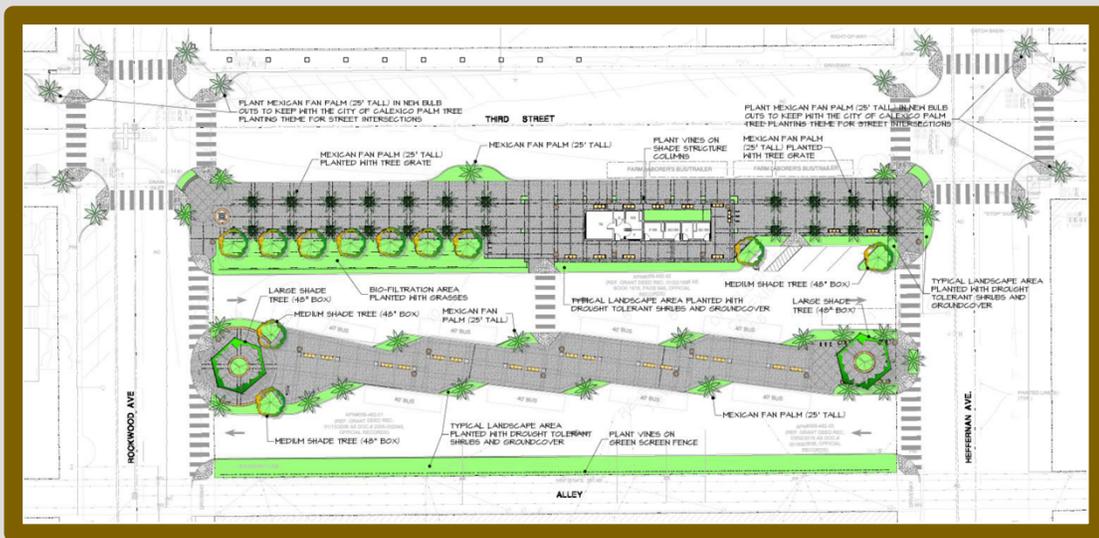


FY 22 MULTIMODAL PROJECT DISCRETIONARY GRANT APPLICATION

Calexico Intermodal Transportation Center (ITC)



Benefit-Cost Analysis

Submitted by

IMPERIAL COUNTY TRANSPORTATION COMMISSION



Benefit-Cost Analysis: Callexico Intermodal Transportation Center (ITC)

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Benefit-Cost Analysis Callexico Intermodal Transportation Center (ITC)

I. SUMMARY

A benefit-cost analysis (BCA) was completed for the Callexico Intermodal Transportation Center (ITC) project in accordance with the United States Department of Transportation (U.S. DOT) Benefit-Cost Analysis Guidance for Discretionary Grant Programs (March 2022 Revised). **The BCA resulted in a benefit-cost ratio of 1.91** which indicates the project is cost-effective. The benefit-cost ratio is based on calculated project life-cycle benefits of \$15.6 million and life-cycle costs of \$8.2 million over a 20-year period. The discount rate for the BCA was 7 percent except for CO₂ emission benefits that were discounted at 3 percent. The BCA results are summarized in Exhibit 1.

Exhibit 1: Benefit-Cost Analysis Summary

Benefit-Cost Analysis (BCA) Summary	
Life-Cycle Benefits	\$15,593,465
Life-Cycle Costs	\$8,164,448
Net Present Value	\$7,429,016
Benefit/Cost Ratio	1.91

Project life-cycle benefits are attributed to Transit Facility Amenities, Mortality Reduction (walking), External Highway Use Cost Savings, Vehicle Operating Cost Savings, and Vehicle Emissions Cost Savings. Itemized benefits by type are provided in Exhibit 2.

Exhibit 2: Benefit-Cost Analysis Itemized Benefits

BCA Itemized Benefits		
	Total Over 20 Years	Annual Average
Transit Facilities Amenities Benefits	\$4,988,119	\$249,406
Mortality Reduction Walking Benefits	\$6,889,128	\$344,456
External Highway Use Cost Savings	\$818,409	\$40,920
Vehicle Operating Cost Savings	\$2,582,637	\$129,132
Emissions Reduction Cost Savings	\$315,172	\$15,759
Total Itemized Benefits	\$15,593,465	\$779,673



Project life-cycle costs are comprised of the following: previously incurred design costs; estimated construction and construction management cost in year 2020 dollars; land acquisition purchase appraisal estimates for the two remaining parcels; and estimated annual operations and maintenance cost in year 2020 dollars. Additional project cost details are provided on page 11.

II. BACKGROUND

BCA is a systematic process for identifying, quantifying, and comparing expected benefits and costs of a potential infrastructure project. A BCA provides estimates of the anticipated benefits that are expected to accrue from a project over a specified period and compares them to the anticipated costs of the project. Based on U.S. DOT's BCA guidance, project cost includes both the resources required to develop and construct the project and the costs of maintaining the new or improved asset over time. Estimated benefits are based on the projected impacts of the project on both users of the facility and non-users, valued in monetary terms.¹ The BCA was conducted in Microsoft Excel.

For the Calexico ITC project, the BCA estimated the benefits from improved pedestrian mobility by providing a central location to access multiple alternative transportation options within walking distance from the Calexico West Land Port of Entry (LPOE). There are at least 25 different shuttle, bus, and taxi services in downtown Calexico, many operating from different locations throughout downtown.² The existing bus transfer stop located one block east of the Calexico ITC site at Paulin Ave and Third Street is undersized for the volume of demand which creates difficulty for buses to access the location.

The Calexico ITC has been designed to serve the demand by providing the space to consolidate public and private transportation providers in one facility. Benefits will be generated from the expected increase ridership by improving transportation connections, mobility, and bus stop facility amenities in Downtown Calexico. The Calexico ITC will include nine 40 foot bus parking bays, canopies over the bus waiting areas, benches, four public parking spaces including 1 van accessible parking space, an electric charging station parking space for the new Calexico Microtransit service, a section reserved for farm laborer buses and trailers, bike racks, a shade canopy adjacent to the ticket booth, a street post clock, information kiosk, lighting and landscaping throughout the facility. The facility will include a single story 1,175 square-foot air-conditioned building that will house a ticket booth, security room, one public restroom, two transit driver restrooms, one staff restroom, and a staff break room. Pedestrian improvements include bulb-outs (curb extensions) across the street, 10 foot-wide crosswalk striping to safely access the new facility from across the street, and reconstruction of 0.1-mile long sidewalk on

¹ U.S. DOT, Benefit-Cost Analysis for Discretionary Grant Programs, March 2022 Revised, p 5.

² Imperial County Transportation Commission, Calexico Border Intermodal Transportation Center Feasibility Study Final Report (Huitt-Zollars, Inc), October 23, 2014, p 1. https://www.imperialctc.org/assets/documents/transit-and-non-motorized/Calexico_ITC_Final_Report-1646069770.pdf



the eastside of Rockwood Avenue between the Calexico ITC and the Calexico West Land Port of Entry (LPOE) to make it Americans with Disabilities Act (ADA) accessible and improve safety.

III. BENEFITS

1. Benefit Type Categories

Project benefits were generated from:

- Transit Facility Amenities
- Mortality Reduction
- External Highway User Cost Savings
- Vehicle Operating Cost Savings
- Emissions Reduction Cost Savings

1.a. Transit Facility Amenities

Monetized values for new bus stop amenities per user trip were obtained from the U.S. DOT BCA Guidance.³ Calexico ITC bus stop amenities included in the project design plans are listed in Exhibit 3 along with estimated values for each amenity type. The total transit amenities monetized value per user trip is \$2.16. This value was multiplied by the estimated number of Calexico ITC transit trips to calculate total annual benefits from facility amenities. Transit trip estimates and amenity benefit calculations are provided in sections III.2 and V.

Exhibit 3: Calexico ITC Transit Amenities and Values per User Trip

Value (\$2020)	Bus Stop Facility
\$0.03	Bus Stop Clocks
\$0.18	Stop Seating Availability
\$0.24	Stop Weather Protection
\$0.14	Restroom Availability
\$0.07	Staff Availability
\$0.30	Step-Free Access to Station/Stop
\$0.29	Surveillance Cameras
\$0.59	Temperature Controlled Environment
\$0.10	Ticket Machines
\$0.22	Timetables
\$2.16	Total Value per User Trip

³ U.S. DOT Benefit-Cost Analysis Guidance for Discretionary Programs, Table A-10, p 42.



1.b. Mortality Reduction – Walking

Mortality reduction benefits are generated through physical activity such as walking and cycling. For this BCA, estimated benefits are generated from induced walking trips only (cycling benefits not included). The mortality reduction monetized value of \$7.08 per induced walking trip (\$2020) was used as recommended in the U.S. DOT BCA Guidelines.⁴ Annual mortality benefits were calculated by multiplying the mortality reduction value of \$7.08 by the estimated number of new annual transit trips. New transit trip estimates and mortality benefit calculations are provided in sections III.2 and V.

1.c. External Highway Use Cost Savings – Noise and Congestion

External highway use cost is associated with noise and congestion from Vehicle Miles Traveled (VMT). Therefore, cost savings occur when VMT are reduced. The project is expected to reduce VMT through increased transit ridership attributed to the new transit facility and pedestrian improvements to the Calexico West LPOE. VMT reduction was calculated by multiplying new annual transit trips by average bus miles traveled per person per vehicle trip (see section III.2 for VMT reduction calculations). The external highway use cost monetized value of \$0.14 per vehicle mile traveled (\$2020) was utilized as recommended in the U.S. DOT BCA Guidelines.⁵ External highway use cost savings were calculated by multiplying the external highway use cost value of \$0.14 per VMT by the estimated reduction in VMT. External highway use cost savings calculations are provided in section V.

1.d. Vehicle Operating Cost Savings

Vehicle operating cost savings are generated when VMT is reduced. The vehicle operating cost monetized value of \$0.45 per vehicle mile traveled (\$2020) was utilized as recommended in the U.S. DOT BCA Guidelines.⁶ Vehicle operating cost savings were calculated by multiplying the vehicle operating cost value of \$0.45 per VMT by the estimated reduction in VMT. External highway use cost savings calculations are provided in section V.

1.e. Emissions Reduction Cost Savings

Emissions cost savings occur when VMT is reduced. The BCA utilized the recommended monetized emissions cost values from the U.S. DOT BCA Guidance listed in Exhibit 4 for the 20-year period starting in 2025 and ending in 2044.⁷

⁴ Ibid., Table A-12, p 42.

⁵ Ibid., Table A-13, All Vehicles – Urban (\$0.138 Congestion plus \$0.0046 Noise = \$0.14), p 45.

⁶ Ibid., Table A-15, Light Duty Vehicles, p 37.

⁷ Ibid., Table A-6, p. 38.



The BCA also includes benefits from the reduction in Volatile Organic Compounds (VOC) emissions estimated at \$4,300 per metric ton from year 1 through year 20.⁸ Emissions reduction estimates and cost savings are provided in sections III.3. and V.

Exhibit 4: Emissions Damage Cost per Metric Ton

Year	NOx	SOx	PM _{2.5}	CO ₂
2025	\$16,500	\$44,900	\$801,700	\$56
2026	\$16,800	\$45,700	\$814,500	\$57
2027	\$17,100	\$46,500	\$827,400	\$58
2028	\$17,400	\$47,300	\$840,600	\$60
2029	\$17,700	\$48,200	\$854,000	\$61
2030	\$18,100	\$49,100	\$867,600	\$62
2031	\$18,100	\$49,100	\$867,600	\$63
2032	\$18,100	\$49,100	\$867,600	\$64
2033	\$18,100	\$49,100	\$867,600	\$65
2034	\$18,100	\$49,100	\$867,600	\$66
2035	\$18,100	\$49,100	\$867,600	\$67
2036	\$18,100	\$49,100	\$867,600	\$69
2037	\$18,100	\$49,100	\$867,600	\$70
2038	\$18,100	\$49,100	\$867,600	\$71
2039	\$18,100	\$49,100	\$867,600	\$72
2040	\$18,100	\$49,100	\$867,600	\$73
2041	\$18,100	\$49,100	\$867,600	\$74
2042	\$18,100	\$49,100	\$867,600	\$75
2043	\$18,100	\$49,100	\$867,600	\$77
2044	\$18,100	\$49,100	\$867,600	\$78

2. New Transit Trips and VMT Reduction Calculations by Benefit Source

New transit trips and reduction in VMT attributed to the project were estimated from the following three sources:

- Northbound pedestrians crossing the international border from the Calexico West LPOE.
- Existing Imperial County Transportation Commission (ICTC) public transit service.
- Future ICTC public Microtransit service.

⁸ California Life-Cycle Benefit/Cost Analysis Model for 2022 INFRA/RAISE Applications, version 8.1, Parameters - VOC emissions cost.



2.a. New Transit Trips and VMT Reduction from the Calexico West LPOE

The calculation of new transit trips and reduction in VMT from the Calexico West LPOE for years 2025 through 2044 is presented in Exhibit 5. Assumptions, data sources and calculations associated with Exhibit 5 are provided in Exhibit 6.

Exhibit 5: New Transit Trips and VMT Reduction from the Calexico West LPOE

Project Year	Year	Avg. Daily Pedestrians	Transit Service Days	Avg. Annual Pedestrians (weekdays)	New Annual Transit Riders (BUILD)	New Annual Transit Trips (BUILD)	Annual VMT Reduction (BUILD)
	2022	13,151					
	2023	13,404					
	2024	13,662	260	3,552,183			
1	2025	13,925	260	3,620,569	11,831	23,662	139,562
2	2026	14,193	260	3,690,272	12,059	24,117	142,249
3	2027	14,467	260	3,761,318	12,291	24,582	144,987
4	2028	14,745	260	3,833,730	12,527	25,055	147,779
5	2029	15,029	260	3,907,537	12,769	25,537	150,624
6	2030	15,318	260	3,982,765	13,014	26,029	153,524
7	2031	15,613	260	4,059,442	13,265	26,530	156,479
8	2032	15,914	260	4,137,594	13,520	27,041	159,492
9	2033	16,220	260	4,217,251	13,781	27,561	162,562
10	2034	16,532	260	4,298,441	14,046	28,092	165,692
11	2035	16,851	260	4,381,195	14,316	28,633	168,882
12	2036	17,175	260	4,465,542	14,592	29,184	172,133
13	2037	17,506	260	4,551,513	14,873	29,746	175,447
14	2038	17,843	260	4,639,138	15,159	30,319	178,825
15	2039	18,186	260	4,728,451	15,451	30,902	182,267
16	2040	18,536	260	4,819,483	15,749	31,497	185,776
17	2041	18,893	260	4,912,268	16,052	32,104	189,353
18	2042	19,257	260	5,006,839	16,361	32,722	192,998
19	2043	19,628	260	5,103,231	16,676	33,352	196,714
20	2044	20,006	260	5,201,478	16,997	33,994	200,501
TOTAL					285,328	570,656	3,365,847

2.b. New Transit Trips and VMT Reduction from Existing ICTC Transit Service

The calculation of new transit trips and reduction in VMT from Existing ICTC Transit Service for years 2025 through 2044 is presented in Exhibit 7. Assumptions, data sources and calculations associated with Exhibit 7 are provided in Exhibit 8. The analysis is based on passenger count surveys for ICTC transit routes 21, 1N, 31D, and 32D that stop at the existing transfer stop at East 3rd Street and Paulin Avenue. The Calexico ITC will replace the existing transfer stop at East 3rd Street and Paulin Avenue. Additional information including estimated new ridership and assumptions is provided in Exhibit 8.



Exhibit 6: Assumptions, Data Sources and Calculations:
 New Transit Trips and VMT Reduction from the Calexico West LPOE

Item	Data	Assumptions, Data Sources, Calculations, Notes
Year	2025 - 2044	Assumes project opens in year 2025 (Year 1) and benefits accrue through year 2024 (Year 20).
Avg. Daily Pedestrians	13,151	13,151 = Existing (year 2022) daily northbound pedestrians at the Calexico West LPOE. source: U.S. General Services Administration, Calexico West Land Port of Entry Fact Sheet, https://www.gsa.gov/cdnstatic/Calexico%20West%20Fact%20Sheet%20-October%202021.pdf . Estimated increase in daily northbound pedestrians at the Calexico border crossing. Note that the number of pedestrian crossings has reduced to 13,151 per day in year 2022, therefore, lower figure of 13,151 crossing per day was used instead of the 20,000 noted in the Feasibility Study.
	1.93%	Estimated annual increase in daily northbound pedestrians at the Calexico border crossing. Source: ICTC, Calexico Border Intermodal Transportation Center Feasibility Study (Huitt-Zollars, Inc.), October 23, 2014, p 4. Based on the statement "This increased demand for pedestrian processing could grow from 20,000 per day today to nearly 30,000 by the planning horizon year of 2035".
Transit Service Days	260	Analysis limited to weekdays.
Avg. Annual Pedestrians	calculation	Avg. Daily Pedestrians × Transit Service Days.
New Annual Transit Riders (Build)	calculation	Project Year 1 example calculation: (Avg. Annual Pedestrians Year 2025 – Avg. Annual Pedestrians Year 2024) × 17.30%.
	17.30%	Percent of new pedestrians crossing the border that will use transit when the project opens. Source: Transit in a Border Zone https://devpost.com/software/transit-in-a-border-zone . Only applies to the increase in the number of pedestrians starting in operational Year 1. (year 2025). The study's regression results indicate that an additional one thousand pedestrian border crossings result in an extra 269 public transportation trips in Brownsville and 173 in Laredo. The lower figure was used for this analysis.
New Annual Transit Trips (Build)	calculation	New Annual Transit Riders × 2. Assumes two transit trips per rider.
Annual VMT Reduction (Build)	9.85 miles	Average miles traveled per passenger per bus trip. Source: Imperial Valley Transit Annual Passenger Mile Sampling Methodology and Final Results, July 1, 2019-June 30,2020, July 2020, p. 24.
	1.67	Average Vehicle Occupancy. Source: US DOT Benefit-Cost Analysis Guidance for Discretionary Programs, March 2022, Table A-4, p 37.
	calculation	(New Annual Transit Trips × 9.85) ÷ 1.67



Exhibit 7: New Transit Trips and VMT Reduction
 from Existing ICTC Transit Service

Project Year	Year	Annual Passengers (No BUILD)	Annual Passengers (BUILD)	New Annual Transit Trips (BUILD)	Annual VMT Reduction (BUILD)
	2022				
	2023				
	2024				
1	2025	126,911	164,984	38,073	224,563
2	2026	126,911	203,057	76,146	449,126
3	2027	126,911	203,057	76,146	449,126
4	2028	126,911	203,057	76,146	449,126
5	2029	126,911	203,057	76,146	449,126
6	2030	126,911	203,057	76,146	449,126
7	2031	126,911	203,057	76,146	449,126
8	2032	126,911	203,057	76,146	449,126
9	2033	126,911	203,057	76,146	449,126
10	2034	126,911	203,057	76,146	449,126
11	2035	126,911	203,057	76,146	449,126
12	2036	126,911	203,057	76,146	449,126
13	2037	126,911	203,057	76,146	449,126
14	2038	126,911	203,057	76,146	449,126
15	2039	126,911	203,057	76,146	449,126
16	2040	126,911	203,057	76,146	449,126
17	2041	126,911	203,057	76,146	449,126
18	2042	126,911	203,057	76,146	449,126
19	2043	126,911	203,057	76,146	449,126
20	2044	126,911	203,057	76,146	449,126
TOTAL				1,484,853	8,757,966

Exhibit 8: Assumptions, Data Sources and Calculations:
 New Transit Trips and VMT Reduction from Existing ICTC Transit Service

Item	Data	Assumptions, Data Sources, Calculations, Notes
Year	2025 -2044	Assumes project opens in year 2025 (Year 1) and benefits accrue through year 2044 (Year 20).
Annual Passengers (No Build)	126,911	See Attachment 1. To be conservative and avoid overestimating cost and benefits, annual passenger ridership remains flat through year 2044.
Annual Passengers (Build)	164,984 Year 1; 203,057 Years 2 - 20	See Attachment 1. To be conservative, annual passenger ridership remains flat from year 2026 through year 2044.
Additional Annual Ridership (Build)	calculation	Annual Passengers (Build) – Annual Passengers (No Build)
Annual VMT Reduction (Build)	calculation	Same as Exhibit 6 (last Item, page 7).



2.c. New Transit Trips and VMT Reduction from the Future ICTC Microtransit Service

ICTC is scheduled to begin operating a new on-demand Uber-like service in late 2022 in the City of Calexico using electric vehicles. The vehicles will be charged at the Calexico ITC when the facility becomes operational.

The calculation of new transit trips and reduction in VMT from the future Microtransit Service for years 2025 through 2044 is presented in Exhibit 9. Assumptions, data sources and calculations associated with Exhibit 9 are provided in Exhibit 10.

Exhibit 9: New Transit Trips and VMT Reduction from the Future ICTC Microtransit Service

Project Year	Year	Annual Passengers (No BUILD)	Annual Passengers (BUILD)	Additional Annual Ridership (BUILD)	Annual VMT Reduction (BUILD)
1	2025	50,000	65,000	15,000	88,473
2	2026	50,000	80,000	30,000	176,946
3	2027	50,000	80,000	30,000	176,946
4	2028	50,000	80,000	30,000	176,946
5	2029	50,000	80,000	30,000	176,946
6	2030	50,000	80,000	30,000	176,946
7	2031	50,000	80,000	30,000	176,946
8	2032	50,000	80,000	30,000	176,946
9	2033	50,000	80,000	30,000	176,946
10	2034	50,000	80,000	30,000	176,946
11	2035	50,000	80,000	30,000	176,946
12	2036	50,000	80,000	30,000	176,946
13	2037	50,000	80,000	30,000	176,946
14	2038	50,000	80,000	30,000	176,946
15	2039	50,000	80,000	30,000	176,946
16	2040	50,000	80,000	30,000	176,946
17	2041	50,000	80,000	30,000	176,946
18	2042	50,000	80,000	30,000	176,946
19	2043	50,000	80,000	30,000	176,946
20	2044	50,000	80,000	30,000	176,946
TOTAL				585,000	3,450,449



Exhibit 10: Assumptions, Data Sources and Calculations:
New Transit Trips and VMT Reduction from the Future Microtransit Service

Item	Data	Assumptions, Data Sources, Calculations, Notes
Year	2025 -2044	Assumes project opens in year 2025 (Year 1) and benefits accrue through year 2044 (Year 20).
Annual Passengers (No Build)	50,000	Annual ridership is estimated at 50,000 – 90,000 per year. The lowest amount was selected for the analysis. Source: ICTC California Air resources Board Mobility Project Voucher Application (Via transit provider estimates), page 11. To be conservative and avoid overestimating cost and benefits, annual passenger ridership remains flat through year 2044.
Annual Passengers (Build)	65,000 Year 1; 80,000 Years 2 - 20	Assumes the new Calexico ITC transit amenities will increase ridership by 60% over two years. Source: Transportation Research Interdisciplinary Perspectives "Does improving stop amenities help increase Bus Rapid Transit ridership? Findings based on a quasi-experiment" (Xiao Shi, et. al.) 2021, Table 2 (lowest percentage increase in boardings and alightings), p 7, at www.elsevier.com/locate/trip . To be conservative, annual passenger ridership remains flat from year 2026 through year 2044.
Additional Annual Ridership (Build)	calculation	Annual Passengers (Build) – Annual Passengers (No Build).
Annual VMT Reduction (Build)	calculation	Same as Exhibit 6 (last Item, page 7).

3. Emissions Reduction and Cost Savings Calculations

The emissions reduction and cost savings in constant dollars is provided in Exhibit 11. Assumptions, data sources and calculations associated with Exhibit 11 are provided in Exhibit 12.

Exhibit 11: Emissions Reduction and Cost Savings in Constant Dollars

Project Year	Year	CO Reduced (metric tons)	CO Savings (constant \$)	CO2 Reduced (metric tons)	CO2 Savings (constant \$)	NOX Reduced (metric tons)	NOX Savings (constant \$)	PM2.5 Reduced (metric tons)	PM2.5 Savings (constant \$)	SOX Reduced (metric tons)	SOX Savings (constant \$)	VOC Reduced (metric tons)	VOC Savings (constant \$)
1	2025	0.63	\$57	200	\$11,190	0.04	\$653	0.0013	\$1,057	0.0020	\$89	0.0171	\$73
2	2026	1.07	\$96	339	\$19,336	0.07	\$1,128	0.0022	\$1,824	0.0034	\$153	0.0290	\$125
3	2027	1.07	\$96	340	\$19,745	0.07	\$1,153	0.0022	\$1,859	0.0034	\$157	0.0291	\$125
4	2028	1.07	\$97	342	\$20,500	0.07	\$1,177	0.0023	\$1,896	0.0034	\$160	0.0292	\$126
5	2029	1.08	\$97	343	\$20,918	0.07	\$1,202	0.0023	\$1,933	0.0034	\$164	0.0293	\$126
6	2030	1.08	\$97	344	\$21,341	0.07	\$1,234	0.0023	\$1,971	0.0034	\$167	0.0294	\$127
7	2031	1.09	\$98	346	\$21,767	0.07	\$1,238	0.0023	\$1,978	0.0034	\$168	0.0296	\$127
8	2032	1.09	\$98	347	\$22,198	0.07	\$1,243	0.0023	\$1,986	0.0034	\$169	0.0297	\$128
9	2033	1.09	\$99	348	\$22,633	0.07	\$1,248	0.0023	\$1,994	0.0034	\$169	0.0298	\$128
10	2034	1.10	\$99	350	\$23,072	0.07	\$1,253	0.0023	\$2,002	0.0035	\$170	0.0299	\$129
11	2035	1.10	\$99	351	\$23,516	0.07	\$1,258	0.0023	\$2,010	0.0035	\$171	0.0300	\$129
12	2036	1.11	\$100	352	\$24,317	0.07	\$1,263	0.0023	\$2,018	0.0035	\$171	0.0301	\$130
13	2037	1.11	\$100	354	\$24,772	0.07	\$1,268	0.0023	\$2,026	0.0035	\$172	0.0303	\$130
14	2038	1.12	\$101	355	\$25,232	0.07	\$1,274	0.0023	\$2,035	0.0035	\$173	0.0304	\$131
15	2039	1.12	\$101	357	\$25,696	0.07	\$1,279	0.0024	\$2,044	0.0035	\$173	0.0305	\$131
16	2040	1.13	\$101	358	\$26,166	0.07	\$1,285	0.0024	\$2,053	0.0035	\$174	0.0307	\$132
17	2041	1.13	\$102	360	\$26,642	0.07	\$1,290	0.0024	\$2,062	0.0036	\$175	0.0308	\$132
18	2042	1.14	\$102	362	\$27,122	0.07	\$1,296	0.0024	\$2,071	0.0036	\$176	0.0309	\$133
19	2043	1.14	\$103	363	\$27,972	0.07	\$1,302	0.0024	\$2,080	0.0036	\$177	0.0311	\$134
20	2044	1.15	\$103	365	\$28,466	0.07	\$1,308	0.0024	\$2,090	0.0036	\$177	0.0312	\$134
	TOTAL	21.62	\$1,946	6876	\$462,601	1.36	\$24,351	0.05	\$38,988	0.07	\$3,305	0.59	\$2,529



Exhibit 12: Assumptions, Data Sources and Calculations:
 Emissions Reduction and Cost Savings

Item	Data	Assumptions, Data Sources, Calculations, Notes
Year	2025 -2044	Assumes project opens in year 2025 (Year 1) and benefits accrue through year 2044 (Year 20).
Emissions Reduced (all emissions)	19 mph	19 miles per hour was selected as the average vehicle speed for calculating the reduction in vehicles emissions. Source: Carlos Cardelino (1998) Daily Variability of Motor Vehicle Emissions Derived from Traffic Counter Data, Journal of the Air & Waste Management Association, 48:7, 637-645, DOI: 10.1080/10473289.1998.10463709, Table 4, Urban Collector, p 642.
	Automobile Emissions Factors	The automobile emissions factors for the analysis were obtained from the California Life-Cycle Benefit/Cost Analysis Model for 2022 INFRA/RAISE Applications (Cal-B/C Corridor) version 8.1, Parameters tab, Speed 19, provided Exhibit 13.
	calculation	For each pollutant, total VMT reduction from all sources was multiplied by the pollutant emissions factor (Exhibit 13) and then converted to Metric Tons.
Emissions Cost Savings (all emissions)	calculation	For each pollutant, Emissions reduced was multiplied by the cost of the emission described in section III.1.e. to obtain savings in constant dollars.

Exhibit 13: Automobile Emissions Factors (g/mile)

Speed	CO	CO2	NOX	PM2.5	SOX	VOC	PM2.5
0	3.5182	78.9185	0.3056	0.0020	0.0008	0.3900	0.0020
15	1.0783	367.8114	0.0696	0.0027	0.0036	0.0361	0.0027
16	1.0942	366.7610	0.0702	0.0026	0.0036	0.0348	0.0026
17	1.1103	365.7136	0.0708	0.0025	0.0036	0.0335	0.0025
18	1.1267	364.6693	0.0714	0.0024	0.0036	0.0323	0.0024
19	1.1433	363.6278	0.0720	0.0024	0.0036	0.0311	0.0024
20	1.1601	362.5894	0.0726	0.0023	0.0036	0.0300	0.0023

IV. COSTS

Project costs are presented and described in Exhibit 14.



Exhibit 14: Assumptions, Data Sources and Calculations:
Cost Estimate

Item	Data	Assumptions, Data Sources, Calculations, Notes
Design	\$559,000	Design has been completed. The amount of \$559,000 is the amount expended for Design (plans, specifications, and estimates).
Property Acquisition – Purchased	\$225,000	One of three parcels that comprise the project site has been purchased. The amount of \$225,000 represents the purchase price.
Property Acquisition – Not Purchased	\$1,252,000	Two parcels remain to be purchased. The amount shown is the appraised value for both parcels combined.
Construction Management	\$1,095,019	Construction management cost represent 15% of the cost construction.
Construction	\$7,300,127	Construction cost in 2022 dollars totals \$8,593,892 (source: Calexico ITC project Construction Cost Estimate dated April 11, 2022). Constructions cost were converted to year 2020 dollars (8.5% per year reduction based on the annual inflation rate from the project cost estimate).
Maintenance and Operation	\$65,000 per year	Source: 2018 Annual Operations and Maintenance Cost from the Calexico ITC Feasibility Study, p. 55. Amount of \$61,000 (2018) escalated by 3% per year to year 2020 based on the escalation rate used in the Feasibility Study.

V. FINAL CALCULATIONS

Final BCA calculations are provided in Exhibit 15.



Exhibit 15: Benefit-Cost Analysis Final Calculations (Part 1 of 2)

Analysis Year	Calendar Year	Project Year	Constant \$s		NPV		Constant \$s		NPV		Constant \$s		NPV	
			Transit Facilities Amenities BUILD (\$2020)	Transit Facilities Amenities BUILD Discounted 7%	Mortality Reduction Benefits BUILD (\$2020)	Mortality Reduction Benefits BUILD Discounted 7%	External Hwy User Cost Savings BUILD (\$2020)	External Hwy User Cost Savings BUILD Discounted 7%	Vehicle Operating Cost Savings BUILD (\$2020)	Vehicle Operating Cost Savings BUILD Discounted 7%				
1	2020													
2	2021													
3	2022													
4	2023													
5	2024													
6	2025	1	\$547,874	\$365,072	\$543,283	\$362,013	\$64,541	\$43,006	\$203,669	\$135,713				
7	2026	2	\$663,496	\$413,192	\$922,267	\$574,341	\$109,563	\$68,230	\$345,745	\$215,312				
8	2027	3	\$664,499	\$386,745	\$925,554	\$538,681	\$109,953	\$63,994	\$346,977	\$201,944				
9	2028	4	\$665,521	\$361,999	\$928,904	\$505,262	\$110,351	\$60,024	\$348,233	\$189,416				
10	2029	5	\$666,563	\$338,847	\$932,319	\$473,944	\$110,757	\$56,303	\$349,513	\$177,675				
11	2030	6	\$667,625	\$317,184	\$935,800	\$444,592	\$111,170	\$52,816	\$350,818	\$166,671				
12	2031	7	\$668,708	\$296,914	\$939,348	\$417,082	\$111,592	\$49,548	\$352,148	\$156,358				
13	2032	8	\$669,811	\$277,948	\$942,964	\$391,297	\$112,021	\$46,485	\$353,504	\$146,692				
14	2033	9	\$670,935	\$260,200	\$946,650	\$367,127	\$112,459	\$43,614	\$354,886	\$137,631				
15	2034	10	\$672,081	\$243,593	\$950,407	\$344,471	\$112,906	\$40,922	\$356,294	\$129,137				
16	2035	11	\$673,250	\$228,053	\$954,236	\$323,233	\$113,360	\$38,399	\$357,729	\$121,175				
17	2036	12	\$674,440	\$213,510	\$958,139	\$303,322	\$113,824	\$36,034	\$359,193	\$113,711				
18	2037	13	\$675,654	\$199,902	\$962,116	\$284,656	\$114,297	\$33,816	\$360,684	\$106,713				
19	2038	14	\$676,891	\$187,166	\$966,171	\$267,154	\$114,778	\$31,737	\$362,204	\$100,152				
20	2039	15	\$678,152	\$175,247	\$970,304	\$250,745	\$115,269	\$29,788	\$363,753	\$94,001				
21	2040	16	\$679,437	\$164,093	\$974,516	\$235,358	\$115,770	\$27,960	\$365,332	\$88,232				
22	2041	17	\$680,746	\$153,653	\$978,809	\$220,930	\$116,280	\$26,246	\$366,942	\$82,824				
23	2042	18	\$682,081	\$143,883	\$983,185	\$207,400	\$116,800	\$24,638	\$368,582	\$77,751				
24	2043	19	\$683,442	\$134,738	\$987,645	\$194,711	\$117,329	\$23,131	\$370,254	\$72,994				
25	2044	20	\$684,829	\$126,179	\$992,191	\$182,810	\$117,869	\$21,717	\$371,958	\$68,533				
Total			\$13,346,035	\$4,988,119	\$18,694,807	\$6,889,128	\$2,220,890	\$818,409	\$7,008,418	\$2,582,637				



Exhibit 15: Benefit-Cost Analysis Final Calculations (Part 2 of 2)

Analysis Year	Calendar Year	Project Year	Constant \$s NPV		Constant \$s NPV		Constant \$s Total Benefits (\$2020)	Constant \$s Total Cost		Present Value Cost	Present Value Benefits	Net Benefits
			Emission Cost Savings BUILD (excluding CO ₂)	Emission Cost Savings BUILD (excluding CO ₂) Discounted 7%	CO ₂ Emission Cost Savings BUILD	CO ₂ Emission Cost Savings BUILD Discounted 3%		Initial Cost (\$2020)	Op. & Maintenance (\$2020)			
1	2020							\$784,000		\$732,710		(732,710)
2	2021											
3	2022											
4	2023							\$1,252,000		\$955,145		(955,145)
5	2024							\$8,395,146		\$5,985,623		(5,985,623)
6	2025	1	\$1,929	\$1,285	\$11,190	\$9,372	\$1,372,487		\$65,000	\$43,312	\$916,461	873,149
7	2026	2	\$3,326	\$2,071	\$19,336	\$15,722	\$2,063,732		\$65,000	\$40,479	\$1,288,869	1,248,390
8	2027	3	\$3,390	\$1,973	\$19,745	\$15,587	\$2,070,118		\$65,000	\$37,831	\$1,208,923	1,171,092
9	2028	4	\$3,455	\$1,879	\$20,500	\$15,712	\$2,076,965		\$65,000	\$35,356	\$1,134,292	1,098,937
10	2029	5	\$3,522	\$1,790	\$20,918	\$15,565	\$2,083,593		\$65,000	\$33,043	\$1,064,124	1,031,082
11	2030	6	\$3,596	\$1,708	\$21,341	\$15,417	\$2,090,351		\$65,000	\$30,881	\$998,389	967,508
12	2031	7	\$3,610	\$1,603	\$21,767	\$15,267	\$2,097,172		\$65,000	\$28,861	\$936,772	907,911
13	2032	8	\$3,623	\$1,504	\$22,198	\$15,116	\$2,104,122		\$65,000	\$26,973	\$879,040	852,067
14	2033	9	\$3,638	\$1,411	\$22,633	\$14,963	\$2,111,201		\$65,000	\$25,208	\$824,945	799,737
15	2034	10	\$3,652	\$1,324	\$23,072	\$14,809	\$2,118,412		\$65,000	\$23,559	\$774,257	750,698
16	2035	11	\$3,667	\$1,242	\$23,516	\$14,654	\$2,125,758		\$65,000	\$22,018	\$726,756	704,739
17	2036	12	\$3,682	\$1,166	\$24,317	\$14,712	\$2,133,594		\$65,000	\$20,577	\$682,455	661,878
18	2037	13	\$3,697	\$1,094	\$24,772	\$14,551	\$2,141,220		\$65,000	\$19,231	\$640,731	621,500
19	2038	14	\$3,713	\$1,027	\$25,232	\$14,389	\$2,148,988		\$65,000	\$17,973	\$601,626	583,653
20	2039	15	\$3,728	\$964	\$25,696	\$14,227	\$2,156,902		\$65,000	\$16,797	\$564,972	548,174
21	2040	16	\$3,745	\$904	\$26,166	\$14,066	\$2,164,965		\$65,000	\$15,698	\$530,614	514,915
22	2041	17	\$3,761	\$849	\$26,642	\$13,904	\$2,173,179		\$65,000	\$14,671	\$498,406	483,735
23	2042	18	\$3,778	\$797	\$27,122	\$13,743	\$2,181,548		\$65,000	\$13,712	\$468,212	454,501
24	2043	19	\$3,795	\$748	\$27,972	\$13,760	\$2,190,437		\$65,000	\$12,815	\$440,083	427,269
25	2044	20	\$3,813	\$702	\$28,466	\$13,595	\$2,199,126		\$65,000	\$11,976	\$413,538	401,561
Total			\$71,119	\$26,041	\$462,601	\$289,131	\$41,803,869	\$10,431,146	\$1,300,000	\$8,164,448	\$15,593,465	\$7,429,016

Benefit/Cost Ratio = 1.91



ATTACHMENT 1: Calexico ITC Estimated Annual Passengers (Build and No Build) for Existing ICTC Transit Service

Route	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Total Ridership Jul-Feb-2020	% Average Passengers that use the 3rd/Paulin Stop ¹	Total Estimated Passengers Jul-Feb 2020 that used the 3rd/Paulin Stop ²	Total Avg. Monthly Passengers Jul-Feb 2020 that used the 3rd/Paulin Stop ³	Total Estimated Annual Passengers that use the 3rd/Paulin Stop ⁴ (NO BUILD)	Total Estimated NEW Annual Passengers that will use the 3rd/Paulin Stop ⁵ (BUILD) Year 1	Total Estimated NEW Annual Passengers that will use the 3rd/Paulin Stop (BUILD) Years 2 - 20 ⁶
21*	2,801	4,972	9,689	10,750	5,987	3,851	4,661	4,940	47,651	32%	15,248	1,906	22,872	29,734	36,596
1N	17,810	22,148	20,177	22,941	18,361	18,027	19,045	18,381	156,890	38%	59,618	7,452	89,427	116,255	143,084
31D	1,212	1,261	1,234	1,431	1,375	1,166	1,274	1,287	10,240	50%	5,120	640	7,680	9,984	12,288
32D	1,247	1,242	1,170	1,358	1,062	1,047	1,147	968	9,241	50%	4,621	578	6,931	9,010	11,089
TOTAL	23,070	29,623	32,270	36,480	26,785	24,091	26,127	25,576	224,022			10,576	126,911	164,984	203,057

*Calexico to Imperial Valley College and back

Source: ICTC Passenger Count Surveys (boardings and alightings) at the existing transfer stop at 3rd and Paulin: July 2019-February 2020.

¹Based on the ICTC Passenger Count Surveys.

²(Total Ridership) × (Percent Average Passengers that use the existing 3rd & Paulin Bus Transfer Stop) = Estimated Passengers that use the Transfer Stop during an eight-month period (based on passenger count surveys).

³Average monthly passengers at existing transfer stop = Estimated passengers for the 8-month period ÷ 8.

⁴Estimated annual passengers at existing transfer stop = Average monthly passengers × 12 months.

^{5&6} Assumes the new Calexico ITC transit amenities will increase ridership by 60% over two years. Source: Transportation Research Interdisciplinary Perspectives "Does improving stop amenities help increase Bus Rapid Transit ridership? Findings based on a quasi-experiment" (Xiao Shi, et. al.) 2021, Table 2 (lowest percentage increase in boardings and alightings), p 7, at www.elsevier.com/locate/trip.