming a start of construction in 2023, year 2053 was used as the end date to capture a 30-year life cycle.
- **Inflation Rate.** Cost estimates are based on 2020 dollars (2020$). A 1.98% annual inflation rate[1] was used to estimate the year-of-expenditure cost.

[1] ENR Construction Index, calendar year 2019.

- **Discount Rate.** A 2.40% nominal discount rate[2] was used to determine the present value (2020$) for year-of-expenditure costs.
- **Days of Operation.** All alternatives assume 140 days of winter operation. UTA currently operates buses about 140 days per winter season.
- **Bus Operations.**
  - 14-year bus service life. Purchase all new buses 14 years after initial purchase at $530k per bus (2020$).
  - Alternatives include a bus maintenance facility sized for the number of buses needed for each alternative.
  - O&M costs for buses include a mid-life bus transmission overhaul ($50k per bus[3]). UDOT annualized this cost by taking the total number of buses and dividing by 7 years to determine an average annual number of buses that would receive an overhaul with each alternative.
  - Operating costs were provided by UTA.[4]
  - Includes snow sheds for three higher-risk avalanche paths in the mid-canyon segment of Little Cottonwood Canyon.[5]
  - The Enhanced Bus Service in Peak-period Shoulder Lane Alternative includes an additional annual cost to remove snow ($250k annually) and to repave the peak-period shoulder lanes every 8 years in the canyon ($4M per repave).
- **Gondola Alternatives.**
  - The winter O&M cost includes labor, energy cost, and an annual reserve (about $600k) for replacing major equipment (cables, cabins, and drive motors).
  - Includes road snow sheds in the three mid-canyon avalanche paths to reduce the use of artillery and reduce gondola closure times.
  - Gondola Alternative A includes bus service from remote mobility hubs (1,500 spaces at a gravel pit mobility hub and 1,000 spaces at a 9400 South and Highland Drive mobility hub). UTA estimated that 26 buses would be needed for Gondola Alternative A.
  - Gondola Alternative B would include 2,500 parking spaces at the gondola base station and no auxiliary bus service from remote mobility hubs.

[2] White House Office of Management and Budget, OMB Circular No. A-94, December 2019.
[3] Communication with UTA, January 25, 2021.
[4] Communication with UTA, April 22, 2021.
[5] White Pine Chutes 1–4, White Pine, and Little Pine.

- **Cog Rail Alternative.**
  - Includes a stand-alone operations and maintenance facility at the reconfigured park-and-ride lot at the entrance to Little Cottonwood Canyon.
  - Includes snow sheds over the tracks and the existing roadway in three mid-canyon avalanche paths. Includes rail-only snow sheds in four of the higher-risk avalanche paths in the upper-canyon segment.[6]
  - Cog rail vehicles would receive a major overhaul after 20 years of service at a cost of one-third of the rail vehicle initial capital cost. This overhaul is recommended to extend the vehicle life to about 40 years total.
  - Operating cost estimate is for winter service only and is based on the cost per revenue-mile for UTA's light-rail fleet.[7] Diesel-powered light-rail vehicles could be different.
  - UDOT assumed 15-minute headways during the peak hours and 30-minute headways during off-peak times. Each cog rail train would have three cars. There would be a total of eight train sets based on coordination with UTA.
  - UDOT added $3M for snow removal equipment purchases. The annual O&M includes an allocation of $600k annually for snow removal.

The LCCA excludes Wasatch Boulevard improvements, noise walls, and tolling infrastructure, which are common to all five alternatives.

[6] East Hellgate, Superior, Little Superior, and Hilton.

[7] UTA's Comprehensive Annual Financial Report 2019, June 2, 2020.

3.0 Results

The estimated initial capital costs used in the LCCA for the five alternatives are presented in Table 1.

Table 1. Initial Capital Costs (2020$)

Alternative	Estimated Initial Capital Cost ($M)[a]	Rank (least to highest cost)
Enhanced Bus Service Alternative	$274	1
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	$433	2
Gondola Alternative A (Starting at Canyon Entrance)	$486	4
Gondola Alternative B (Starting at La Caille)	$483	3
Cog Rail Alternative	$997	5

[a] Excludes costs for Wasatch Boulevard, noise walls, and tolling infrastructure, which are common to all five alternatives.

As mentioned in Section 2.2, *Major Assumptions*, 2023 and 2024 were assumed as the years of construction,[8] and operating costs start in 2025. In Figure 1 below, the slope of the lines after 2025 represents the relative difference in O&M costs among the alternatives. The approximate initial, winter-season O&M costs for each alternative are as follows:

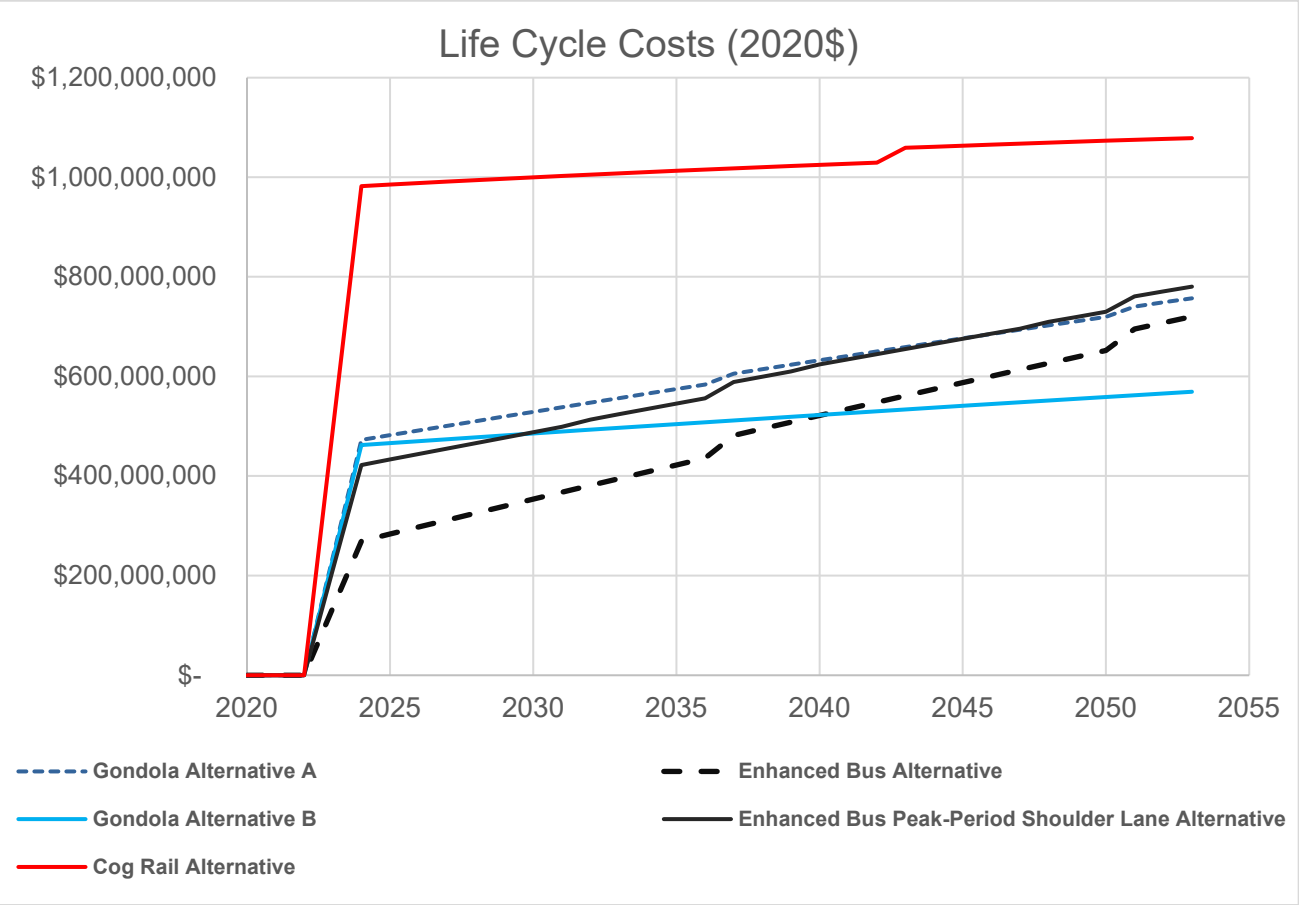
- Enhanced Bus Service Alternative – $14.0M
- Enhanced Bus Service in Peak-period Shoulder Lane Alternative – $11.0M
- Gondola Alternative A (Starting at Canyon Entrance) – $9.5M
- Gondola Alternative B (Starting at La Caille) – $4.0M
- Cog Rail Alternative (Starting at La Caille) – $3.4M

Figure 1 below presents cumulative cost curves for discounted (2020$) year-of-expenditure costs for the five alternatives analyzed in this LCCA. The LCCA inputs and year-of-expenditure cost for each alternative are provided in Attachment A, Life Cycle Cost Inputs and Assumptions.

The Cog Rail Alternative has a higher initial capital cost (about $997M) compared to the other alternatives. The annual O&M cost for the Cog Rail Alternative (about $3.4M annually) is less than the O&M costs for the alternatives that use buses ($9.5M to $14.0M annually) and lower than Gondola Alternative B ($4.0M annually), resulting in a flatter cumulative cost curve between 2025 and 2053. However, the annual O&M cost savings for the Cog Rail Alternative over a 30-year period is not adequate to compensate for the much higher initial capital investment.

[8] Half of initial capital costs were applied in 2023 and half in 2024.

Figure 1. Life Cycle Cost, All Alternatives



For the enhanced bus service alternatives and Gondola Alternative A, the bump or uptick in years 2037 and 2051 is due to new bus purchases. For the Cog Rail Alternative, the uptick in 2043 captures the major cog rail vehicle overhaul (assumed to be one-third of the initial capital cost), which is needed to extend the life of cog rail vehicles to 40 years or more.

Table 2 below presents the present value of the 30-year life cycle cost for each alternative. These values are the cumulative costs in 2053 from Figure 1. Table 2 also presents the ranking (least cost to highest cost) of the alternatives based on the present value of the estimated 30-year costs. In addition, Table 2 presents the initial capital cost ranking for comparison.

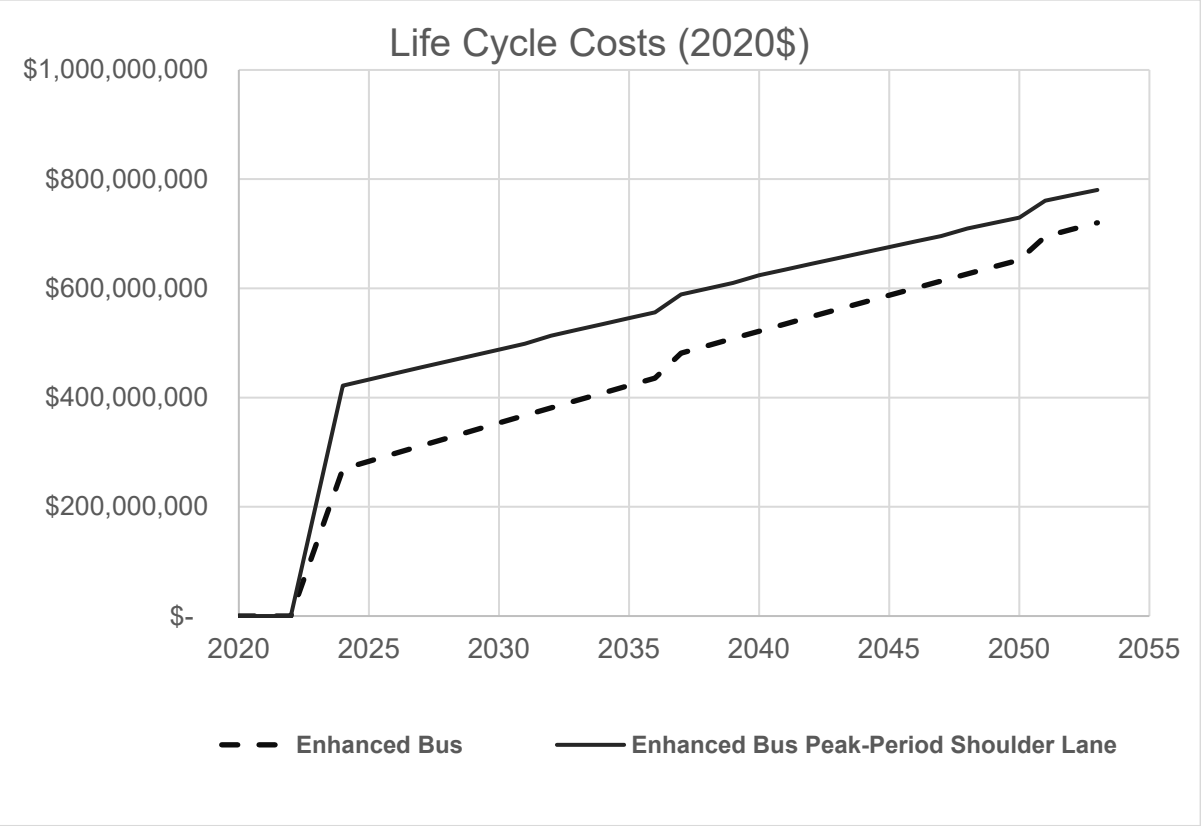
Table 2. 30-year Life Cycle Costs (2020$)

Alternative	Present Value, 30-year Costs ($M)	Present Value Rank (least to highest cost)	Initial Capital Cost Rank (least to highest cost)
Gondola Alternative B (Starting at La Caille)	$569	1	3
Enhanced Bus Service Alternative	$720	2	1
Gondola Alternative A (Starting at Canyon Entrance)	$757	3	4
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	$780	4	2
Cog Rail Alternative	$1,079	5	5

3.1 Results for the Enhanced Bus Service Alternatives

Figure 2 presents the cumulative cost curves for the enhanced bus service alternatives.

Figure 2. Life Cycle Cost, Enhanced Bus Service Alternatives



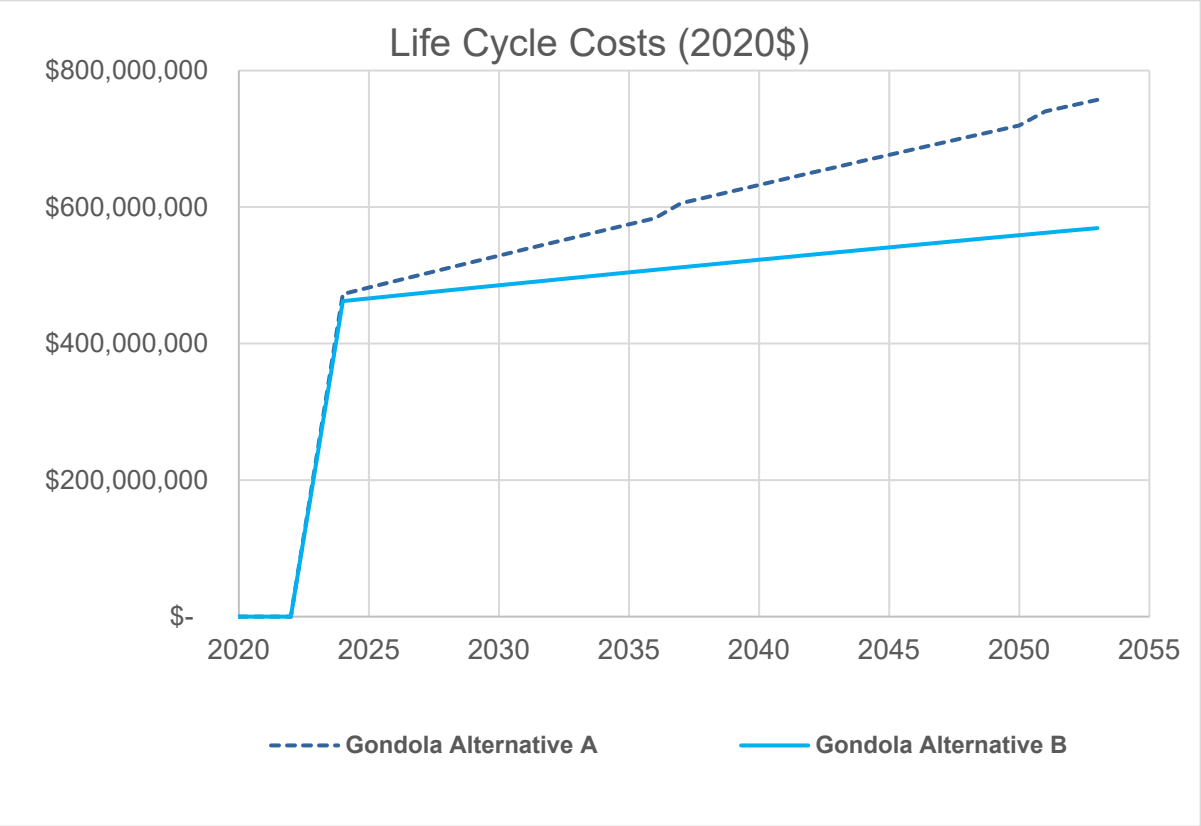
The cost of constructing the peak-period shoulder lanes ($183M) is the primary reason for the higher capital cost of the Enhanced Bus Service in Peak-period Shoulder Lane Alternative ($433M total) compared to the Enhanced Bus Service Alternative ($274M total). However, because of faster travel times, the Enhanced Bus Service in Peak-period Shoulder Lane Alternative requires fewer buses (45 buses at about $23.8M

total) than does the Enhanced Bus Service Alternative (65 buses at about $34.5M total). Fewer buses also result in a lower annual O&M cost for the Enhanced Bus Service in Peak-period Shoulder Lane Alternative ($11M) compared to the Enhanced Bus Service Alternative ($14M). Therefore, the gap in cumulative cost curves between these alternatives narrows over time. However, the 30-year life cycle cost for the Enhanced Bus Service Alternative ($720M) is still about $60M lower than the life cycle cost for the Enhanced Bus Service in Peak-period Shoulder Lane Alternative ($780M).

3.2 Results for the Gondola Alternatives

Figure 3 presents the cumulative cost curves for the gondola alternatives.

Figure 3. Life Cycle Cost, Gondola Alternatives

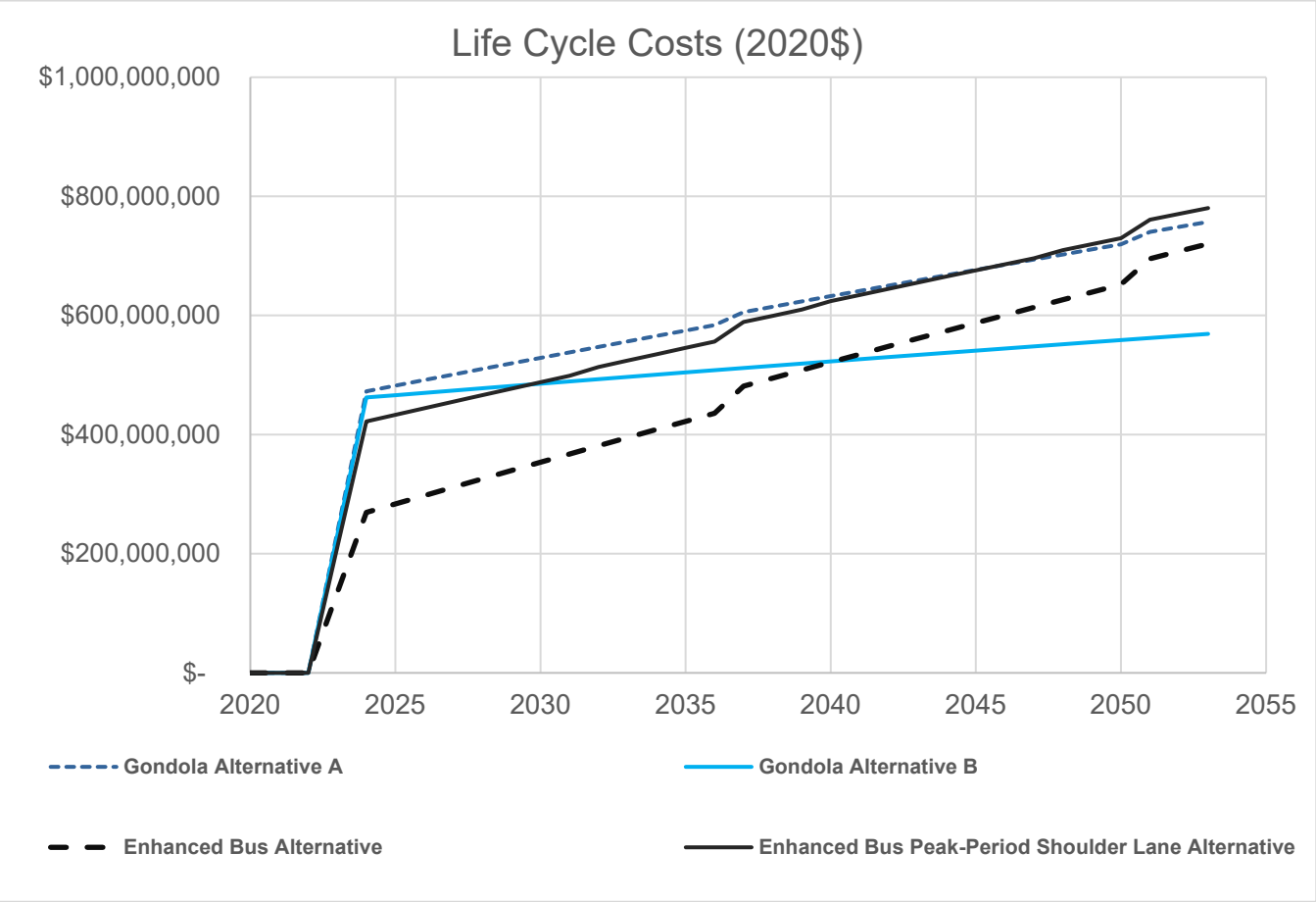


Gondola Alternative A would have a slightly higher initial capital cost ($486M) compared to Gondola Alternative B ($483M). Gondola Alternative B would be a longer gondola alignment and would require additional improvements to S.R. 210 near the gondola base station to facilitate personal vehicle access to the parking at the base station. However, because all gondola riders could park at the base station with Gondola Alternative B, no buses would be needed compared to Gondola Alternative A (26 buses). Therefore, the annual O&M costs for Gondola Alternative B ($3.4M) would be about $6.1M lower than for Gondola Alternative A ($9.5M). After 30 years of operation, the life cycle cost of Gondola Alternative B ($569M) would be about $188M less than that of Gondola Alternative A ($757M).

3.3 Comparison among Enhanced Bus Service and Gondola Alternatives

The 30-year life cycle costs for the enhanced bus service and gondola alternatives are more similar relative to the Cog Rail Alternative. Figure 4 provides the LCCA results for the enhanced bus service and gondola alternatives.

Figure 4. Life Cycle Costs, Enhanced Bus Service and Gondola Alternatives



The following are some comparisons between the bus and gondola alternatives.

- With the higher O&M costs of the bus alternatives (about $11M to $14M annually) compared to the gondola alternatives ($4.0M to $9.5M annually), over time, the cumulative costs of the bus alternatives are closing the initial difference in the cumulative cost curves, which would get established in 2024 by the gondola alternatives' higher initial capital and construction costs.
- Gondola Alternative B has the lowest 30-year life cycle cost of about $569M. This is primarily because no bus purchases and no annual bus O&M cost would be needed with this alternative. The cumulative cost curve for Gondola Alternative B crosses and becomes less than for the Enhanced Bus Service Alternative in about 2040.
- The Enhanced Bus Service Alternative, which has the lowest estimated initial capital cost ($274M), becomes the second-ranked (second-lowest) alternative based on cumulative costs ($720M) over the 30-year life cycle. The Enhanced Bus Service Alternative would be about $151M more than the first- ranked (lowest) cumulative cost alternative, Gondola Alternative B ($569M).
- In about 2030, after about 6 years of operation, the cumulative costs of the Enhanced Bus Service in Peak-period Shoulder Lane Alternative become about the same as those for Gondola Alternative B ($489M in 2030). The higher O&M costs of the Enhanced Bus Service in Peak-period Shoulder Lane Alternative overcome the cumulative costs of Gondola Alternative B, which has a higher initial capital cost but a lower estimated annual O&M cost.
- Gondola Alternative A ($486M initial capital cost) has a $53M higher estimated capital cost than the Enhanced Bus Service in Peak-period Shoulder Lane Alternative ($433M initial cost). With a higher estimated O&M costs of the Enhanced Bus Service in Peak-period Shoulder Lane Alternative ($11M annually), the cumulative costs of the Enhanced Bus Service in Peak-period Shoulder Lane Alternative exceeds the cumulative costs of Gondola Alternative A ($9.5M annually) in about 2048. Over 30 years, the cumulative cost to purchase and operate 45 buses with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative ($780M) slightly exceeds (+$23M, or +3.0%[9]) the cumulative costs of constructing and operating Gondola Alternative A ($757M) with its 26 buses.

The enhanced bus service alternatives and Gondola Alternative A require transit riders to transition from their personal vehicles to buses sooner (meaning that the transfer from personal vehicle to transit occurs at mobility hubs that are farther from the entrance to Little Cottonwood Canyon). With these alternatives, more buses would be needed, higher annual O&M costs would be required, and a higher estimated 30-year life cycle cost would result.

[9] The percent increase (3.0%) equals the cost difference ($23M) divided by the 30-year life cycle cost for Gondola Alternative A ($757M). The calculation is 23 ÷ 757 = 0.030, or 3.0%.

4.0 Disclaimer

This LCCA is a simplistic analysis performed to compare the capital versus operating cost differences between fundamentally different alternatives. The costs include many assumptions and uncertainties. Construction costs were based on planning-level design, and O&M costs were based on references that might not account for all aspects of operating the alternatives in the unique setting of Little Cottonwood Canyon. In addition, inflationary factors are dynamic, so year-of-expenditure costs should be expected to be different than what was estimated for this LCCA.

Attachment A. Life Cycle Cost Inputs and Assumptions

Life Cycle Cost Analysis

Assumptions and Inputs

Discount Rate	**2.40%**	Nominal Discount Rate, 2020. Ref. 1
Inflation Rate	**1.98%**	ENR Construction Index, 2019. Ref. 2

Base year 2020
14 year bus life, transmission overhual at about 7 years
40 year rail vehicle life with a major overhaul at 20 years.
Includes annual reserves for gondola equipment replacement
No revenues are included
No salvage value of the equipment
Excludes Wasatch Blvd improvements and tolling infra., which are the same for all alternatives

References:
1. https://www.whitehouse.gov/wp-content/uploads/2019/12/M-20-07.pdf
2. https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/econ/prices/

Cog Rail Alternative, Base (LaCaille) to Alta

	2020$	
Cog Rail Capital	$ 631,500,000	For rail infrastructure, cog rail vehicles, and an operations and maintenance facility (OMF)
North Little Cottonwood Road	$ 47,400,000	Road Improvements (N. LCR only, Acess Rd, no Wastach Blvd)
Trailheads	$ 12,400,000	Park and Ride reconfig. ($6.7M) and Trailhead parking ($5.7M) improvements
Parking Structure	$ 52,000,000	Parking structure ($52M)
Road + Rail Snowsheds	$ 250,000,000	Assumes the minimum length (2,465 ft mid-canyon + 3,645 ft upper-canyon) snowsheds
Maintenance Equipment	$ 3,000,000	Needed for snow removal from tracks
Rail Vehicles	$ 92,000,000	Rail vehicles; 8 train sets (3 vehicles each) @ $11.5M per set, 40 year life
Rail Vehicle Overhaul	$ 30,360,000	Major rail vehicle overhaul after 20 years service at 1/3 initial capital cost
Rail Operation & Maintenance	$ 2,800,000	Winter Service
Additional Snow Removal	$ 600,000	For staging snow removal from rail then road
Net Present Value	**$ 1,078,565,194**	YOE Cost Discounted to 2020

Year of Expenditure	Years	Capital	Operating and Maintenance	Net Present Value	Cumulative 2020$
2020	0	$ -	$ -	$ -	$ -
2021	1	$ -	$ -	$ -	$ -
2022	2	$ -	$ -	$ -	$ -
2023	3	$ 528,329,861	$ -	$ 492,045,526	$ 492,045,526
2024	4	$ 538,790,792	$ -	$ 490,027,371	$ 982,072,897
2025	5	$ -	$ 3,461,799	$ 3,074,695	$ 985,147,593
2026	6	$ -	$ 3,474,903	$ 3,013,998	$ 988,161,591
2027	7	$ -	$ 3,488,266	$ 2,954,676	$ 991,116,267
2028	8	$ -	$ 3,501,894	$ 2,896,699	$ 994,012,965
2029	9	$ -	$ 3,515,791	$ 2,840,033	$ 996,852,999
2030	10	$ -	$ 3,529,964	$ 2,784,650	$ 999,637,649
2031	11	$ -	$ 3,544,417	$ 2,730,520	$ 1,002,368,169
2032	12	$ -	$ 3,559,157	$ 2,677,612	$ 1,005,045,781
2033	13	$ -	$ 3,574,188	$ 2,625,899	$ 1,007,671,679
2034	14	$ -	$ 3,589,517	$ 2,575,352	$ 1,010,247,031
2035	15	$ -	$ 3,605,149	$ 2,525,945	$ 1,012,772,976
2036	16	$ -	$ 3,621,091	$ 2,477,651	$ 1,015,250,627
2037	17	$ -	$ 3,637,349	$ 2,430,444	$ 1,017,681,072
2038	18	$ -	$ 3,653,928	$ 2,384,299	$ 1,020,065,371
2039	19	$ -	$ 3,670,836	$ 2,339,192	$ 1,022,404,563
2040	20	$ -	$ 3,688,079	$ 2,295,097	$ 1,024,699,660
2041	21	$ -	$ 3,705,663	$ 2,251,992	$ 1,026,951,651
2042	22	$ -	$ 3,723,595	$ 2,209,853	$ 1,029,161,504
2043	23	$ 47,659,221	$ 3,741,882	$ 29,790,201	$ 1,058,951,705
2044	24	$ -	$ 3,760,531	$ 2,128,385	$ 1,061,080,091
2045	25	$ -	$ 3,779,550	$ 2,089,013	$ 1,063,169,104
2046	26	$ -	$ 3,798,945	$ 2,050,520	$ 1,065,219,624
2047	27	$ -	$ 3,818,724	$ 2,012,887	$ 1,067,232,511
2048	28	$ -	$ 3,838,895	$ 1,976,093	$ 1,069,208,604
2049	29	$ -	$ 3,859,465	$ 1,940,119	$ 1,071,148,723
2050	30	$ -	$ 3,880,442	$ 1,904,945	$ 1,073,053,668
2051	31	$ -	$ 3,901,835	$ 1,870,554	$ 1,074,924,222
2052	32	$ -	$ 3,923,651	$ 1,836,926	$ 1,076,761,149
2053	33	$ -	$ 3,945,899	$ 1,804,045	**$ 1,078,565,194**

Gondola Alternative Option A, base station at canyon entrance w/ remote mobility hubs

	2020$	
Gondola Capital	$ 253,000,000	Stations, towers, cabins.
Park & Ride and Trailhead	$ 12,360,000	Reconfigured parking
Initial Bus System Costs	$ 43,000,000	Includes initial bus purchase, maintenance faciliy, and transit priorty control equipment
Future Bus Purchases	$ 13,780,000	26 buses
Road Snow Sheds	$ 72,000,000	Snowsheds with berms (2,465 ft mid-canyon)
Mobility Hubs	$ 99,000,000	Includes parking ($52M), interchange ($32M) and land purchases ($15)
Gondola O&M	$ 3,984,000	Winter Service. Includes annual equipment replacement reserves
Bus O&M	$ 5,500,000	Winter Service
Bus Overhaul, annualized	$ 185,714	Mid-life Bus transmission overhaul (26 buses / 7 years = 3.7 buses overhauled per year at $50k per)
Net Present Value	**$ 757,006,509**	YOE Cost Discounted to 2020

Year of Expenditure	Years	Capital	Operating and Maintenance	Net Present Value	Cumulative 2020$
2020	0	$ -	$ -	$ -	$ -
2021	1	$ -	$ -	$ -	$ -
2022	2	$ -	$ -	$ -	$ -
2023	3	$ 254,200,745	$ -	$ 236,742,892	$ 236,742,892
2024	4	$ 259,233,920	$ -	$ 235,771,876	$ 472,514,769
2025	5	$ -	$ 10,665,683	$ 9,473,030	$ 481,987,798
2026	6	$ -	$ 10,876,864	$ 9,434,175	$ 491,421,974
2027	7	$ -	$ 11,092,226	$ 9,395,481	$ 500,817,454
2028	8	$ -	$ 11,311,852	$ 9,356,944	$ 510,174,399
2029	9	$ -	$ 11,535,826	$ 9,318,566	$ 519,492,965
2030	10	$ -	$ 11,764,236	$ 9,280,346	$ 528,773,311
2031	11	$ -	$ 11,997,168	$ 9,242,282	$ 538,015,593
2032	12	$ -	$ 12,234,712	$ 9,204,374	$ 547,219,966
2033	13	$ -	$ 12,476,959	$ 9,166,622	$ 556,386,588
2034	14	$ -	$ 12,724,003	$ 9,129,024	$ 565,515,612
2035	15	$ -	$ 12,975,938	$ 9,091,581	$ 574,607,193
2036	16	$ -	$ 13,232,861	$ 9,054,291	$ 583,661,484
2037	17	$ 19,231,110	$ 13,494,872	$ 21,867,212	$ 605,528,697
2038	18	$ -	$ 13,762,071	$ 8,980,170	$ 614,508,867
2039	19	$ -	$ 14,034,560	$ 8,943,337	$ 623,452,204
2040	20	$ -	$ 14,312,444	$ 8,906,656	$ 632,358,860
2041	21	$ -	$ 14,595,830	$ 8,870,124	$ 641,228,984
2042	22	$ -	$ 14,884,828	$ 8,833,743	$ 650,062,727
2043	23	$ -	$ 15,179,547	$ 8,797,511	$ 658,860,238
2044	24	$ -	$ 15,480,102	$ 8,761,427	$ 667,621,665
2045	25	$ -	$ 15,786,608	$ 8,725,492	$ 676,347,157
2046	26	$ -	$ 16,099,183	$ 8,689,704	$ 685,036,861
2047	27	$ -	$ 16,417,947	$ 8,654,062	$ 693,690,923
2048	28	$ -	$ 16,743,022	$ 8,618,567	$ 702,309,490
2049	29	$ -	$ 17,074,534	$ 8,583,218	$ 710,892,708
2050	30	$ -	$ 17,412,610	$ 8,548,013	$ 719,440,721
2051	31	$ 25,305,473	$ 17,757,380	$ 20,644,489	$ 740,085,210
2052	32	$ -	$ 18,108,976	$ 8,478,036	$ 748,563,246
2053	33	$ -	$ 18,467,533	$ 8,443,263	**$ 757,006,509**

Gondola Alternative Option B (LaCaille), parking at the base station

	2020$	
Gondola Capital, high range	$ 285,000,000	Stations, towers, cabins
N Little Cottonwood Rd Impr.	$ 47,400,000	Road improvements near base station
Park & Ride and Trailhead	$ 12,500,000	Paved traiheads
Initial Bus System Costs	$ -	Includes initial bus purchase, bus maintenance faciliy, and transit priorty control equipment
Future Bus Purchases	$ -	17 buses, 14 year replacement cycle
Road Snow Sheds	$ 72,000,000	Snowsheds with berms (2,465 ft mid-canyon)
Parking Structure	$ 52,000,000	Bas Godola Parking ($52M)
Gondola O&M	$ 3,984,000	Winter, includes annual equipment replacement reserves
Net Present Value	**$ 569,124,403**	YOE Cost Discounted to 2020

Year of Expenditure	Years	Capital	Operating and Maintenance	Net Present Value	Cumulative 2020$
2020	0	$ -	$ -	$ -	$ -
2021	1	$ -	$ -	$ -	$ -
2022	2	$ -	$ -	$ -	$ -
2023	3	$ 248,653,891	$ -	$ 231,576,982	$ 231,576,982
2024	4	$ 253,577,238	$ -	$ 230,627,155	$ 462,204,137
2025	5	$ -	$ 4,394,347	$ 3,902,964	$ 466,107,101
2026	6	$ -	$ 4,481,355	$ 3,886,956	$ 469,994,057
2027	7	$ -	$ 4,570,086	$ 3,871,014	$ 473,865,071
2028	8	$ -	$ 4,660,574	$ 3,855,136	$ 477,720,207
2029	9	$ -	$ 4,752,853	$ 3,839,324	$ 481,559,531
2030	10	$ -	$ 4,846,960	$ 3,823,577	$ 485,383,108
2031	11	$ -	$ 4,942,929	$ 3,807,894	$ 489,191,003
2032	12	$ -	$ 5,040,799	$ 3,792,276	$ 492,983,279
2033	13	$ -	$ 5,140,607	$ 3,776,722	$ 496,760,001
2034	14	$ -	$ 5,242,391	$ 3,761,231	$ 500,521,232
2035	15	$ -	$ 5,346,191	$ 3,745,804	$ 504,267,036
2036	16	$ -	$ 5,452,045	$ 3,730,441	$ 507,997,477
2037	17	$ -	$ 5,559,996	$ 3,715,140	$ 511,712,617
2038	18	$ -	$ 5,670,084	$ 3,699,902	$ 515,412,519
2039	19	$ -	$ 5,782,351	$ 3,684,727	$ 519,097,246
2040	20	$ -	$ 5,896,842	$ 3,669,614	$ 522,766,860
2041	21	$ -	$ 6,013,599	$ 3,654,563	$ 526,421,422
2042	22	$ -	$ 6,132,669	$ 3,639,573	$ 530,060,996
2043	23	$ -	$ 6,254,095	$ 3,624,645	$ 533,685,641
2044	24	$ -	$ 6,377,927	$ 3,609,778	$ 537,295,419
2045	25	$ -	$ 6,504,209	$ 3,594,973	$ 540,890,392
2046	26	$ -	$ 6,632,993	$ 3,580,228	$ 544,470,620
2047	27	$ -	$ 6,764,326	$ 3,565,543	$ 548,036,163
2048	28	$ -	$ 6,898,260	$ 3,550,919	$ 551,587,082
2049	29	$ -	$ 7,034,845	$ 3,536,355	$ 555,123,437
2050	30	$ -	$ 7,174,135	$ 3,521,850	$ 558,645,287
2051	31	$ -	$ 7,316,183	$ 3,507,405	$ 562,152,692
2052	32	$ -	$ 7,461,044	$ 3,493,019	$ 565,645,711
2053	33	$ -	$ 7,608,772	$ 3,478,692	**$ 569,124,403**

Enhanced Bus Service

	2020$	
Initial Bus System Costs	$ 96,000,000	Includes initial bus purchase, maintenance faciliy, and transit priorty control equipment
Future Bus Purchases	$ 34,450,000	65 buses at $530k per
Mobility Hubs	$ 99,000,000	Mobility Hub ($52M), Interchange ($32M), and ROW ($15M)
Trailhead parking	$ 5,800,000	Trailheads
Road Snow Sheds	$ 72,300,000	Snowsheds with berms (2,465 ft mid-canyon)
Bus O&M	$ 14,020,000	per UTA 4/22/21
Bus Overhaul, annualized	$ 464,286	Mid-life Bus transmission overhaul (65 buses / 7 years = 9.3 buses overhauled per year at $50k per)
Net Present Value	**$ 720,374,938**	YOE Cost Discounted to 2020

Year of Expenditure	Years	Capital	Operating and Maintenance	Net Present Value	Cumulative 2020$
2020	0	$ -	$ -	$ -	$ -
2021	1	$ -	$ -	$ -	$ -
2022	2	$ -	$ -	$ -	$ -
2023	3	$ 144,822,729	$ -	$ 134,876,677	$ 134,876,677
2024	4	$ 147,690,219	$ -	$ 134,323,472	$ 269,200,149
2025	5	$ -	$ 15,976,150	$ 14,189,671	$ 283,389,820
2026	6	$ -	$ 16,292,477	$ 14,131,472	$ 297,521,292
2027	7	$ -	$ 16,615,069	$ 14,073,510	$ 311,594,802
2028	8	$ -	$ 16,944,047	$ 14,015,787	$ 325,610,589
2029	9	$ -	$ 17,279,539	$ 13,958,300	$ 339,568,890
2030	10	$ -	$ 17,621,674	$ 13,901,050	$ 353,469,939
2031	11	$ -	$ 17,970,583	$ 13,844,034	$ 367,313,973
2032	12	$ -	$ 18,326,401	$ 13,787,251	$ 381,101,224
2033	13	$ -	$ 18,689,263	$ 13,730,702	$ 394,831,926
2034	14	$ -	$ 19,059,311	$ 13,674,385	$ 408,506,311
2035	15	$ -	$ 19,436,685	$ 13,618,298	$ 422,124,610
2036	16	$ -	$ 19,821,531	$ 13,562,442	$ 435,687,052
2037	17	$ 48,077,774	$ 20,213,998	$ 45,631,960	$ 481,319,012
2038	18	$ -	$ 20,614,235	$ 13,451,416	$ 494,770,427
2039	19	$ -	$ 21,022,397	$ 13,396,244	$ 508,166,672
2040	20	$ -	$ 21,438,640	$ 13,341,299	$ 521,507,970
2041	21	$ -	$ 21,863,125	$ 13,286,578	$ 534,794,548
2042	22	$ -	$ 22,296,015	$ 13,232,083	$ 548,026,631
2043	23	$ -	$ 22,737,476	$ 13,177,810	$ 561,204,442
2044	24	$ -	$ 23,187,678	$ 13,123,761	$ 574,328,202
2045	25	$ -	$ 23,646,794	$ 13,069,933	$ 587,398,135
2046	26	$ -	$ 24,115,001	$ 13,016,326	$ 600,414,461
2047	27	$ -	$ 24,592,478	$ 12,962,938	$ 613,377,400
2048	28	$ -	$ 25,079,409	$ 12,909,770	$ 626,287,170
2049	29	$ -	$ 25,575,981	$ 12,856,820	$ 639,143,990
2050	30	$ -	$ 26,082,386	$ 12,804,087	$ 651,948,077
2051	31	$ 63,263,682	$ 26,598,817	$ 43,080,411	$ 695,028,487
2052	32	$ -	$ 27,125,473	$ 12,699,269	$ 707,727,756
2053	33	$ -	$ 27,662,558	$ 12,647,182	**$ 720,374,938**

Enhanced Bus Service in Peak-Period Shoulder Lane

	2020$	
Peak-Period Shoulder	$ 183,000,000	LCC Roadway widening
Peak-Period Shoulder Repave	$ 4,000,000	Repaving shoulders every 8 years
Initial Bus System Costs	$ 68,000,000	Includes initial bus purchase, maintenance faciliy, and transit priorty control equipment
Future Bus Purchases	$ 23,850,000	45 buses, $530k per bus
Road Snow Sheds	$ 72,300,000	Snowsheds with berms
Mobility Hubs	$ 99,000,000	Mobility Hub ($52M), Interchange ($32M), and ROW ($15M)
Trailhead parking	$ 5,800,000	Trailheads
Bus O&M	$ 10,810,000	UTA 4/22/21
Bus Overhaul, annualized	$ 321,429	Mid-life Bus transmission overhaul (45 buses / 7 years = 6.4 buses overhauled per year at $50k per)
Additional Snow Removal	$ 200,000	Estimated to clear PPSL annually
Bus O&M	**$ 780,387,434**	YOE Cost Discounted to 2020

Year of Expenditure	Years	Capital	Operating and Maintenance	Net Present Value	Cumulative 2020$
2020	0	$ -	$ -	$ -	$ -
2021	1	$ -	$ -	$ -	$ -
2022	2	$ -	$ -	$ -	$ -
2023	3	$ 227,017,980	$ -	$ 211,426,970	$ 211,426,970
2024	4	$ 231,512,936	$ -	$ 210,559,789	$ 421,986,758
2025	5	$ -	$ 12,498,552	$ 11,100,944	$ 433,087,703
2026	6	$ -	$ 12,746,023	$ 11,055,413	$ 444,143,116
2027	7	$ -	$ 12,998,395	$ 11,010,069	$ 455,153,184
2028	8	$ -	$ 13,255,763	$ 10,964,910	$ 466,118,094
2029	9	$ -	$ 13,518,227	$ 10,919,937	$ 477,038,031
2030	10	$ -	$ 13,785,888	$ 10,875,148	$ 487,913,179
2031	11	$ -	$ 14,058,848	$ 10,830,543	$ 498,743,722
2032	12	$ 5,061,044	$ 14,337,214	$ 14,593,627	$ 513,337,349
2033	13	$ -	$ 14,621,090	$ 10,741,881	$ 524,079,229
2034	14	$ -	$ 14,910,588	$ 10,697,822	$ 534,777,052
2035	15	$ -	$ 15,205,818	$ 10,653,945	$ 545,430,996
2036	16	$ -	$ 15,506,893	$ 10,610,247	$ 556,041,243
2037	17	$ 33,284,613	$ 15,813,929	$ 32,807,213	$ 588,848,456
2038	18	$ -	$ 16,127,045	$ 10,523,388	$ 599,371,844
2039	19	$ -	$ 16,446,361	$ 10,480,226	$ 609,852,070
2040	20	$ 5,920,524	$ 16,771,999	$ 14,121,591	$ 623,973,661
2041	21	$ -	$ 17,104,084	$ 10,394,431	$ 634,368,092
2042	22	$ -	$ 17,442,745	$ 10,351,798	$ 644,719,890
2043	23	$ -	$ 17,788,111	$ 10,309,339	$ 655,029,230
2044	24	$ -	$ 18,140,316	$ 10,267,055	$ 665,296,285
2045	25	$ -	$ 18,499,494	$ 10,224,944	$ 675,521,229
2046	26	$ -	$ 18,865,784	$ 10,183,006	$ 685,704,235
2047	27	$ -	$ 19,239,327	$ 10,141,240	$ 695,845,474
2048	28	$ 6,925,964	$ 19,620,265	$ 13,664,824	$ 709,510,298
2049	29	$ -	$ 20,008,747	$ 10,058,220	$ 719,568,519
2050	30	$ -	$ 20,404,920	$ 10,016,966	$ 729,585,485
2051	31	$ 43,797,934	$ 20,808,937	$ 30,972,770	$ 760,558,255
2052	32	$ -	$ 21,220,954	$ 9,934,964	$ 770,493,219
2053	33	$ -	$ 21,641,129	$ 9,894,215	**$ 780,387,434**