

CHICAGO TRANSIT AUTHORITY
RED LINE EXTENSION
SOCIAL BENEFITS - SOCIAL COSTS ANALYSIS (2020 \$)

Year	Calendar Year	Capital Costs ¹ (Design/Const; 2020\$)	O&M Costs ²	Farm Crops Production Loss Costs ³	Ecological Acreage Loss (Project)	Ecological Value Per Acre	Ecological Land Loss Costs ⁴	Ecological Acreage Loss Induced Development	Ecological Value Per Acre	Ecological Land Loss Induced Development Costs ⁴	Chicago UZA Estimated Population	Chicago UZA Estimated AVMT-No Build	Per Capita VMT	Occupancy per Vehicle	AVMT Change ⁵	Proportion Auto Traffic	Auto AVMT Change	VMT Value	Auto VMT Benefits ⁵
0	2019	(\$40,400,000)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	8,982,430	68,833,929,745	7,663	1.67					
0	2020	(\$40,000,000)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,014,767	69,081,731,892	7,663	1.67					
0	2021	(\$40,000,000)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,047,220	69,330,426,127	7,663	1.67					
0	2022	(\$40,000,000)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,079,790	69,580,015,661	7,663	1.67					
1	2023	(\$40,000,000)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,112,477	69,830,503,717	7,663	1.67					
2	2024	(\$40,000,000)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,145,282	70,081,893,531	7,663	1.67					
3	2025	(\$560,791,322)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,178,205	70,334,188,347	7,663	1.67					
4	2026	(\$560,293,902)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,211,247	70,587,391,425	7,663	1.67					
5	2027	(\$559,796,923)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,244,407	70,841,506,035	7,663	1.67					
6	2028	(\$559,300,385)		\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,277,687	71,096,535,456	7,663	1.67					
7	2029	(\$558,804,288)	(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,311,087	71,352,482,984	7,663	1.67	-11,400,000	1.00	-11,400,000	(\$0.28)	\$3,242,160
8	2030		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,344,607	71,609,351,923	7,663	1.67	-11,682,759	1.00	-11,682,759	(\$0.28)	\$3,322,577
9	2031		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,378,247	71,867,145,590	7,663	1.67	-11,965,517	1.00	-11,965,517	(\$0.28)	\$3,402,993
10	2032		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,412,009	72,125,867,314	7,663	1.67	-12,248,276	1.00	-12,248,276	(\$0.28)	\$3,483,410
11	2033		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,445,892	72,385,520,436	7,663	1.67	-12,531,034	1.00	-12,531,034	(\$0.28)	\$3,563,826
12	2034		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,479,897	72,646,108,310	7,663	1.67	-12,813,793	1.00	-12,813,793	(\$0.28)	\$3,644,243
13	2035		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,514,025	72,907,634,300	7,663	1.67	-13,096,552	1.00	-13,096,552	(\$0.28)	\$3,724,659
14	2036		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,548,275	73,170,101,783	7,663	1.67	-13,379,310	1.00	-13,379,310	(\$0.28)	\$3,805,076
15	2037		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,582,649	73,433,514,149	7,663	1.67	-13,662,069	1.00	-13,662,069	(\$0.28)	\$3,885,492
16	2038		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,617,147	73,697,874,800	7,663	1.67	-13,944,828	1.00	-13,944,828	(\$0.28)	\$3,965,909
17	2039		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,651,768	73,963,187,150	7,663	1.67	-14,227,586	1.00	-14,227,586	(\$0.28)	\$4,046,326
18	2040		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,686,515	74,229,454,623	7,663	1.67	-14,510,345	1.00	-14,510,345	(\$0.28)	\$4,126,742
19	2041		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,721,386	74,496,680,660	7,663	1.67	-14,793,103	1.00	-14,793,103	(\$0.28)	\$4,207,159
20	2042		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,756,383	74,764,868,710	7,663	1.67	-15,075,862	1.00	-15,075,862	(\$0.28)	\$4,287,575
21	2043		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,791,506	75,034,022,238	7,663	1.67	-15,358,621	1.00	-15,358,621	(\$0.28)	\$4,367,992
22	2044		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,826,756	75,304,144,718	7,663	1.67	-15,641,379	1.00	-15,641,379	(\$0.28)	\$4,448,408
23	2045		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,862,132	75,575,239,639	7,663	1.67	-15,924,138	1.00	-15,924,138	(\$0.28)	\$4,528,825
24	2046		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,897,636	75,847,310,502	7,663	1.67	-16,206,897	1.00	-16,206,897	(\$0.28)	\$4,609,241
25	2047		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,933,267	76,120,360,819	7,663	1.67	-16,489,655	1.00	-16,489,655	(\$0.28)	\$4,689,658
26	2048		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	9,969,027	76,394,394,118	7,663	1.67	-16,772,414	1.00	-16,772,414	(\$0.28)	\$4,770,074
27	2049		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,004,915	76,669,413,937	7,663	1.67	-17,055,172	1.00	-17,055,172	(\$0.28)	\$4,850,491
28	2050		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,040,933	76,945,423,827	7,663	1.67	-17,337,931	1.00	-17,337,931	(\$0.28)	\$4,930,908
29	2051		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,077,080	77,222,427,353	7,663	1.67	-17,620,690	1.00	-17,620,690	(\$0.28)	\$5,011,324
30	2052		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,113,358	77,500,428,092	7,663	1.67	-17,903,448	1.00	-17,903,448	(\$0.28)	\$5,091,741
31	2053		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,149,766	77,779,429,633	7,663	1.67	-18,186,207	1.00	-18,186,207	(\$0.28)	\$5,172,157
32	2054		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,186,305	78,059,435,579	7,663	1.67	-18,468,966	1.00	-18,468,966	(\$0.28)	\$5,252,574
33	2055		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,222,976	78,340,449,547	7,663	1.67	-18,751,724	1.00	-18,751,724	(\$0.28)	\$5,332,990
34	2056		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,259,779	78,622,475,166	7,663	1.67	-19,034,483	1.00	-19,034,483	(\$0.28)	\$5,413,407
35	2057		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,296,714	78,905,516,076	7,663	1.67	-19,317,241	1.00	-19,317,241	(\$0.28)	\$5,493,823
36	2058		(\$32,700,000)	\$0	0	(\$4,373)	\$0	0	(\$2,916)	\$0	10,333,782	79,189,575,934	7,663	1.67	-19,600,000	1.00	-19,600,000	(\$0.28)	\$5,574,240
TOTALS		(\$3,039,386,821)	(\$981,000,000)	\$0			\$0					2,955,757,961,848			-465,000,000		-465,000,000		\$132,246,000
3% Discount		(\$2,653,606,198)	(\$536,772,496)	\$0			\$0												\$69,475,357
5% Discount		(\$2,433,270,097)	(\$375,106,920)	\$0			\$0												\$47,310,049
7% Discount		(\$2,237,747,186)	(\$270,385,447)	\$0			\$0												\$33,290,613

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Year	Calendar Year	Proportion Heavy Tk	Diesel Bus VMT Decrease	VTM Value	Diesel Bus VMT Benefits ⁵	Project Train Miles Traveled Increase	Average Cars per Train	Revenue Car Miles Increase	KiloWatt Hours per Revenue Train Car Mile	Project Train Annual Kilowatt Hours Increase	Annual Ridership ¹⁸	Auto Drivers & Passengers Potentially Convert to Riding Train	Assumed 20% Drivers Working 1/2 hr on train	Productivity Rate Per Hour	Increased Worker Productivity Benefits ^{9a}	Auto Noise Value (per VMT)	Auto Noise Benefits ⁶	Bus Noise Value (per VMT)	Bus Noise Benefits ⁶	Train Noise Value (per VMT)	Train Noise Costs ⁶	
0	2019																					
0	2020																					
0	2021																					
0	2022																					
1	2023																					
2	2024																					
3	2025																					
4	2026																					
5	2027																					
6	2028																					
7	2029	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	1,903,800	380,760	\$16.20	\$3,084,156	(\$0.050)	\$570,000	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
8	2030	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	1,951,021	390,204	\$16.20	\$3,160,654	(\$0.050)	\$584,138	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
9	2031	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	1,998,241	399,648	\$16.20	\$3,237,151	(\$0.050)	\$598,276	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
10	2032	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,045,462	409,092	\$16.20	\$3,313,649	(\$0.050)	\$612,414	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
11	2033	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,092,683	418,537	\$16.20	\$3,390,146	(\$0.050)	\$626,552	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
12	2034	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,139,903	427,981	\$16.20	\$3,466,644	(\$0.050)	\$640,690	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
13	2035	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,187,124	437,425	\$16.20	\$3,543,141	(\$0.050)	\$654,828	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
14	2036	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,234,345	446,869	\$16.20	\$3,619,639	(\$0.050)	\$668,966	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
15	2037	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,281,566	456,313	\$16.20	\$3,696,136	(\$0.050)	\$683,103	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
16	2038	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,328,786	465,757	\$16.20	\$3,772,634	(\$0.050)	\$697,241	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
17	2039	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,376,007	475,201	\$16.20	\$3,849,131	(\$0.050)	\$711,379	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
18	2040	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,423,228	484,646	\$16.20	\$3,925,629	(\$0.050)	\$725,517	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
19	2041	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,470,448	494,090	\$16.20	\$4,002,126	(\$0.050)	\$739,655	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
20	2042	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,517,669	503,534	\$16.20	\$4,078,624	(\$0.050)	\$753,793	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
21	2043	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,564,890	512,978	\$16.20	\$4,155,121	(\$0.050)	\$767,931	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
22	2044	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,612,110	522,422	\$16.20	\$4,231,619	(\$0.050)	\$782,069	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
23	2045	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,659,331	531,866	\$16.20	\$4,308,116	(\$0.050)	\$796,207	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
24	2046	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,706,552	541,310	\$16.20	\$4,384,614	(\$0.050)	\$810,345	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
25	2047	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,753,772	550,754	\$16.20	\$4,461,111	(\$0.050)	\$824,483	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
26	2048	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,800,993	560,199	\$16.20	\$4,537,609	(\$0.050)	\$838,621	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
27	2049	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,848,214	569,643	\$16.20	\$4,614,106	(\$0.050)	\$852,759	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
28	2050	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,895,434	579,087	\$16.20	\$4,690,604	(\$0.050)	\$866,897	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
29	2051	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,942,655	588,531	\$16.20	\$4,767,101	(\$0.050)	\$881,034	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
30	2052	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	2,989,876	597,975	\$16.20	\$4,843,599	(\$0.050)	\$895,172	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
31	2053	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	3,037,097	607,419	\$16.20	\$4,920,096	(\$0.050)	\$909,310	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
32	2054	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	3,084,317	616,863	\$16.20	\$4,996,594	(\$0.050)	\$923,448	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
33	2055	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	3,131,538	626,308	\$16.20	\$5,073,091	(\$0.050)	\$937,586	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
34	2056	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	3,178,759	635,752	\$16.20	\$5,149,589	(\$0.050)	\$951,724	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
35	2057	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	3,225,979	645,196	\$16.20	\$5,226,086	(\$0.050)	\$965,862	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
36	2058	1.00	-276,451	(\$12.64)	\$3,494,341	914,917	6.0	5,489,502	7.85	43,092,591	13,000,000	3,273,200	654,640	\$16.20	\$5,302,584	(\$0.050)	\$980,000	(\$0.055)	\$15,205	\$3.25	(\$2,973,480)	
TOTALS			-8,293,530		\$104,830,219	27,447,510		164,685,060			390,000,000				\$125,801,100		\$23,250,000		\$456,144		(\$89,204,408)	
3% Discount					\$57,359,815										\$66,089,532		\$12,214,374		\$249,588		(\$48,809,860)	
5% Discount					\$40,084,139										\$45,004,432		\$8,317,519		\$174,417		(\$34,109,267)	
7% Discount					\$28,893,543										\$31,668,223		\$5,852,780		\$125,723		(\$24,586,721)	

CHICAGO TRANSIT AUTHORITY
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Year	Calendar Year	CO ₂ Change (MT)	CO ₂ Value (per MT)	Undiscounted CO ₂ Value @ 3% Avg SCC	NPV CO ₂ Benefits @ 3% Avg SCC ⁷ [Undisc/(1.03 ^A)]	Auto/Light Truck NO _x Change per Mile (MT) or 0.083 grams * 0.000001	NO _x Change Auto/Light Truck (MT)	Bus NO _x Change per Mile (MT) or 2.396 grams * 0.000001	NO _x Change Bus (MT)	Train NO _x Change per Mile (MT) or 7.85KWh * 0.00000125	Proportion Electricity from Coal & Nat. Gas	NO _x Change Train (MT)	NO _x Value (per MT)	NO _x Benefits ⁸	Auto/Light Truck PM _{2.5} Change per Mile (MT) or 0.0085 grams * 0.000001	PM _{2.5} Change Auto/Light Truck (MT)	Bus PM _{2.5} Change per Mile (MT) or 0.041 grams * 0.000001	PM _{2.5} Change Bus (MT)	Train PM _{2.5} Change per Mile (MT) or 7.85KWh * 0.000000416	Proportion Electricity from Coal & Nat. Gas	PM _{2.5} Change Train (MT)	PM Value (per MT)	PM Benefit ⁹	
0	2019																							
0	2020																							
0	2021																							
0	2022																							
1	2023																							
2	2024																							
3	2025																							
4	2026																							
5	2027																							
6	2028																							
7	2029	-11,024	\$61.00	\$672,464	\$546,775	0.00000083	-0.95	0.000002396	-0.66	0.00000981	0.36	19.39	(\$48,200)	(\$857,145)	0.000000085	-0.10	0.0000000410	-0.01	0.0000003266	0.36	0.65	(\$854,000)	(\$458,701)	
8	2030	-11,024	\$62.00	\$683,488	\$539,552	0.00000083	-0.97	0.000002396	-0.66	0.00000981	0.34	18.21	(\$49,100)	(\$813,812)	0.000000085	-0.10	0.0000000410	-0.01	0.0000003266	0.34	0.61	(\$867,600)	(\$429,704)	
9	2031	-11,024	\$63.00	\$694,512	\$532,286	0.00000083	-0.99	0.000002396	-0.66	0.00000981	0.32	17.02	(\$49,100)	(\$754,473)	0.000000085	-0.10	0.0000000410	-0.01	0.0000003266	0.32	0.57	(\$867,600)	(\$393,402)	
10	2032	-11,024	\$64.00	\$705,536	\$524,985	0.00000083	-1.02	0.000002396	-0.66	0.00000981	0.29	15.84	(\$49,100)	(\$695,135)	0.000000085	-0.10	0.0000000410	-0.01	0.0000003266	0.29	0.53	(\$867,600)	(\$357,100)	
11	2033	-11,024	\$65.00	\$716,560	\$517,658	0.00000083	-1.04	0.000002396	-0.66	0.00000981	0.27	14.65	(\$49,100)	(\$635,797)	0.000000085	-0.11	0.0000000410	-0.01	0.0000003266	0.27	0.49	(\$867,600)	(\$320,798)	
12	2034	-11,024	\$66.00	\$727,584	\$510,313	0.00000083	-1.06	0.000002396	-0.66	0.00000981	0.25	13.47	(\$49,100)	(\$576,459)	0.000000085	-0.11	0.0000000410	-0.01	0.0000003266	0.25	0.45	(\$867,600)	(\$284,496)	
13	2035	-11,024	\$67.00	\$738,608	\$502,956	0.00000083	-1.09	0.000002396	-0.66	0.00000981	0.23	12.28	(\$49,100)	(\$517,121)	0.000000085	-0.11	0.0000000410	-0.01	0.0000003266	0.23	0.41	(\$867,600)	(\$248,194)	
14	2036	-11,024	\$69.00	\$760,656	\$502,883	0.00000083	-1.11	0.000002396	-0.66	0.00000981	0.21	11.10	(\$49,100)	(\$457,783)	0.000000085	-0.11	0.0000000410	-0.01	0.0000003266	0.21	0.37	(\$867,600)	(\$211,892)	
15	2037	-11,024	\$70.00	\$771,680	\$495,312	0.00000083	-1.13	0.000002396	-0.66	0.00000981	0.18	9.91	(\$49,100)	(\$398,445)	0.000000085	-0.12	0.0000000410	-0.01	0.0000003266	0.18	0.33	(\$867,600)	(\$175,590)	
16	2038	-11,024	\$71.00	\$782,704	\$487,755	0.00000083	-1.16	0.000002396	-0.66	0.00000981	0.16	8.73	(\$49,100)	(\$339,107)	0.000000085	-0.12	0.0000000410	-0.01	0.0000003266	0.16	0.29	(\$867,600)	(\$139,288)	
17	2039	-11,024	\$72.00	\$793,728	\$480,218	0.00000083	-1.18	0.000002396	-0.66	0.00000981	0.14	7.54	(\$49,100)	(\$279,769)	0.000000085	-0.12	0.0000000410	-0.01	0.0000003266	0.14	0.25	(\$867,600)	(\$102,986)	
18	2040	-11,024	\$73.00	\$804,752	\$472,707	0.00000083	-1.20	0.000002396	-0.66	0.00000981	0.12	6.36	(\$49,100)	(\$220,431)	0.000000085	-0.12	0.0000000410	-0.01	0.0000003266	0.12	0.21	(\$867,600)	(\$66,684)	
19	2041	-11,024	\$74.00	\$815,776	\$465,226	0.00000083	-1.23	0.000002396	-0.66	0.00000981	0.10	5.17	(\$49,100)	(\$161,093)	0.000000085	-0.13	0.0000000410	-0.01	0.0000003266	0.10	0.17	(\$867,600)	(\$30,382)	
20	2042	-11,024	\$75.00	\$826,800	\$457,779	0.00000083	-1.25	0.000002396	-0.66	0.00000981	0.07	3.99	(\$49,100)	(\$101,754)	0.000000085	-0.13	0.0000000410	-0.01	0.0000003266	0.07	0.13	(\$867,600)	\$5,920	
21	2043	-11,024	\$77.00	\$848,848	\$456,298	0.00000083	-1.27	0.000002396	-0.66	0.00000981	0.05	2.80	(\$49,100)	(\$42,416)	0.000000085	-0.13	0.0000000410	-0.01	0.0000003266	0.05	0.09	(\$867,600)	\$42,222	
22	2044	-11,024	\$78.00	\$859,872	\$448,761	0.00000083	-1.30	0.000002396	-0.66	0.00000981	0.03	1.62	(\$49,100)	\$16,922	0.000000085	-0.13	0.0000000410	-0.01	0.0000003266	0.03	0.05	(\$867,600)	\$78,524	
23	2045	-11,024	\$79.00	\$870,896	\$441,276	0.00000083	-1.32	0.000002396	-0.66	0.00000981	0.01	0.43	(\$49,100)	\$76,260	0.000000085	-0.14	0.0000000410	-0.01	0.0000003266	0.01	0.01	(\$867,600)	\$114,826	
24	2046	-11,024	\$80.00	\$881,920	\$433,846	0.00000083	-1.35	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$98,571	0.000000085	-0.14	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$129,353	
25	2047	-11,024	\$81.00	\$892,944	\$426,475	0.00000083	-1.37	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$99,723	0.000000085	-0.14	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$131,438	
26	2048	-11,024	\$82.00	\$903,968	\$419,165	0.00000083	-1.39	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$100,875	0.000000085	-0.14	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$133,524	
27	2049	-11,024	\$83.00	\$914,992	\$411,919	0.00000083	-1.42	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$102,028	0.000000085	-0.14	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$135,609	
28	2050	-11,024	\$85.00	\$937,040	\$409,558	0.00000083	-1.44	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$103,180	0.000000085	-0.15	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$137,694	
29	2051	-11,024	\$86.00	\$948,064	\$402,308	0.00000083	-1.46	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$104,332	0.000000085	-0.15	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$139,779	
30	2052	-11,024	\$87.00	\$959,088	\$395,132	0.00000083	-1.49	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$105,485	0.000000085	-0.15	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$141,865	
31	2053	-11,024	\$88.00	\$970,112	\$388,032	0.00000083	-1.51	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$106,637	0.000000085	-0.15	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$143,950	
32	2054	-11,024	\$89.00	\$981,136	\$381,011	0.00000083	-1.53	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$107,789	0.000000085	-0.16	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$146,035	
33	2055	-11,024	\$90.00	\$992,160	\$374,070	0.00000083	-1.56	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$108,942	0.000000085	-0.16	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$148,120	
34	2056	-11,024	\$92.00	\$1,014,208	\$371,246	0.00000083	-1.58	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$110,094	0.000000085	-0.16	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$150,206	
35	2057	-11,024	\$93.00	\$1,025,232	\$364,350	0.00000083	-1.60	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$111,246	0.000000085	-0.16	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$152,291	
36	2058	-11,024	\$94.00	\$1,036,256	\$357,542	0.00000083	-1.63	0.000002396	-0.66	0.00000981	0.00	0.00	(\$49,100)	\$112,399	0.000000085	-0.17	0.0000000410	-0.01	0.0000003266	0.00	0.00	(\$867,600)	\$154,376	
TOTALS		-330,720			\$13,517,395		-39		-20			168.49		(\$5,386,259)		-3.95		-0.34			5.61		(\$1,133,485)	
3% Discount					\$13,517,395									(\$4,276,760)									(\$1,453,141)	
5% Discount					\$13,517,395									(\$3,598,418)									(\$1,396,060)	
7% Discount					\$13,517,395									(\$3,011,500)									(\$1,266,370)	

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Year	Calendar Year	Auto/Light Truck VOC Change per Mile (MT) or 1.034 grams * 0.000001	VOC Change Auto/Light Truck (MT)	Bus VOC Change per Mile (MT) or 0.0447 grams * 0.000001	VOC Change Bus (MT)	VOC Value (per MT)	VOC Benefits ¹⁰	Resource Externalities Value	Resource Consumption Benefits ¹¹	Parking Internal + External Benefits Value	Total Parking Benefits ¹²	Walking Health Costs Value - External	Bicycling Health Costs Value - External	Health Benefits - Increased Cardiovascular Activity ¹³	Walking Mortality Costs Value - Internal	Bicycling Mortality Costs Value - Internal	Mortality Benefits - Increased Cardiovascular Activity ¹³	Barrier Effect Value-Car	Barrier Effect Value-Heavy Bus	Barrier Effect Benefits ¹⁴
0	2019																			
0	2020																			
0	2021																			
0	2022																			
1	2023																			
2	2024																			
3	2025																			
4	2026																			
5	2027																			
6	2028																			
7	2029	0.000001034	-11.8	0.000000447	-0.12	(\$2,228)	\$26,538	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$394,848	(0.2972)	(0.1176)	\$394,848	(0.0173)	(0.0285)	\$189,341
8	2030	0.000001034	-12.1	0.000000447	-0.12	(\$2,228)	\$27,190	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$404,642	(0.2972)	(0.1176)	\$404,642	(0.0173)	(0.0285)	\$194,233
9	2031	0.000001034	-12.4	0.000000447	-0.12	(\$2,228)	\$27,841	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$414,435	(0.2972)	(0.1176)	\$414,435	(0.0173)	(0.0285)	\$199,125
10	2032	0.000001034	-12.7	0.000000447	-0.12	(\$2,228)	\$28,492	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$424,229	(0.2972)	(0.1176)	\$424,229	(0.0173)	(0.0285)	\$204,016
11	2033	0.000001034	-13.0	0.000000447	-0.12	(\$2,228)	\$29,144	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$434,022	(0.2972)	(0.1176)	\$434,022	(0.0173)	(0.0285)	\$208,908
12	2034	0.000001034	-13.2	0.000000447	-0.12	(\$2,228)	\$29,795	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$443,816	(0.2972)	(0.1176)	\$443,816	(0.0173)	(0.0285)	\$213,800
13	2035	0.000001034	-13.5	0.000000447	-0.12	(\$2,228)	\$30,447	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$453,610	(0.2972)	(0.1176)	\$453,610	(0.0173)	(0.0285)	\$218,691
14	2036	0.000001034	-13.8	0.000000447	-0.12	(\$2,228)	\$31,098	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$463,403	(0.2972)	(0.1176)	\$463,403	(0.0173)	(0.0285)	\$223,583
15	2037	0.000001034	-14.1	0.000000447	-0.12	(\$2,228)	\$31,749	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$473,197	(0.2972)	(0.1176)	\$473,197	(0.0173)	(0.0285)	\$228,475
16	2038	0.000001034	-14.4	0.000000447	-0.12	(\$2,228)	\$32,401	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$482,990	(0.2972)	(0.1176)	\$482,990	(0.0173)	(0.0285)	\$233,367
17	2039	0.000001034	-14.7	0.000000447	-0.12	(\$2,228)	\$33,052	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$492,784	(0.2972)	(0.1176)	\$492,784	(0.0173)	(0.0285)	\$238,258
18	2040	0.000001034	-15.0	0.000000447	-0.12	(\$2,228)	\$33,704	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$502,577	(0.2972)	(0.1176)	\$502,577	(0.0173)	(0.0285)	\$243,150
19	2041	0.000001034	-15.3	0.000000447	-0.12	(\$2,228)	\$34,355	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$512,371	(0.2972)	(0.1176)	\$512,371	(0.0173)	(0.0285)	\$248,042
20	2042	0.000001034	-15.6	0.000000447	-0.12	(\$2,228)	\$35,006	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$522,165	(0.2972)	(0.1176)	\$522,165	(0.0173)	(0.0285)	\$252,934
21	2043	0.000001034	-15.9	0.000000447	-0.12	(\$2,228)	\$35,658	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$531,958	(0.2972)	(0.1176)	\$531,958	(0.0173)	(0.0285)	\$257,825
22	2044	0.000001034	-16.2	0.000000447	-0.12	(\$2,228)	\$36,309	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$541,752	(0.2972)	(0.1176)	\$541,752	(0.0173)	(0.0285)	\$262,717
23	2045	0.000001034	-16.5	0.000000447	-0.12	(\$2,228)	\$36,961	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$551,545	(0.2972)	(0.1176)	\$551,545	(0.0173)	(0.0285)	\$267,609
24	2046	0.000001034	-16.8	0.000000447	-0.12	(\$2,228)	\$37,612	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$561,339	(0.2972)	(0.1176)	\$561,339	(0.0173)	(0.0285)	\$272,500
25	2047	0.000001034	-17.1	0.000000447	-0.12	(\$2,228)	\$38,263	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$571,132	(0.2972)	(0.1176)	\$571,132	(0.0173)	(0.0285)	\$277,392
26	2048	0.000001034	-17.3	0.000000447	-0.12	(\$2,228)	\$38,915	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$580,926	(0.2972)	(0.1176)	\$580,926	(0.0173)	(0.0285)	\$282,284
27	2049	0.000001034	-17.6	0.000000447	-0.12	(\$2,228)	\$39,566	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$590,720	(0.2972)	(0.1176)	\$590,720	(0.0173)	(0.0285)	\$287,176
28	2050	0.000001034	-17.9	0.000000447	-0.12	(\$2,228)	\$40,218	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$600,513	(0.2972)	(0.1176)	\$600,513	(0.0173)	(0.0285)	\$292,067
29	2051	0.000001034	-18.2	0.000000447	-0.12	(\$2,228)	\$40,869	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$610,307	(0.2972)	(0.1176)	\$610,307	(0.0173)	(0.0285)	\$296,959
30	2052	0.000001034	-18.5	0.000000447	-0.12	(\$2,228)	\$41,520	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$620,100	(0.2972)	(0.1176)	\$620,100	(0.0173)	(0.0285)	\$301,851
31	2053	0.000001034	-18.8	0.000000447	-0.12	(\$2,228)	\$42,172	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$629,894	(0.2972)	(0.1176)	\$629,894	(0.0173)	(0.0285)	\$306,743
32	2054	0.000001034	-19.1	0.000000447	-0.12	(\$2,228)	\$42,823	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$639,687	(0.2972)	(0.1176)	\$639,687	(0.0173)	(0.0285)	\$311,634
33	2055	0.000001034	-19.4	0.000000447	-0.12	(\$2,228)	\$43,475	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$649,481	(0.2972)	(0.1176)	\$649,481	(0.0173)	(0.0285)	\$316,526
34	2056	0.000001034	-19.7	0.000000447	-0.12	(\$2,228)	\$44,126	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$659,275	(0.2972)	(0.1176)	\$659,275	(0.0173)	(0.0285)	\$321,418
35	2057	0.000001034	-20.0	0.000000447	-0.12	(\$2,228)	\$44,777	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$669,068	(0.2972)	(0.1176)	\$669,068	(0.0173)	(0.0285)	\$326,309
36	2058	0.000001034	-20.3	0.000000447	-0.12	(\$2,228)	\$45,429	(0.05)		(\$0.148)	\$0	(0.2972)	(0.1176)	\$678,862	(0.2972)	(0.1176)	\$678,862	(0.0173)	(0.0285)	\$331,201
TOTALS							\$1,079,504		\$0		\$0			\$16,105,647			\$16,105,647			\$7,808,134
3% Discount							\$567,297		\$0		\$0			\$8,461,092			\$8,461,092			\$4,096,841
5% Discount							\$386,388		\$0		\$0			\$5,761,679			\$5,761,679			\$2,787,482
7% Discount							\$271,944		\$0		\$0			\$4,054,314			\$4,054,314			\$1,959,914

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Year	Calendar Year	Transport Diversity Value	Transport Diversity Benefits-Auto ¹⁵	Average Travel Time Savings Per Train Rider (hrs)	Time Value (per hr)	Travel Time Savings ¹⁶	Road Accidents Reduced	CTA Bus Accidents Decreased	CTA Train Accidents Increased	Total Change in Accidents	Value of Statistical Life	Road Death/ Crash Ratio	Deaths Reduced	Deaths Prevented Benefits
0	2019													
0	2020										\$11,410,084			
0	2021										\$11,501,365			
0	2022										\$11,593,376			
1	2023										\$11,686,123			
2	2024										\$11,779,612			
3	2025										\$11,873,848			
4	2026										\$11,968,839			
5	2027										\$12,064,590			
6	2028										\$12,161,107			
7	2029	(0.0087)	\$98,838	0.35	\$17.80	\$80,990,000	-31.19	-1.53	0.68	-32.04	\$12,258,396	0.003205	-0.1027	\$1,258,785
8	2030	(0.0087)	\$101,290	0.35	\$17.80	\$80,990,000	-31.96	-1.53	0.68	-32.82	\$12,356,463	0.003205	-0.1052	\$1,299,485
9	2031	(0.0087)	\$103,741	0.35	\$17.80	\$80,990,000	-32.73	-1.53	0.68	-33.59	\$12,455,314	0.003205	-0.1076	\$1,340,756
10	2032	(0.0087)	\$106,193	0.35	\$17.80	\$80,990,000	-33.51	-1.53	0.68	-34.36	\$12,554,957	0.003205	-0.1101	\$1,382,604
11	2033	(0.0087)	\$108,644	0.35	\$17.80	\$80,990,000	-34.28	-1.53	0.68	-35.14	\$12,655,397	0.003205	-0.1126	\$1,425,036
12	2034	(0.0087)	\$111,096	0.35	\$17.80	\$80,990,000	-35.05	-1.53	0.68	-35.91	\$12,756,640	0.003205	-0.1151	\$1,468,058
13	2035	(0.0087)	\$113,547	0.35	\$17.80	\$80,990,000	-35.83	-1.53	0.68	-36.68	\$12,858,693	0.003205	-0.1176	\$1,511,677
14	2036	(0.0087)	\$115,999	0.35	\$17.80	\$80,990,000	-36.60	-1.53	0.68	-37.46	\$12,961,562	0.003205	-0.1200	\$1,555,901
15	2037	(0.0087)	\$118,450	0.35	\$17.80	\$80,990,000	-37.37	-1.53	0.68	-38.23	\$13,065,255	0.003205	-0.1225	\$1,600,735
16	2038	(0.0087)	\$120,902	0.35	\$17.80	\$80,990,000	-38.15	-1.53	0.68	-39.00	\$13,169,777	0.003205	-0.1250	\$1,646,187
17	2039	(0.0087)	\$123,353	0.35	\$17.80	\$80,990,000	-38.92	-1.53	0.68	-39.78	\$13,275,135	0.003205	-0.1275	\$1,692,263
18	2040	(0.0087)	\$125,805	0.35	\$17.80	\$80,990,000	-39.69	-1.53	0.68	-40.55	\$13,381,336	0.003205	-0.1300	\$1,738,972
19	2041	(0.0087)	\$128,256	0.35	\$17.80	\$80,990,000	-40.47	-1.53	0.68	-41.32	\$13,488,387	0.003205	-0.1324	\$1,786,319
20	2042	(0.0087)	\$130,708	0.35	\$17.80	\$80,990,000	-41.24	-1.53	0.68	-42.10	\$13,596,294	0.003205	-0.1349	\$1,834,313
21	2043	(0.0087)	\$133,159	0.35	\$17.80	\$80,990,000	-42.01	-1.53	0.68	-42.87	\$13,705,064	0.003205	-0.1374	\$1,882,961
22	2044	(0.0087)	\$135,611	0.35	\$17.80	\$80,990,000	-42.79	-1.53	0.68	-43.65	\$13,814,705	0.003205	-0.1399	\$1,932,269
23	2045	(0.0087)	\$138,062	0.35	\$17.80	\$80,990,000	-43.56	-1.53	0.68	-44.42	\$13,925,223	0.003205	-0.1423	\$1,982,246
24	2046	(0.0087)	\$140,514	0.35	\$17.80	\$80,990,000	-44.34	-1.53	0.68	-45.19	\$14,036,624	0.003205	-0.1448	\$2,032,899
25	2047	(0.0087)	\$142,965	0.35	\$17.80	\$80,990,000	-45.11	-1.53	0.68	-45.97	\$14,148,917	0.003205	-0.1473	\$2,084,235
26	2048	(0.0087)	\$145,417	0.35	\$17.80	\$80,990,000	-45.88	-1.53	0.68	-46.74	\$14,262,109	0.003205	-0.1498	\$2,136,263
27	2049	(0.0087)	\$147,868	0.35	\$17.80	\$80,990,000	-46.66	-1.53	0.68	-47.51	\$14,376,206	0.003205	-0.1523	\$2,188,989
28	2050	(0.0087)	\$150,320	0.35	\$17.80	\$80,990,000	-47.43	-1.53	0.68	-48.29	\$14,491,215	0.003205	-0.1547	\$2,242,423
29	2051	(0.0087)	\$152,771	0.35	\$17.80	\$80,990,000	-48.20	-1.53	0.68	-49.06	\$14,607,145	0.003205	-0.1572	\$2,296,571
30	2052	(0.0087)	\$155,223	0.35	\$17.80	\$80,990,000	-48.98	-1.53	0.68	-49.83	\$14,724,002	0.003205	-0.1597	\$2,351,443
31	2053	(0.0087)	\$157,674	0.35	\$17.80	\$80,990,000	-49.75	-1.53	0.68	-50.61	\$14,841,794	0.003205	-0.1622	\$2,407,045
32	2054	(0.0087)	\$160,126	0.35	\$17.80	\$80,990,000	-50.52	-1.53	0.68	-51.38	\$14,960,528	0.003205	-0.1647	\$2,463,386
33	2055	(0.0087)	\$162,577	0.35	\$17.80	\$80,990,000	-51.30	-1.53	0.68	-52.15	\$15,080,213	0.003205	-0.1671	\$2,520,475
34	2056	(0.0087)	\$165,029	0.35	\$17.80	\$80,990,000	-52.07	-1.53	0.68	-52.93	\$15,200,854	0.003205	-0.1696	\$2,578,320
35	2057	(0.0087)	\$167,480	0.35	\$17.80	\$80,990,000	-52.84	-1.53	0.68	-53.70	\$15,322,461	0.003205	-0.1721	\$2,636,928
36	2058	(0.0087)	\$169,932	0.35	\$17.80	\$80,990,000	-53.62	-1.53	0.68	-54.47	\$15,445,041	0.003205	-0.1746	\$2,696,310
TOTALS			\$4,031,550			\$1,781,780,000	-865	-34	16	-983			-2.8317	\$38,023,376
3% Discount			\$2,117,972			\$1,329,455,795								\$29,956,654
5% Discount			\$1,442,258			\$929,049,219								\$20,182,952
7% Discount			\$1,014,872			\$669,679,429								\$14,060,697

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Year	Calendar Year	No Injury AIS 0 0.43676 * \$0	Minor AIS 1 0.41739 * 0.003 VSL	Moderate AIS 2 0.08872 * 0.047 VSL	Serious AIS 3 0.04817 * 0.105 VSL	Severe AIS 4 0.00617 * 0.266 VSL	Critical AIS 5 0.00279 * 0.593 VSL	Injuries per Accident	Injuries Prevented Benefits Accidents*Σ[Pr(AIS _i)*Val ue (AIS _i)]	Property Damage Only \$4,600 per Accident ¹⁷	Total Accident Death/ Injury/PDO Benefits ¹⁷	Residual Value ¹⁸
0	2019											
0	2020											
0	2021											
0	2022											
1	2023											
2	2024											
3	2025											
4	2026											
5	2027											
6	2028											
7	2029	\$0	\$15,350	\$51,116	\$62,001	\$20,119	\$20,281	1.44	\$7,791,761	\$147,397	\$9,197,943	
8	2030	\$0	\$15,472	\$51,524	\$62,497	\$20,280	\$20,443	1.44	\$8,043,692	\$150,955	\$9,494,132	
9	2031	\$0	\$15,596	\$51,937	\$62,997	\$20,442	\$20,607	1.44	\$8,299,154	\$154,513	\$9,794,423	
10	2032	\$0	\$15,721	\$52,352	\$63,501	\$20,605	\$20,772	1.44	\$8,558,189	\$158,071	\$10,098,865	
11	2033	\$0	\$15,847	\$52,771	\$64,009	\$20,770	\$20,938	1.44	\$8,820,838	\$161,629	\$10,407,503	
12	2034	\$0	\$15,973	\$53,193	\$64,521	\$20,936	\$21,105	1.44	\$9,087,141	\$165,188	\$10,720,387	
13	2035	\$0	\$16,101	\$53,619	\$65,037	\$21,104	\$21,274	1.44	\$9,357,141	\$168,746	\$11,037,564	
14	2036	\$0	\$16,230	\$54,048	\$65,558	\$21,273	\$21,445	1.44	\$9,630,879	\$172,304	\$11,359,084	
15	2037	\$0	\$16,360	\$54,480	\$66,082	\$21,443	\$21,616	1.44	\$9,908,398	\$175,862	\$11,684,995	
16	2038	\$0	\$16,491	\$54,916	\$66,611	\$21,615	\$21,789	1.44	\$10,189,741	\$179,420	\$12,015,348	
17	2039	\$0	\$16,623	\$55,355	\$67,144	\$21,787	\$21,963	1.44	\$10,474,951	\$182,978	\$12,350,193	
18	2040	\$0	\$16,756	\$55,798	\$67,681	\$21,962	\$22,139	1.44	\$10,764,073	\$186,536	\$12,689,581	
19	2041	\$0	\$16,890	\$56,244	\$68,222	\$22,137	\$22,316	1.44	\$11,057,150	\$190,095	\$13,033,564	
20	2042	\$0	\$17,025	\$56,694	\$68,768	\$22,315	\$22,495	1.44	\$11,354,227	\$193,653	\$13,382,193	
21	2043	\$0	\$17,161	\$57,148	\$69,318	\$22,493	\$22,675	1.44	\$11,655,350	\$197,211	\$13,735,522	
22	2044	\$0	\$17,298	\$57,605	\$69,873	\$22,673	\$22,856	1.44	\$11,960,564	\$200,769	\$14,093,602	
23	2045	\$0	\$17,437	\$58,066	\$70,432	\$22,854	\$23,039	1.44	\$12,269,916	\$204,327	\$14,456,489	
24	2046	\$0	\$17,576	\$58,530	\$70,995	\$23,037	\$23,223	1.44	\$12,583,452	\$207,885	\$14,824,236	
25	2047	\$0	\$17,717	\$58,999	\$71,563	\$23,221	\$23,409	1.44	\$12,901,219	\$211,443	\$15,196,897	
26	2048	\$0	\$17,859	\$59,471	\$72,136	\$23,407	\$23,596	1.44	\$13,223,265	\$215,001	\$15,574,529	
27	2049	\$0	\$18,001	\$59,946	\$72,713	\$23,595	\$23,785	1.44	\$13,549,638	\$218,560	\$15,957,187	
28	2050	\$0	\$18,145	\$60,426	\$73,294	\$23,783	\$23,975	1.44	\$13,880,387	\$222,118	\$16,344,928	
29	2051	\$0	\$18,291	\$60,909	\$73,881	\$23,974	\$24,167	1.44	\$14,215,561	\$225,676	\$16,737,808	
30	2052	\$0	\$18,437	\$61,397	\$74,472	\$24,165	\$24,360	1.44	\$14,555,209	\$229,234	\$17,135,886	
31	2053	\$0	\$18,584	\$61,888	\$75,068	\$24,359	\$24,555	1.44	\$14,899,382	\$232,792	\$17,539,219	
32	2054	\$0	\$18,733	\$62,383	\$75,668	\$24,554	\$24,752	1.44	\$15,248,130	\$236,350	\$17,947,866	
33	2055	\$0	\$18,883	\$62,882	\$76,273	\$24,750	\$24,950	1.44	\$15,601,504	\$239,908	\$18,361,887	
34	2056	\$0	\$19,034	\$63,385	\$76,884	\$24,948	\$25,149	1.44	\$15,959,556	\$243,466	\$18,781,343	
35	2057	\$0	\$19,186	\$63,892	\$77,499	\$25,148	\$25,351	1.44	\$16,322,339	\$247,025	\$19,206,292	
36	2058	\$0	\$19,340	\$64,403	\$78,119	\$25,349	\$25,553	1.44	\$16,689,905	\$250,583	\$19,636,798	\$973,365,716
TOTALS									\$235,361,128	\$4,064,661	\$277,449,166	\$973,365,716
3% Discount									\$185,428,874	\$3,138,757		\$335,842,733
5% Discount									\$124,930,575	\$2,138,529		\$168,058,808
7% Discount									\$87,034,395	\$1,505,592		\$85,204,013

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Year	Calendar Year	Discount Factor (3%)	Discount Factor (5%)	Discount Factor (7%)	NPV Costs (3% Discount)	NPV Benefits (3% Discount)	NPV Costs (5% Discount)	NPV Benefits (5% Discount)	NPV Costs (7% Discount)	NPV Benefits (7% Discount)
0	2019	1.0000	1.0000	1.0000	(\$40,400,000)	\$0	(\$40,400,000)	\$0	(\$40,400,000)	\$0
0	2020	1.0000	1.0000	1.0000	(\$40,000,000)	\$0	(\$40,000,000)	\$0	(\$40,000,000)	\$0
0	2021	1.0000	1.0000	1.0000	(\$40,000,000)	\$0	(\$40,000,000)	\$0	(\$40,000,000)	\$0
0	2022	1.0000	1.0000	1.0000	(\$40,000,000)	\$0	(\$40,000,000)	\$0	(\$40,000,000)	\$0
1	2023	0.9709	0.9524	0.9346	(\$38,834,951)	\$0	(\$38,095,238)	\$0	(\$37,383,178)	\$0
2	2024	0.9426	0.9070	0.8734	(\$37,703,836)	\$0	(\$36,281,179)	\$0	(\$34,937,549)	\$0
3	2025	0.9151	0.8638	0.8163	(\$513,203,501)	\$0	(\$484,432,629)	\$0	(\$457,772,766)	\$0
4	2026	0.8885	0.8227	0.7629	(\$497,813,875)	\$0	(\$460,955,180)	\$0	(\$427,445,535)	\$0
5	2027	0.8626	0.7835	0.7130	(\$482,885,744)	\$0	(\$438,615,537)	\$0	(\$399,127,470)	\$0
6	2028	0.8375	0.7462	0.6663	(\$468,405,268)	\$0	(\$417,358,559)	\$0	(\$372,685,463)	\$0
7	2029	0.8131	0.7107	0.6227	(\$483,364,827)	\$82,166,830	(\$422,484,251)	\$71,886,653	(\$370,210,877)	\$63,059,871
8	2030	0.7894	0.6768	0.5820	(\$28,160,975)	\$80,230,039	(\$24,145,216)	\$68,866,164	(\$20,762,290)	\$59,293,095
9	2031	0.7664	0.6446	0.5439	(\$27,340,752)	\$78,357,376	(\$22,995,443)	\$65,988,512	(\$19,404,010)	\$55,765,543
10	2032	0.7441	0.6139	0.5083	(\$26,544,420)	\$76,528,826	(\$21,900,422)	\$63,231,807	(\$18,134,588)	\$52,449,208
11	2033	0.7224	0.5847	0.4751	(\$25,771,281)	\$74,743,351	(\$20,857,545)	\$60,590,952	(\$16,948,213)	\$49,331,409
12	2034	0.7014	0.5568	0.4440	(\$25,020,661)	\$72,999,941	(\$19,864,329)	\$58,061,061	(\$15,839,452)	\$46,400,226
13	2035	0.6810	0.5303	0.4150	(\$24,291,904)	\$71,297,604	(\$18,918,408)	\$55,637,458	(\$14,803,226)	\$43,644,456
14	2036	0.6611	0.5051	0.3878	(\$23,584,373)	\$69,642,663	(\$18,017,532)	\$53,322,950	(\$13,834,791)	\$41,060,857
15	2037	0.6419	0.4810	0.3624	(\$22,897,450)	\$68,019,385	(\$17,159,554)	\$51,098,458	(\$12,929,711)	\$38,624,744
16	2038	0.6232	0.4581	0.3387	(\$22,230,533)	\$66,434,354	(\$16,342,432)	\$48,967,376	(\$12,083,842)	\$36,334,321
17	2039	0.6050	0.4363	0.3166	(\$21,583,042)	\$64,886,670	(\$15,564,221)	\$46,925,768	(\$11,293,310)	\$34,180,845
18	2040	0.5874	0.4155	0.2959	(\$20,954,410)	\$63,375,452	(\$14,823,068)	\$44,969,864	(\$10,554,496)	\$32,156,097
19	2041	0.5703	0.3957	0.2765	(\$20,344,087)	\$61,899,841	(\$14,117,207)	\$43,096,050	(\$9,864,015)	\$30,252,354
20	2042	0.5537	0.3769	0.2584	(\$19,751,541)	\$60,458,996	(\$13,444,960)	\$41,300,867	(\$9,218,705)	\$28,462,355
21	2043	0.5375	0.3589	0.2415	(\$19,176,253)	\$59,058,025	(\$12,804,723)	\$39,586,929	(\$8,615,612)	\$26,785,203
22	2044	0.5219	0.3418	0.2257	(\$18,617,722)	\$57,684,100	(\$12,194,975)	\$37,939,036	(\$8,051,974)	\$25,202,459
23	2045	0.5067	0.3256	0.2109	(\$18,075,458)	\$56,342,545	(\$11,614,262)	\$36,360,252	(\$7,525,209)	\$23,714,200
24	2046	0.4919	0.3101	0.1971	(\$17,548,988)	\$55,003,666	(\$11,061,201)	\$34,829,434	(\$7,032,906)	\$22,303,165
25	2047	0.4776	0.2953	0.1842	(\$17,037,853)	\$53,681,283	(\$10,534,478)	\$33,353,839	(\$6,572,809)	\$20,970,948
26	2048	0.4637	0.2812	0.1722	(\$16,541,605)	\$52,391,575	(\$10,032,836)	\$31,941,539	(\$6,142,813)	\$19,719,395
27	2049	0.4502	0.2678	0.1609	(\$16,059,810)	\$51,133,718	(\$9,555,082)	\$30,589,793	(\$5,740,946)	\$18,543,586
28	2050	0.4371	0.2551	0.1504	(\$15,592,049)	\$49,911,729	(\$9,100,078)	\$29,300,797	(\$5,365,370)	\$17,443,720
29	2051	0.4243	0.2429	0.1406	(\$15,137,912)	\$48,715,048	(\$8,666,741)	\$28,062,266	(\$5,014,365)	\$16,405,685
30	2052	0.4120	0.2314	0.1314	(\$14,697,002)	\$47,547,876	(\$8,254,039)	\$26,876,763	(\$4,686,322)	\$15,430,372
31	2053	0.4000	0.2204	0.1228	(\$14,268,934)	\$46,409,470	(\$7,860,989)	\$25,741,997	(\$4,379,740)	\$14,513,962
32	2054	0.3883	0.2099	0.1147	(\$13,853,334)	\$45,299,106	(\$7,486,657)	\$24,655,771	(\$4,093,215)	\$13,652,866
33	2055	0.3770	0.1999	0.1072	(\$13,449,838)	\$44,216,078	(\$7,130,149)	\$23,615,989	(\$3,825,435)	\$12,843,718
34	2056	0.3660	0.1904	0.1002	(\$13,058,096)	\$43,163,735	(\$6,790,618)	\$22,624,679	(\$3,575,173)	\$12,087,391
35	2057	0.3554	0.1813	0.0937	(\$12,677,763)	\$42,133,219	(\$6,467,255)	\$21,671,733	(\$3,341,283)	\$11,372,729
36	2058	0.3450	0.1727	0.0875	(\$12,308,507)	\$376,970,765	(\$6,159,291)	\$188,818,280	(\$3,122,694)	\$95,905,114
TOTALS					(\$3,239,188,555)	\$2,120,703,266	(\$2,842,486,284)	\$1,409,913,040	(\$2,532,719,354)	\$977,909,893
3% Discount		(\$1,118,485,288)			B/C Ratio:	0.65	B/C Ratio:	0.50	B/C Ratio:	0.39
5% Discount		(\$1,432,573,244)			NPV:	(\$1,118,485,288)	NPV:	(\$1,432,573,244)	NPV:	(\$1,554,809,461)
7% Discount		(\$1,554,809,461)								

CHICAGO TRANSIT AUTHORITY
 RED LINE EXTENSION
 SOCIAL BENEFITS - SOCIAL COSTS ANALYSIS (2020 \$)

Year	Calendar Year	Capital Costs ¹ (Design/Const; 2020\$)	O&M Costs ²	Farm Crops Production Loss Costs ³	Ecological Acreage Loss (Project)	Ecological Value Per Acre	Ecological Land Loss Costs ⁴	Ecological Acreage Loss Induced Development	Ecological Value Per Acre	Ecological Land Loss Induced Development Costs ⁴	Chicago UZA Estimated Population	Chicago UZA Estimated AVMT-No Build	Per Capita VMT	Occupancy per Vehicle	AVMT Change ⁵	Proportion Auto Traffic	Auto AVMT Change	VMT Value	Auto VMT Benefits ⁵
		<p>Social Benefits-Social Costs Analysis (SBSCA) of the proposed Chicago Transit Authority (CTA) Red Line Extension from 95th Street to 130th Street in Chicago. The analysis assumed planning/engineering from 2019-2024, construction from 2025-2029, passenger operations beginning in 2029, and operations of 30 years through 2058. Sources of information were primarily the following public documents: CTA Final Environmental Impact Statement (FEIS), dated July 2022; CTA Draft Environmental Impact Statement (DEIS) and associated appendices, dated October 2016, U.S. Department of Transportation, Benefit-Cost Guidance for Discretionary Grant Programs (U.S. DOT BCA Guidance), dated March 2022 (https://www.transportation.gov/sites/dot.gov/files/2022-03/Benefit%20Cost%20Analysis%20Guidance%202022%20%28Revised%29.pdf); TIGER Benefit-Cost Analysis Resource Guide (TIGER Guide), dated March 2016 (https://www.transportation.gov/sites/dot.gov/files/docs/BCARG2016March.pdf). Other sources are identified in these notations. All figures are in 2020 dollars.</p> <ol style="list-style-type: none"> Capital Costs: According to the FEIS (page 9-1), the total estimated capital construction cost is \$3.6B in year of expenditure (YOE) or about \$3.0B (deflated 2020\$) with costs incurred beginning in 2019 and construction occurring from 2025-2029. Construction costs are assumed to be about 92% of the budget. Excluded from the analysis were planning funds spent prior to 2019. Operating and Maintenance (O&M) Costs: The FEIS (page 9-5) estimated annual O&M costs at \$32.7M (2020\$). Farm Crops Production Costs: Not applicable. Ecological Acreage Loss Costs: A calculation is not made as much of the right of way for the Project is predominantly within or adjacent to existing expressways and a rail line. Further, it is assumed that projected wetland losses will be fully mitigated. Ecological losses due to induced development were not calculated due to a lack of credible information. Vehicle Miles Traveled: Chicago urbanized area population was estimated for 2020 based upon the 2010 Census population of 8,608,208 and the 3.6% increase from 2000-2010. A 0.36% annual increase was assumed. Annual vehicle miles traveled data (AVMT) was derived from the IDOT Eisenhower Expressway Reconstruction Expansion DEIS 2040 estimates. This was included for informational purposes only as the data has no practical application for the CTA RLE SBSCA. According to Appendix W of the RLE DEIS (page 1-1), the estimated reduction in regional vehicle miles traveled (VMT) for the build alternatives ranges from 11.4 to 19.6 million. Incremental increases over time were assumed accordingly. The per mile operating costs of average sedans, SUVs, and minivans assumed is \$0.64 @15,000 annual miles based on AAA's Your Driving Costs (2020). The variable rate (non-fixed) of this cost assumed was \$0.2844 (2020\$). Per the DEIS (page 9-8), annual reductions of CTA bus miles due to the Project are expected in the amount of 276,451. According to the National Transit Database, 2020 National Transit Profile Summary, average operating expenses for buses per vehicle revenue mile were \$12.64 in 2020\$. Productivity Increase: According to the DEIS (page 9-8), the Project will add 5,489,502 train car miles annually. Average train length assumed is 6 cars. Thus, annual train miles added is 914,917. Train passengers that otherwise would have driven a car have the potential to increase productivity. An assumption was made that reduced VMT was based on an average of 10 miles per trip, 1.67 persons per car (U.S. DOT BCA Guidance P. 37, Table A-4), these drivers opt to ride the train, and 20% of them opt to work 1/2 hour on each train trip. According to the TIGER Guide (Page 36, Table A-3) the value of time for commuters is \$16.20 (2020 \$). Noise: The TRB Transportation Benefit-Cost Analysis web site provides noise impact values per VMT for vehicles from several studies [bca.transportationeconomics.org, referencing: Todd Litman (2010), "Noise," Transportation Cost and Benefit Analysis, Victoria Transport Policy Institute (www.vtpi.org), available at www.vtpi.org/tca/tca0511.pdf]. Dollar values for noise impacts in these cited studies show the following per VMT (converted to 2020 \$): buses (electric & diesel, \$0.04-\$0.07 or mid-level 0.055); and auto (electric & gas/diesel, \$0.004 and \$0.10 or mid-level \$0.05). Additionally, in the VTPI document, the following study was cited which includes values for passenger train noise: M. Maibach, et al. (2008), Handbook on Estimation of External Cost in the Transport Sector, CE Delft (www.ce.nl) Table 22 p 69. The average proportion noise values for cars (day, night, urban, suburban, rural) in this study were compared to the same for passenger trains. The latter monetized value is about 65 times that of automobiles. Consequently, \$0.05 (value used for autos) X 65 was used to determine an estimated value of \$3.25 (2020 \$) for passenger train noise per mile. through 10. The following sources were consulted for NOx, PM10, PM2.5, and VOC emission rates per VMT: <ul style="list-style-type: none"> - U.S. Bureau of Transportation Statistics via U.S. Environmental Protection Agency, Table 4-43: Estimated National Average Vehicle Emissions Rates per Vehicle by Vehicle Type using Gasoline and Diesel (grams per mile using 2029 estimates for NOx and PM2.5 (https://www.bts.gov/content/estimated-national-average-vehicle-emissions-rates-vehicle-type-using-gasoline-and-nox-respective-gram-per-mile-values-of-0.063-and-0.103-for-auto/light-truck-averaged;PM2.5-for-auto-exhaust,-brakewear,-&-tirewear-of-0.004,-0.003,-and-0.001-and-for-light-trucks-0.005,-0.003,-and-0.001-(average-by-vehicle-type);NOX-bus-of-2.396-and-for-PM2.5-the-sum-of-0.029,-0.009,-and-0.003-for-respective-exhaust,-brakewear-and-tires); - Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks, U.S. EPA, Office of Transportation and Air Quality, April 2008 (AAE) (http://www.epa.gov/otaq/consumer/420f08024.pdf)(NOT USED); - Average In-use Emissions for Heavy-Duty Trucks (https://nepis.epa.gov/Exec/zyPDF.cgi?P100EVY6.PDF?Dockey=P100EVY6.PDF)(Bus VOC only 0.447 gram/mile or 0.00000447 MT/mile)(NOT USED); - DEIS, Appendix W, CTA BTU per revenue train car mile (RVM) is 26,785 or 7.85 per Kwh. - Deru & Torcellini (page 8, Table 3, 2007): Rail emissions of NOx (0.00000125 MT/Kwh); PM2.5: (0.000000416 MT/Kwh); - Energy Information Administration, Illinois Profile (https://www.eia.gov/state/analysis.php?sid=IL) analysis shows 24% of electrical supply is by coal and 12% by natural gas or 36% from non-renewables. - The State of Illinois is committed to reducing municipal electricity emissions from coal and natural gas to zero by 2045. Thus, the rate of electricity generated for CTA trains was reduced to zero in 2045 incrementally from 36% in 2029. - U.S. DOT BCA Guidance, Table A-6: Damage Costs for Emissions per Metric Ton (MT): CO2 ranges from \$61 in 2029 to \$94 in 2058; NOx \$48,200 in 2029 and \$49,100 thereafter; PM2.5 \$854,000 and \$867,600 thereafter (the values were not used for PM10 per the guidance). CO2: According to the DEIS, Appendix U, Table 5-3, the UPRR Alternative will reduce CO2 emissions from the no-build alternative by 12,152 tons per year which equates to 11,024 metric tons (MT). Social cost of carbon (SCC) values were obtained from the U.S. DOT BCA Guidance. The data was then multiplied for each year by the social cost of carbon (SCC) values. Per the guidance, the CO2 values were only discounted at the 3 percent rate but also used in the 5 and 7 percent benefit columns as disbenefits. It was assumed the analysis accounted for changes in all modes. Thus, additional breakdowns by mode were not performed. NOx: Per the U.S.DOT BCA Guidance, the value is \$17,700 (MT) in 2028 and then \$18,100 thereafter. PM2.5: Per the U.S.DOT BCA Guidance, the value is \$854,000 (MT) in 2028 and then \$867,600 thereafter. Also per the U.S.DOT BCA Guidance, a value was not calculated for PM10. VOC: The value of \$2,032 (MT)(2015 \$) per the TIGER Guide was adjusted to \$2,228 (MT)(2020 \$). Resource Consumption Costs: These are external costs of transport resource production (primarily petroleum) or the social benefits of resource conservation. These include military security costs for foreign oil, trade deficits from its import, environmental damages from oil extraction, oil company tax subsidies, and human health risks from injuries and pollution during extraction. Depletion of non-renewable resources for future generations is an externality as well although it is not costed. See the VTPI Transportation Cost and Benefit Analysis II - Resource Consumption External Costs (http://www.vtpi.org/tca/tca0512.pdf). The VTPI, Transportation Cost Analysis Spreadsheet has default cost values per VMT as follows in 2007 \$ for average travel: average car \$0.039 (\$0.048 in 2020 \$); light truck/van \$0.050 (\$0.062 in 2020 \$). Based on the DEIS, Appendix W, a calculation was not made as changes in energy usage due to the Project are less than the margin of error. Parking Costs: The VTPI, Transportation Cost Analysis Spreadsheet has default parking cost values per VMT as follows in 2007 \$ for average travel: car/pickup/van \$0.064 (\$0.079 2020 \$) (internal); \$0.060 (\$0.074 2020 \$)(external) for a total of \$0.124 (\$0.154 in 2020 \$). Internal costs are paid directly by users for residential parking while external costs are off-street parking paid by non-users through increased bundled goods costs and services that includes free/reduced cost parking. The Project does not affect residential parking. There could be some potential benefit in external parking due to passengers arriving at their destination and not needing parking. However, this could be completely offset by station parking lots where passengers board trains. Therefore, no benefit or cost was assigned. 																	

CHICAGO TRANSIT AUTHORITY
RED LINE EXTENSION
SOCIAL BENEFITS - SOCIAL COSTS ANALYSIS (2020 \$)

Year	Calendar Year	Proportion Heavy Tk	Diesel Bus VMT Decrease	VTMT Value	Diesel Bus VMT Benefits ⁵	Project Train Miles Traveled Increase	Average Cars per Train	Revenue Car Miles Increase	KiloWatt Hours per Revenue Train Car Mile	Project Train Annual Kilowatt Hours Increase	Annual Ridership ¹⁸	Auto Drivers & Passengers Potentially Convert to Riding Train	Assumed 20% Drivers Working 1/2 hr on train	Productivity Rate Per Hour	Increased Worker Productivity Benefits ^{5a}	Auto Noise Value (per VMT)	Auto Noise Benefits ⁵	Bus Noise Value (per VMT)	Bus Noise Benefits ⁵	Train Noise Value (per VMT)	Train Noise Costs ⁵
		<p>13. Health Costs: The VTPI Spreadsheet has default health cost values per VMT as follows in 2007 \$ for average reductions as follows: walking: \$0.24 (internal)(\$0.2972 2020 \$); \$0.24 (external)(\$0.2972 2020 \$); bicycling \$0.095 (internal)(\$0.1176 2020 \$); \$0.095 (external)(\$0.1176 2020 \$). Internal cost reduction is reflected through extended lives and reduced mortality rates. External cost reduction is shown through reduced hospital and health care costs. One-half of the benefits are assigned to walking and one-half to bicycling for both internal and external. Benefits only relate to changes in VMT equal to the assumed distance drivers and their passengers convert to walking or bicycling to and from the RLE. Thus, it was assumed 10 auto-driven passenger miles equates to 10 RLE passenger miles plus 1/2 mile walking or bicycling to a station and 1/2 mile walking or bicycling from a station.</p> <p>14. Barrier Effects: These are delay costs to non-motorized travel caused by motorized travel. See the VTPI Transportation Cost and Benefit Analysis II - Barrier Effect publication (http://www.vtpi.org/tca/tca0513.pdf). The VTPI, Transportation Cost Analysis Spreadsheet has default barrier effect cost values per VMT as follows in 2007 \$ for average travel: car/pickup/van \$0.014 (\$0.0173 in 2020 \$) and diesel bus \$0.023 (\$0.0285 in 2020 \$). It was assumed that diesel buses and heavy trucks have the same values. The VMT reduction was multiplied by these values accordingly.</p> <p>15. Transport Diversity: According to the VTPI Transportation Cost Analysis Spreadsheet, the value per VMT for transportation diversity is \$0.007 in 2007 \$ (\$0.00867 in 2020 \$). This represents the benefits of improving transportation options brought about by the Project that reduces overall transportation costs for the public. Additionally, the value measures the extent disadvantaged populations (elderly, low income, minority) are unable to travel due to increased accessibility brought about by improved mode choice.</p> <p>16. Travel Time Savings: The U.S. DOT BCA Guidance (P. 36, Table A-3) hourly value of time for all purposes is \$17.80 (2020\$)(personal and business). The FEIS states that the Project is expected to generate 41,500 daily weekday transit trips (page 9-9). The DEIS states (page 2-6) that transit times will be improved from between 14 to 28 minutes from the Project area to points north of 95th Street (page 2-6). For the BCA, it was assumed that average transit travel time savings per trip is 21 minutes (although it is acknowledged that the savings for trips solely in the Project area are likely less). Estimated annual ridership is as follows: 41,500 x 260 weekdays = 10,790,000. Based upon 2016 CTA rail ridership data (transitchicago.com/facts/), this amount represents about 83% of rides. To capture weekend trips 10,790,000/0.83 = 13,000,000 total annual rides.</p> <p>Increased Land Value: The TIGER Guide states the following: "1) The benefit of any property value increase can only be considered as a one-time stock benefit and cannot be treated as a stream of benefits accruing annually; 2) It cannot include any investment by developers; 3) Other benefits to land value already counted, such as travel time savings, must also be netted out." According to Capturing the Value of Transit by Reconnecting America's Center for TOD (2008), studies have shown ranges of residential property increases as follows: residential land, 2-45%; and office/retail, 1-167% within a 1/4-mile radius of TOD. However, transportation investments also have the potential to decrease land values elsewhere as discussed in Arkell, R. (2021), Chicago Expressway System Social Benefits Minus Social Costs Analysis. Journal of Transport Policy. Given these uncertainties and lack of evidence regarding potential property value increases beyond travel time savings, no value was assigned.</p> <p>17. Accident Reduction Benefits: According to the 2010 Illinois Crash Statistics publication (http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Resources/Safety/Crash-Reports/crash-facts/2010%20Crash%20Facts.pdf), page 10, totals for the state are as follows: 105.74B VMT; 289,260 crashes; and 927 fatalities. The crash rate was 1 accident per 365,554 VMT. This rate was multiplied by the annual VMT savings due to the Project to estimate annual accident reduction. The fatality/crash ratio was 0.0032047 (927/289,260) based on the 2010 data.</p> <p>According to the DEIS (PAGE 9-8), the Project will result in a reduction of 276,452 CTA bus miles per year. According to CTA 2016 Performance Measures (https://www.transitchicago.com/assets/1/6/Performance_Metrics_-_December_2016.pdf), the 2016 annual bus incident rate per 100,000 miles is 0.555. Thus, 276,452 X (0.555/100000) = 1.53 bus incidents decreased annually.</p> <p>The Project adds 5.6 miles to the CTA rail system (FEIS, page ES-1)(11.2 due to doubletrack) which is an increase in track mileage of about 5.0% from the existing 224.1 miles. According to the DEIS (page 9-8), the Project will add 5,489,502 train car miles annually. Average train length assumed was 6 cars. Thus, annual train miles added was calculated as 914,917. According to CTA 2016 Performance Measures (https://www.transitchicago.com/assets/1/6/Performance_Metrics_-_December_2016.pdf), the 2016 annual rail incident rate per 100,000 miles was 0.074. Thus, 914,917 X (0.074/100000) = 0.678 rail incidents increased annually.</p> <p>The value of a statistical life (VSL) is from the U.S. Department of Health and Human Services (HHS) 2016 Guidelines for Regulatory Impact Analysis, Appendix D: Updating Value per Statistical Life (VSL) Estimates for Inflation and Changes in Real Income (0.8% per year). (https://aspe.hhs.gov/sites/default/files/2021-07/hhs-guidelines-appendix-d-vsl-update.pdf). These VSL values are comparable to the U.S. DOT Appendix D: Updating Value per Statistical Life (VSL) Estimates for Inflation and Changes in Real Income (https://aspe.hhs.gov/sites/default/files/2021-07/hhs-guidelines-appendix-d-vsl-update.pdf), dated April 2021.</p> <p>The estimates of injury severity were based in part on the U.S. DOT BCA Guidance, Table A-1: Value of Reduced Fatalities and Injuries monetary values, including 1.44 injuries per accident, and the TIGER Guide, Table 4. KABCO/Unknown – AIS Data Conversion Matrix for injury severity probabilities. Accordingly, the data on number of road accidents reduced was converted to the Abbreviated Injury Scale (AIS) to determine estimated level of injury by severity rates (none, minor, moderate, serious, severe, critical). The AIS format was also used for bus and train accidents.</p> <p>18. The expected life of the Project elements were obtained from <i>Transport infrastructure evaluation using cost-benefit analysis: improvements at evaluating the asset through residual value a case study</i>. Massachusetts Institute of Technology, Engineering Systems Division, ESC-WP-2013-21, updated August 2014 (http://esd.mit.edu/WPS/2013/esd-wp-2013-21.pdf). Project element costs are based upon the August 2009 CTA Locally Preferred Alternatives Report, Table 6.14, LPA Capital Costs for percentage breakdowns based upon the total cost of \$3,039,386,821 in 2020 \$.</p> <p>a. 4 Stations, 50% after 30 years (60 years life): \$531,892,694 (17.5% of capital costs) X 50% useful life = \$265,946,347.</p> <p>b. Permanent Way (tracks, ballast), 20% after 30 years (38 years life): \$623,074,298 (20.5% of capital costs) X 20% = \$124,614,860. Given that the Project ROW is elevated, the criteria for bridges is used instead, 50% after 30 years (60 years life): \$623,074,298 (20.5% of capital costs) X 50% = \$311,537,149.</p> <p>c. Systems/Signaling/Safety, 50% after 30 years (60 years useful life): \$443,750,476 (14.6% of capital costs) X 50% = \$221,875,238.</p> <p>d. Land (150 years useful life): \$109,417,926 (3.6% of capital costs) X 80% useful life = \$87,534,340.</p> <p>e. Setwork/Eastwork (60 years life): \$72,945,284 (2.4% of capital costs) X 50% = \$36,472,642.</p> <p>f. Yards, Shops, Admin. Bldgs., (50 years life): CTA does not consider replacement of the 98th Street facility as part of the Project.</p> <p>g. Vehicles, 0% after 30 years (30 years useful life): \$607,877,364 (20.0% of capital costs) X 0% useful life = \$0 [FTA circular 5010.1D p. IV-18 states that rail cars have a useful life of at least 25 years (30 years useful life is assumed)].</p> <p>h. The above totals 78.6% of capital costs. Professional services is 15.8% with the remaining 5.6 % as unallocated contingency (\$50,000,000 is arbitrarily added to the total residual value to account for this.) Thus, the calculated total residual value after 30 years was \$973,365,716.</p>																			

