Cal-B/C Training Module 3

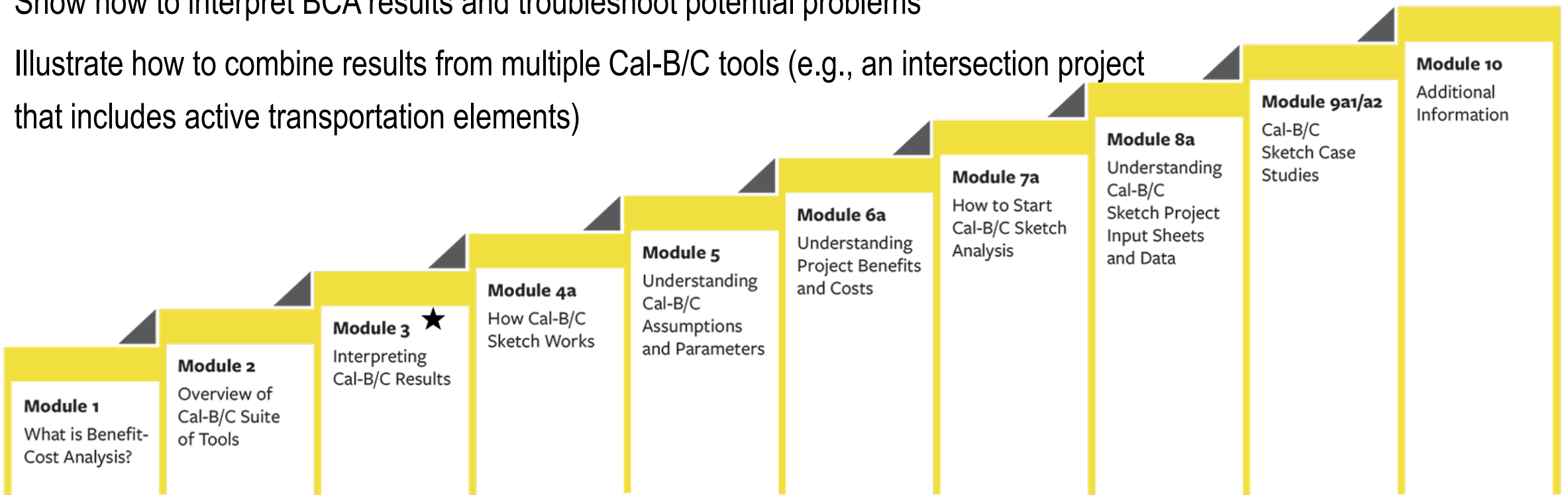
Interpreting Cal-B/C Results

01

About This Module

This module will…

- Provide a quick overview of the Cal-B/C Results worksheet
- Summarize how Cal-B/C results are used to evaluate projects by various agencies
- Provide details on each measure reported in the Results worksheet
- Show how to interpret BCA results and troubleshoot potential problems
- Illustrate how to combine results from multiple Cal-B/C tools (e.g., an intersection project that includes active transportation elements)



★ *This module is covered in this presentation*

Previous Modules…

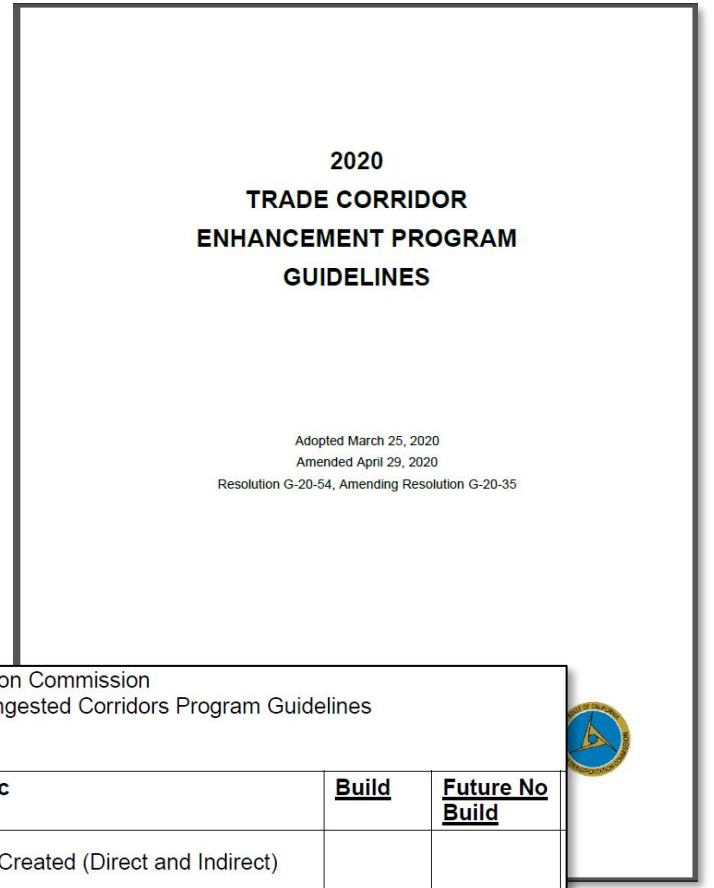
- Module 1 provided a basic introduction on benefit-cost analysis (BCA) and a general overview of how to conduct a BCA
- Module 2 described the Cal-B/C suite of tools, discussed the types of projects that can be evaluated, and provided guidance on which tools to use for various project types

02

Cal-B/C Results Overview

Why Cal-B/C Results Matter

- Used by Caltrans to assess projects proposed for:
  - Interregional portion of the State Transportation Improvement Program (STIP)
  - State Highway Operations and Protection Program (SHOPP)
  - Active Transportation Program (ATP)
- Cal-B/C specified as preferred BCA tool for applications to the California Transportation Commission (CTC) for *The Road Repair and Accountability Act of 2017*, or Senate Bill (SB) 1 grant programs:
  - Solutions for Congested Corridors Program (SCCP)
  - Trade Corridor Enhancement Program (TCEP)
- Cal-B/C recognized by the Federal Highway Administration (FHWA) for Federal grant applications


2020
TRADE CORRIDOR
ENHANCEMENT PROGRAM
GUIDELINES

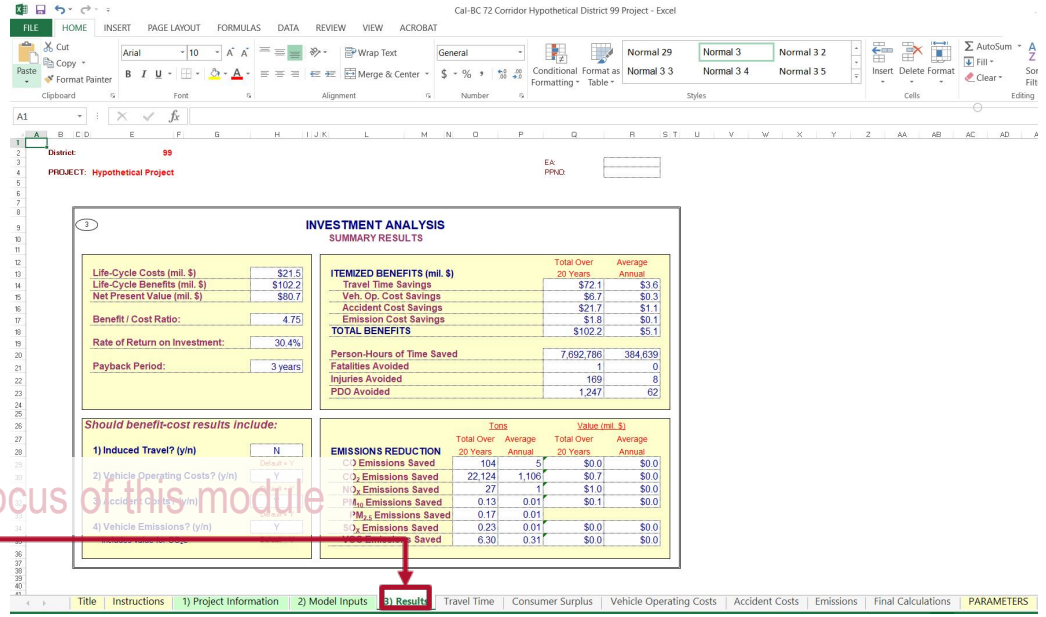
Adopted March 25, 2020
Amended April 29, 2020
Resolution G-20-54, Amending Resolution G-20-35

California Transportation Commission
2020 Solutions for Congested Corridors Program Guidelines

Measure	Metric	Build	Future No Build
Economic Vitality	Jobs Created (Direct and Indirect)		
Air Quality & GHG	Particulate Matter (PM 2.5 PM 10)		
	Carbon Dioxide (CO_2)		
	Volatile Organic Compounds (VOC)		
	Sulphur Dioxides (SO_x)		
	Carbon Monoxide (CO)		
	Nitrogen Oxides (NO_x)		
Accessibility	Number of Jobs Accessible by Mode		
	Access to Key Destinations by Mode		
	% of Population Defined as Low Income or Disadvantaged within ½ mile of rail station, ferry terminal, or high-frequency bus stop		
Cost Effectiveness	Cost Benefit Ratio		

Typical Worksheet Layout in Cal-B/C

- Worksheets vary by Cal-B/C tool, but this example from Cal-B/C Sketch is representative of the general structure of the Cal-B/C tools



"3) Results" worksheet is focus of this module

Worksheets where data are entered

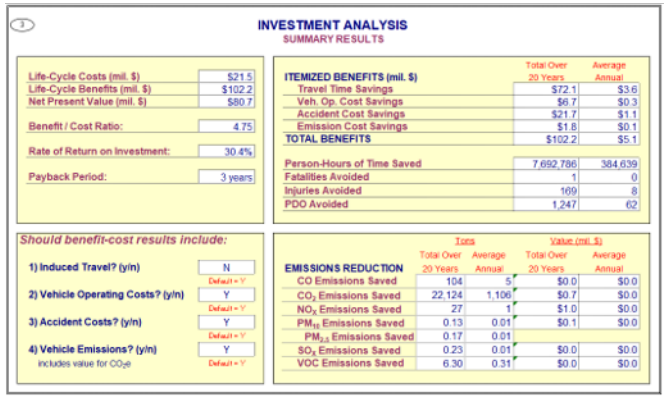
Worksheets where Cal-B/C tools perform calculations and tabulate results

Title	Instructions	1) Project Information	2) Model Inputs	3) Results	Travel Time	Vehicle Operating Costs	Accident Costs	Emissions	Final Calculations	PARAMETERS
	Summary instructions on how to fill out each data item in Cal-B/C	▪ Project Description/ Type of Project ▪ Highway Geometric and Traffic Data ▪ Highway Collision Data ▪ Rail and Transit Data ▪ Project Costs	▪ Default calculations for: ○ Speeds ○ Volumes ○ Collisions ▪ Additional ramp and arterial inputs ▪ Person-trip verification for HOV/HOT projects	▪ BCA results ▪ Itemized Benefits ($) ▪ Emission Savings (Tons)	Calculates No Build and Build Person-Hours and Costs by: ○ Year ○ Facility ○ Mode	Calculates Highway No Build and Build Fuel and Non-Fuel Costs by: ○ Year ○ Facility	Calculates No Build and Build Collision Costs by: ○ Year ○ Facility ○ Mode	Calculates No Build and Build Running and Starting Emissions and Costs: ○ Year ○ Facility ○ Mode	Tabulates final results, including: ▪ Net present value ▪ Internal rate of return	Key default analysis parameters and assumptions for all Cal-B/C tools

Cal-B/C Suite Results Worksheets

- The Results worksheet in all five tools are structured similarly with common features, including overall results and itemized benefits
- There are unique features/measures in each tool
  - Active Transportation has several measures unique to bicycle/pedestrian modes such as Program Impact Scores and Journey Quality
  - Park and Ride includes Residual Value
  - Intermodal Freight includes Shipper Cost Savings and Modal Diversion

Sketch



INVESTMENT ANALYSIS
SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$21.5
Life-Cycle Benefits (mil. $)	$102.2
Net Present Value (mil. $)	$80.7
Benefit / Cost Ratio:	4.75
Rate of Return on Investment:	30.4%
Payback Period:	3 years

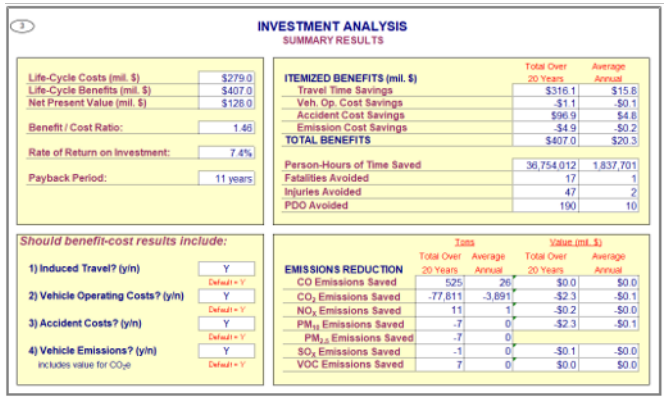
ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Travel Time Savings	$72.1	$3.6
Veh. Op. Cost Savings	$6.7	$0.3
Accident Cost Savings	$21.7	$1.1
Emission Cost Savings	$1.8	$0.1
TOTAL BENEFITS	$102.2	$5.1
Person-Hours of Time Saved	7,692,786	384,639
Fatalities Avoided	1	0
Injuries Avoided	169	8
PDO Avoided	1,247	62

Should benefit-cost results include:

1) Induced Travel? (y/n)	N
2) Vehicle Operating Costs? (y/n)	Y
3) Accident Costs? (y/n)	Y
4) Vehicle Emissions? (y/n) (includes value for CO_2e)	Y

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	104	5	$0.0	$0.0
CO_2 Emissions Saved	22,124	1,106	$0.7	$0.0
NO_X Emissions Saved	27	1	$1.0	$0.0
PM_{10} Emissions Saved	0.13	0.01	$0.1	$0.0
$PM_{2.5}$ Emissions Saved	0.17	0.01		
SO_X Emissions Saved	0.23	0.01	$0.0	$0.0
VOC Emissions Saved	6.30	0.31	$0.0	$0.0

Corridor



INVESTMENT ANALYSIS
SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$279.0
Life-Cycle Benefits (mil. $)	$407.0
Net Present Value (mil. $)	$128.0
Benefit / Cost Ratio:	1.46
Rate of Return on Investment:	7.4%
Payback Period:	11 years

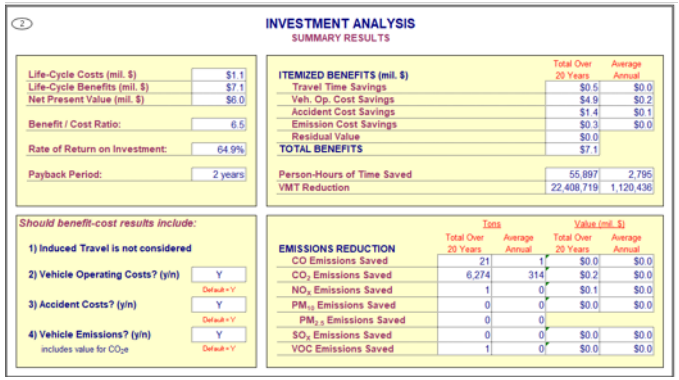
ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Travel Time Savings	$316.1	$15.8
Veh. Op. Cost Savings	-$1.1	-$0.1
Accident Cost Savings	$96.9	$4.8
Emission Cost Savings	-$4.9	-$0.2
TOTAL BENEFITS	$407.0	$20.3
Person-Hours of Time Saved	36,754,012	1,837,701
Fatalities Avoided	17	1
Injuries Avoided	47	2
PDO Avoided	190	10

Should benefit-cost results include:

1) Induced Travel? (y/n)	Y
2) Vehicle Operating Costs? (y/n)	Y
3) Accident Costs? (y/n)	Y
4) Vehicle Emissions? (y/n) (includes value for CO_2e)	Y

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	525	26	$0.0	$0.0
CO_2 Emissions Saved	-77,811	-3,891	-$2.3	-$0.1
NO_X Emissions Saved	11	1	-$0.2	-$0.0
PM_{10} Emissions Saved	-7	0	-$2.3	-$0.1
$PM_{2.5}$ Emissions Saved	-7	0		
SO_X Emissions Saved	-1	0	-$0.1	-$0.0
VOC Emissions Saved	7	0	$0.0	$0.0

Park and Ride



INVESTMENT ANALYSIS
SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$1.1
Life-Cycle Benefits (mil. $)	$7.1
Net Present Value (mil. $)	$6.0
Benefit / Cost Ratio:	6.5
Rate of Return on Investment:	64.9%
Payback Period:	2 years

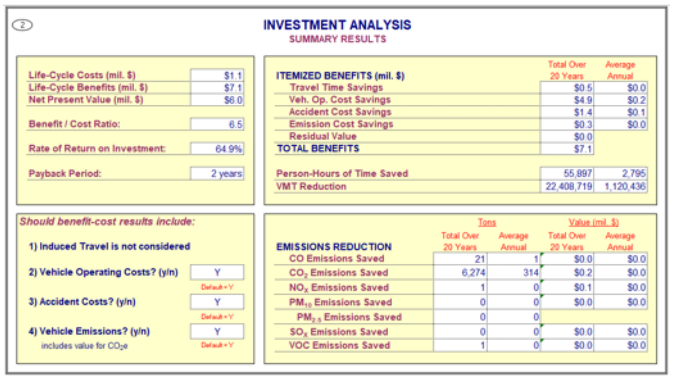
ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Travel Time Savings	$0.5	$0.0
Veh. Op. Cost Savings	$4.9	$0.2
Accident Cost Savings	$1.4	$0.1
Emission Cost Savings	$0.3	$0.0
Residual Value	$0.0	
TOTAL BENEFITS	$7.1	
Person-Hours of Time Saved	55,897	2,795
VMT Reduction	22,408,719	1,120,436

Should benefit-cost results include:

1) Induced Travel is not considered	
2) Vehicle Operating Costs? (y/n)	Y
3) Accident Costs? (y/n)	Y
4) Vehicle Emissions? (y/n) (includes value for CO_2e)	Y

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	21	1	$0.0	$0.0
CO_2 Emissions Saved	6,274	314	$0.2	$0.0
NO_X Emissions Saved	1	0	$0.1	$0.0
PM_{10} Emissions Saved	0	0	$0.0	$0.0
$PM_{2.5}$ Emissions Saved	0	0		
SO_X Emissions Saved	0	0	$0.0	$0.0
VOC Emissions Saved	1	0	$0.0	$0.0

Active Transportation



INVESTMENT ANALYSIS
SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$1.1
Life-Cycle Benefits (mil. $)	$7.1
Net Present Value (mil. $)	$6.0
Benefit / Cost Ratio:	6.5
Rate of Return on Investment:	64.9%
Payback Period:	2 years

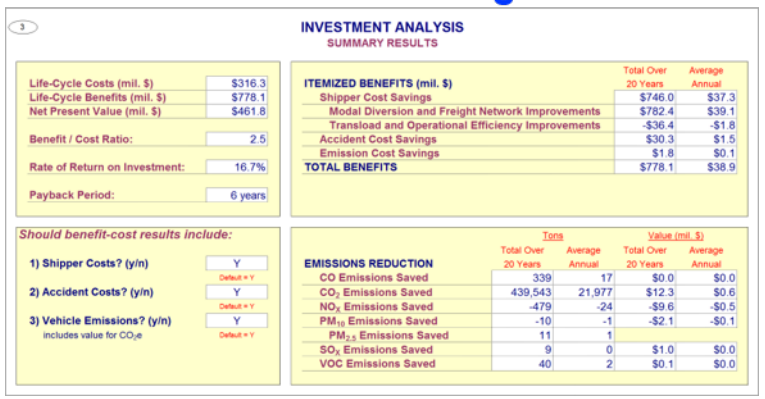
ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Travel Time Savings	$0.5	$0.0
Veh. Op. Cost Savings	$4.9	$0.2
Accident Cost Savings	$1.4	$0.1
Emission Cost Savings	$0.3	$0.0
Residual Value	$0.0	
TOTAL BENEFITS	$7.1	
Person-Hours of Time Saved	55,897	2,795
VMT Reduction	22,408,719	1,120,436

Should benefit-cost results include:

1) Induced Travel is not considered	
2) Vehicle Operating Costs? (y/n)	Y
3) Accident Costs? (y/n)	Y
4) Vehicle Emissions? (y/n) (includes value for CO_2e)	Y

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	21	1	$0.0	$0.0
CO_2 Emissions Saved	6,274	314	$0.2	$0.0
NO_X Emissions Saved	1	0	$0.1	$0.0
PM_{10} Emissions Saved	0	0	$0.0	$0.0
$PM_{2.5}$ Emissions Saved	0	0		
SO_X Emissions Saved	0	0	$0.0	$0.0
VOC Emissions Saved	1	0	$0.0	$0.0

Intermodal Freight



INVESTMENT ANALYSIS
SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$316.3
Life-Cycle Benefits (mil. $)	$778.1
Net Present Value (mil. $)	$461.8
Benefit / Cost Ratio:	2.5
Rate of Return on Investment:	16.7%
Payback Period:	6 years

ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Shipper Cost Savings	$746.0	$37.3
Modal Diversion and Freight Network Improvements	$782.4	$39.1
Transload and Operational Efficiency Improvements	-$36.4	-$1.8
Accident Cost Savings	$30.3	$1.5
Emission Cost Savings	$1.8	$0.1
TOTAL BENEFITS	$778.1	$38.9

Should benefit-cost results include:

1) Shipper Costs? (y/n)	Y
2) Accident Costs? (y/n)	Y
3) Vehicle Emissions? (y/n) (includes value for CO_2e)	Y

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	339	17	$0.0	$0.0
CO_2 Emissions Saved	439,543	21,977	$12.3	$0.6
NO_X Emissions Saved	-479	-24	-$9.6	-$0.5
PM_{10} Emissions Saved	-10	-1	-$2.1	-$0.1
$PM_{2.5}$ Emissions Saved	11	1		
SO_X Emissions Saved	9	0	$1.0	$0.0
VOC Emissions Saved	40	2	$0.1	$0.0

Four Areas of Reported Results or User Options

- All Cal-B/C Tool Results worksheets are organized in a similar manner, though reported measures may differ by tool

1 Overall Results

- Reports Benefit/Cost Ratio and other overall project results

2 User-Defined Options

- Adjusts how results are reported
- Allows user to include or exclude certain benefit factors

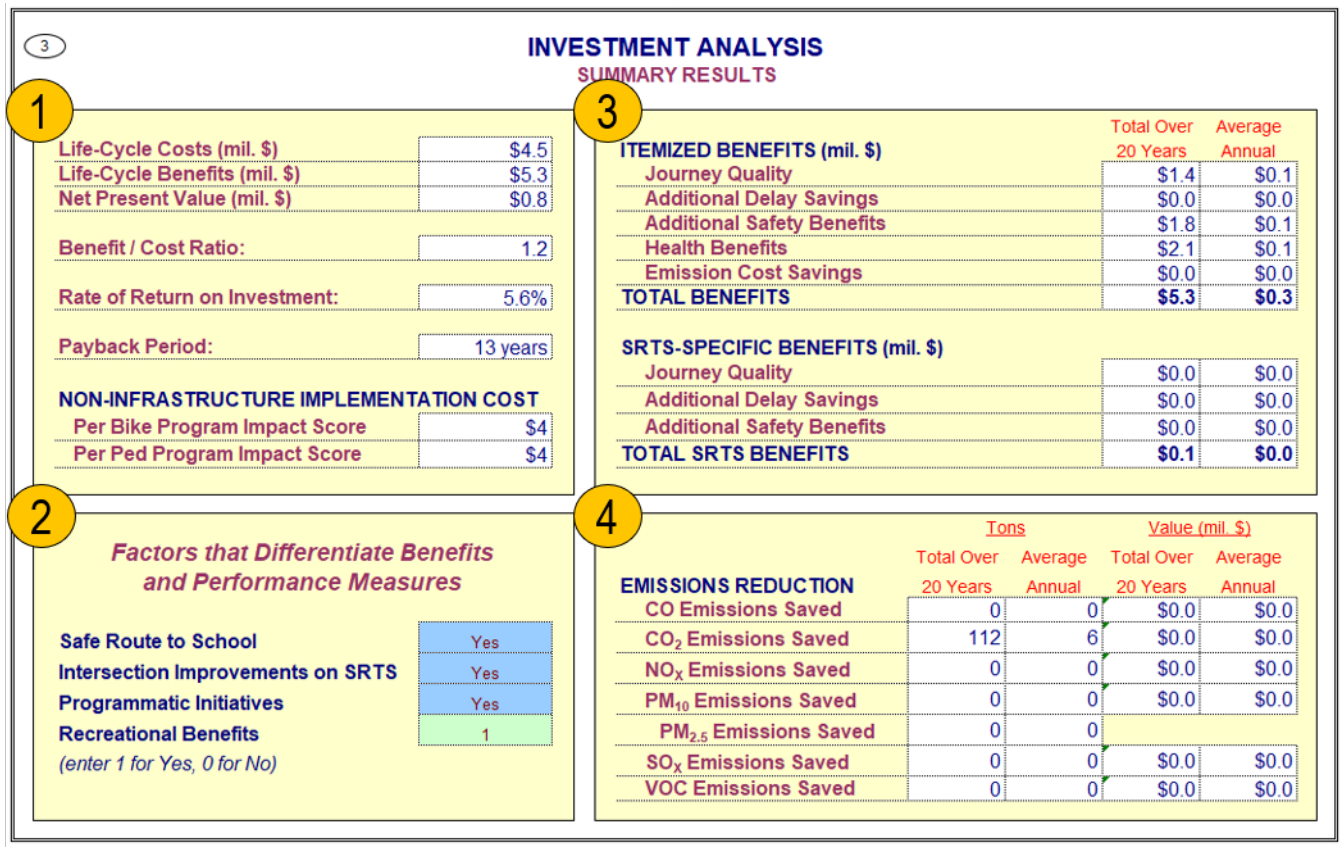
3 Itemized Benefits

- Provides itemized benefits relevant to the types of projects analyzed by each tool

4 Emissions Reduction

- Reports emissions in $ millions and short tons (similar across all tools)

Active Transportation Results Worksheet Used for Illustrative Purposes



3

INVESTMENT ANALYSIS

SUMMARY RESULTS

1

Life-Cycle Costs (mil. $)	$4.5
Life-Cycle Benefits (mil. $)	$5.3
Net Present Value (mil. $)	$0.8
Benefit / Cost Ratio:	1.2
Rate of Return on Investment:	5.6%
Payback Period:	13 years
NON-INFRASTRUCTURE IMPLEMENTATION COST	
Per Bike Program Impact Score	$4
Per Ped Program Impact Score	$4

3

ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Journey Quality	$1.4	$0.1
Additional Delay Savings	$0.0	$0.0
Additional Safety Benefits	$1.8	$0.1
Health Benefits	$2.1	$0.1
Emission Cost Savings	$0.0	$0.0
TOTAL BENEFITS	**$5.3**	**$0.3**
SRTS-SPECIFIC BENEFITS (mil. $)		
Journey Quality	$0.0	$0.0
Additional Delay Savings	$0.0	$0.0
Additional Safety Benefits	$0.0	$0.0
TOTAL SRTS BENEFITS	**$0.1**	**$0.0**

2

Factors that Differentiate Benefits and Performance Measures

Safe Route to School	Yes
Intersection Improvements on SRTS	Yes
Programmatic Initiatives	Yes
Recreational Benefits	1

(enter 1 for Yes, 0 for No)

4

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	0	0	$0.0	$0.0
CO_2 Emissions Saved	112	6	$0.0	$0.0
NO_X Emissions Saved	0	0	$0.0	$0.0
PM_{10} Emissions Saved	0	0	$0.0	$0.0
$PM_{2.5}$ Emissions Saved	0	0		
SO_X Emissions Saved	0	0	$0.0	$0.0
VOC Emissions Saved	0	0	$0.0	$0.0

Performance Results

- 44 measures or user-identified options available
- Not all measures are reported in all tools
- Dollar values are always reported in present value
  - Present value provides a fair comparison between alternatives
  - "A dollar today is worth more than a dollar tomorrow"
- When combining results from multiple Cal-B/C tools many itemized benefits can be added together
  - Emission Reduction benefits and Emission Cost Savings
  - Other itemized benefits are common to only one or two tools (e.g., Journey Quality)

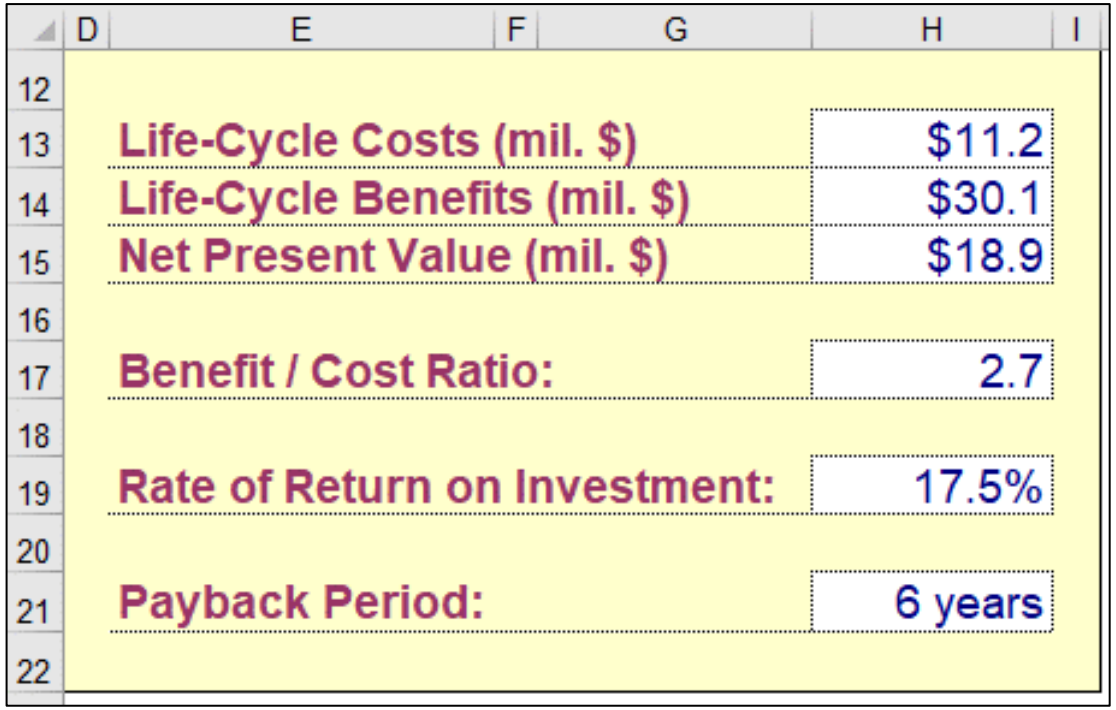
		Results Measure/Option	Units of Measure/ Option Choices	Reported in Cal-B/C Tool				
				Sketch	Corridor	Park and Ride	Active Transportation	Intermodal Freight
1	Overall Results	Life-Cycle Costs	Million $	◆	◆	◆	◆	◆
		Life-Cycle Benefits	Million $	◆	◆	◆	◆	◆
		Net Present Value	Million $	◆	◆	◆	◆	◆
		Benefit / Cost Ratio	Ratio	◆	◆	◆	◆	◆
		Rate of Return on Investment	Percent	◆	◆	◆	◆	◆
		Payback Period	Years	◆	◆	◆	◆	◆
		Per Bike Program Impact Score	Number				◆	
		Per Ped Program Impact Score	Number				◆	
2	User-Defined Options	Induced Travel	Yes or No	◆	◆	◆		
		Vehicle Operating Costs	Yes or No	◆	◆	◆		
		Accident Costs	Yes or No	◆	◆	◆		◆
		Vehicle Emissions	Yes or No	◆	◆	◆		◆
		Safe Route to School	Yes or No				◆	
		Intersection Improvements on SRTS	Yes or No				◆	
		Programmatic Initiatives	Yes or No				◆	
		Recreational Benefits	Yes or No				◆	
		Shipper Costs	Yes or No					◆
3	Itemized Benefits	Travel Time Savings	Million $	◆	◆	◆		
		Vehicle Operating Cost Savings	Million $	◆	◆	◆		
		Accident Cost Savings	Million $	◆	◆	◆		◆
		Emission Cost Savings	Million $	◆	◆	◆	◆	◆
		Person-Hours of Time Saved	Number	◆	◆	◆		
		Fatalities Avoided	Number		◆			
		Injuries Avoided	Number		◆			
		PDO Avoided	Number		◆			
		VMT Reduction	Number			◆		
		Residual Value	Million $			◆		
		Journey Quality	Million $				◆	
		Additional Delay Savings	Million $				◆	
		Additional Safety Benefits	Million $				◆	
		Health Benefits	Million $				◆	
		Journey Quality	Million $				◆	
		Additional Delay Savings	Million $				◆	
		Additional Safety Benefits	Million $				◆	
		Modal Diversion and Freight Network Improvements	Million $					◆
		Shipper Cost Savings	Million $					◆
		Transload and Operational Efficiency Improvements	Million $					◆
4	Emissions Reductions	CO Emissions Saved	Tons/Million $	◆	◆	◆	◆	◆
		CO2 Emissions Saved	Tons/Million $	◆	◆	◆	◆	◆
		NOX Emissions Saved	Tons/Million $	◆	◆	◆	◆	◆
		PM10 Emissions Saved	Tons/Million $	◆	◆	◆	◆	◆
		PM2.5 Emissions Saved	Tons	◆	◆	◆	◆	◆
		SOX Emissions Saved	Tons/Million $	◆	◆	◆	◆	◆
		VOC Emissions Saved	Tons/Million $	◆	◆	◆	◆	◆

03

Overall Results

Overall Results

- Most measures are common across all 5 Cal-B/C tools
- Two summary measures are unique to Cal-B/C AT and will be discussed in subsequent slides



Life-Cycle Costs (mil. $)	$11.2
Life-Cycle Benefits (mil. $)	$30.1
Net Present Value (mil. $)	$18.9
Benefit / Cost Ratio:	2.7
Rate of Return on Investment:	17.5%
Payback Period:	6 years

Measures unique to Cal-B/C AT

	Results Measure	Units of Measure	Reported in Cal-B/C Tool				
			Sketch	Corridor	Park and Ride	Active Transportation	Intermodal Freight
Overall Results	Life-Cycle Costs	Million $	◆	◆	◆	◆	◆
	Life-Cycle Benefits	Million $	◆	◆	◆	◆	◆
	Net Present Value	Million $	◆	◆	◆	◆	◆
	Benefit / Cost Ratio	Ratio	◆	◆	◆	◆	◆
	Rate of Return on Investment	Percent	◆	◆	◆	◆	◆
	Payback Period	Years	◆	◆	◆	◆	◆
	Per Bike Program Impact Score	Number				◆	
	Per Ped Program Impact Score	Number				◆	

Overall Results – Common Measures

Life-Cycle Costs

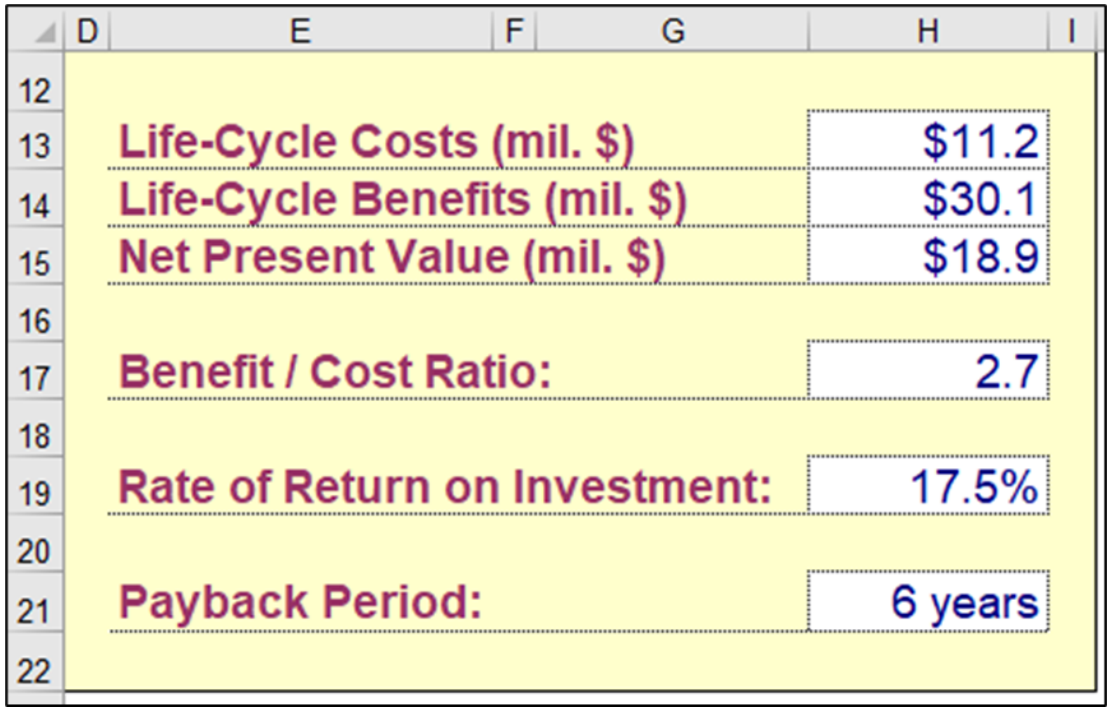
- Present values of all net project costs in in real current dollars
- Costs are entered in Project Costs section of *Project Information* worksheet

Life-Cycle Benefits

- Sum of the present value benefits for the project
- Benefits aggregated in Section A of the *Final Calculation* worksheet

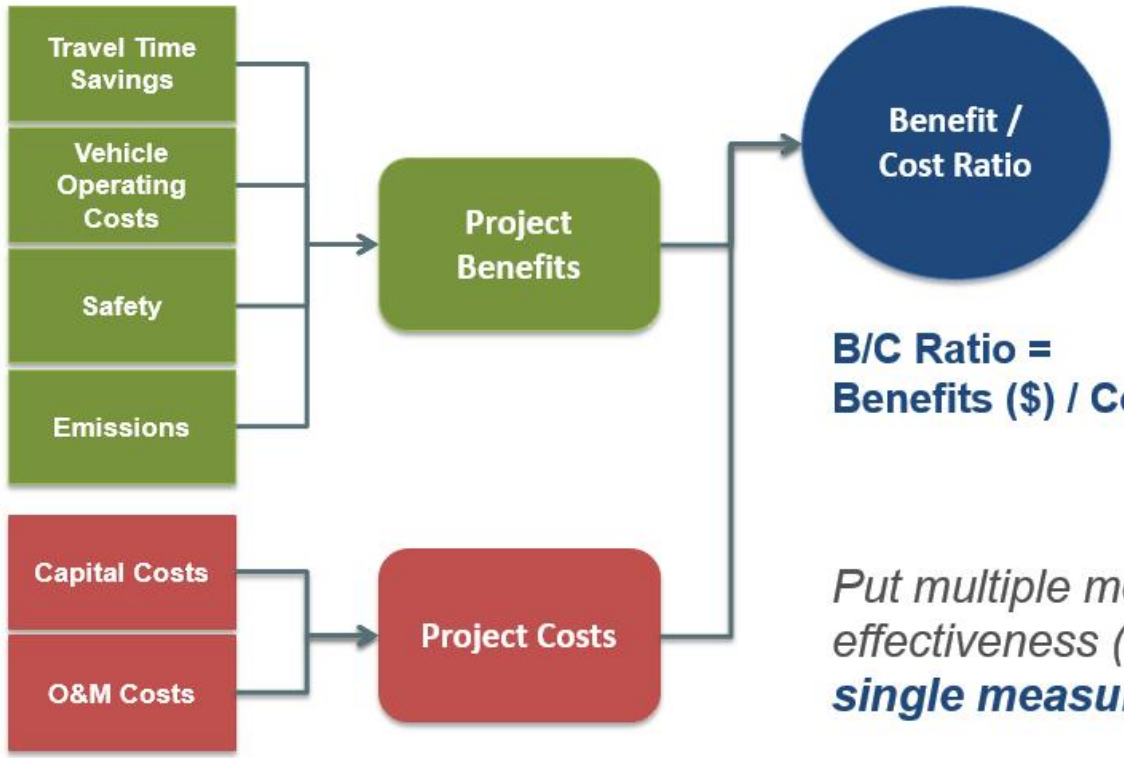
Net Present Value

- Lifecycle benefits minus lifecycle costs
- If Benefits > Costs, then the project has a positive net present value



Overall Results – Benefit-Cost Ratio

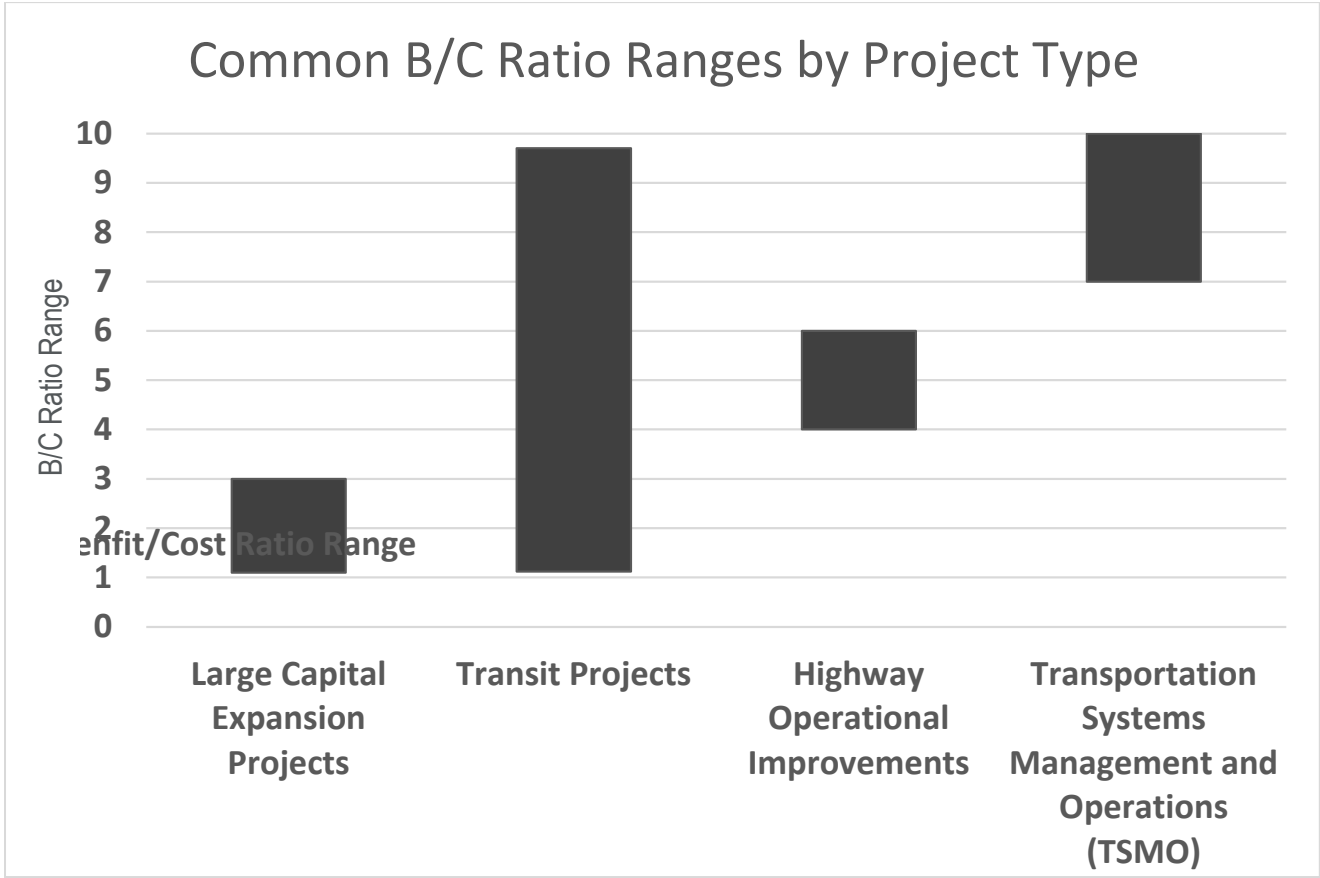
- Summarizes multiple measures into a single measure
- Shows the benefits relative to the costs of a project
- Benefit-Cost Ratio (B/C) Ratio = Lifecycle Benefits / Lifecycle Costs
- A project with a benefit-cost ratio greater than one (1.0) has a positive economic value



Typical B/C Ratios

- Benefit/Cost ratios > 1.0 indicate that the project is economically efficient

- Benefit/Cost ratios can vary widely, even among similar projects
  - Transit projects B/C ratios depend on type of project, rural/urban, and other factors



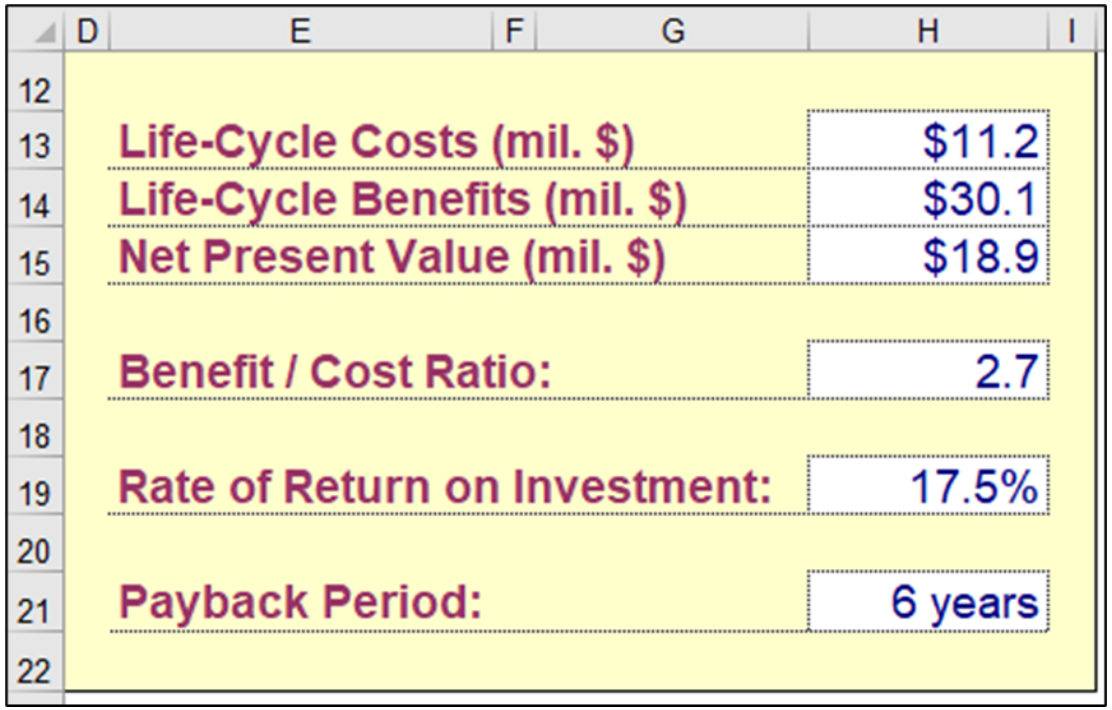
Overall Results – More Common Measures

Rate of Return on Investment

- Discount rate at which benefits and costs are equal
- Calculated in Section C of *Final Calculation* worksheet
- If Rate of Return > Discount Rate, then project has a positive economic value
- Rate of Return can be compared among projects to assist with project staging

Payback Period

- Number of years for net benefits = initial construction costs
- Calculated in Section C of the *Final Calculation* worksheet
- If Payback Period > Project Lifecycle, then initial construction costs are not recovered
- Payback period varies inversely with the benefit-cost ratio (shorter payback period → higher benefit-cost ratio)

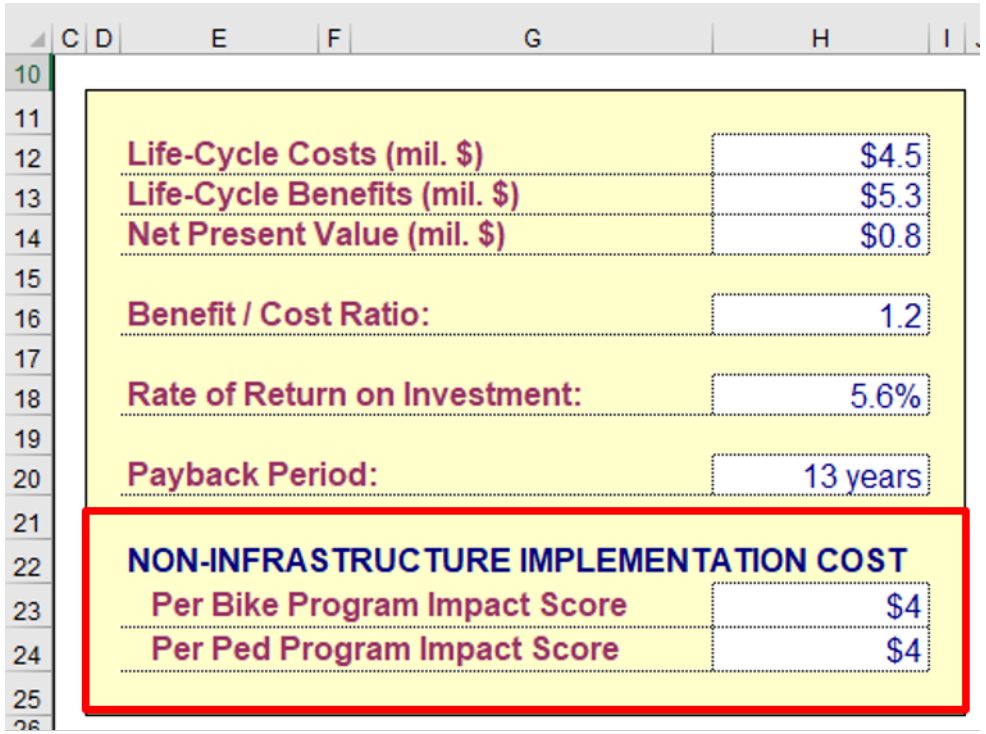


	D	E	F	G	H	I
12						
13		Life-Cycle Costs (mil. $)			$11.2	
14		Life-Cycle Benefits (mil. $)			$30.1	
15		Net Present Value (mil. $)			$18.9	
16						
17		Benefit / Cost Ratio:			2.7	
18						
19		Rate of Return on Investment:			17.5%	
20						
21		Payback Period:			6 years	
22						

Overall Results – Measures Specific to Cal-B/C AT

Bike and Pedestrian Program Impact Scores

- Non-infrastructure AT projects include education, encouragement, and enforcement programs
- Unlike bike lanes, non-infrastructure AT projects are unable to be evaluated for benefits
  - No benefit-cost analysis can be done
- Non-infrastructure AT projects are evaluated with a point system
- Calculated in Section 1I of *Non-Inf Program Info* worksheet of Cal-B/C AT
- Able to compare projects with accompanying AT non-infrastructure programs as having a higher value than a similar project without such programs



Life-Cycle Costs (mil. $)	$4.5
Life-Cycle Benefits (mil. $)	$5.3
Net Present Value (mil. $)	$0.8
Benefit / Cost Ratio:	1.2
Rate of Return on Investment:	5.6%
Payback Period:	13 years
NON-INFRASTRUCTURE IMPLEMENTATION COST	
Per Bike Program Impact Score	$4
Per Ped Program Impact Score	$4

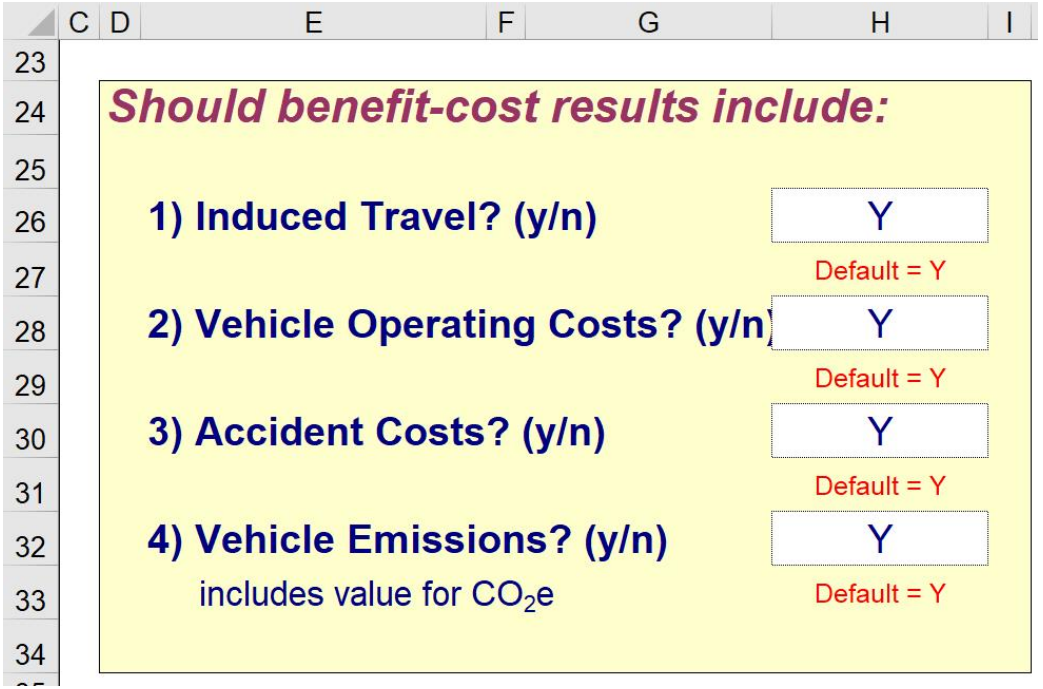
Measures unique to Cal-B/C AT

04

User-Defined Options

User-Defined Options

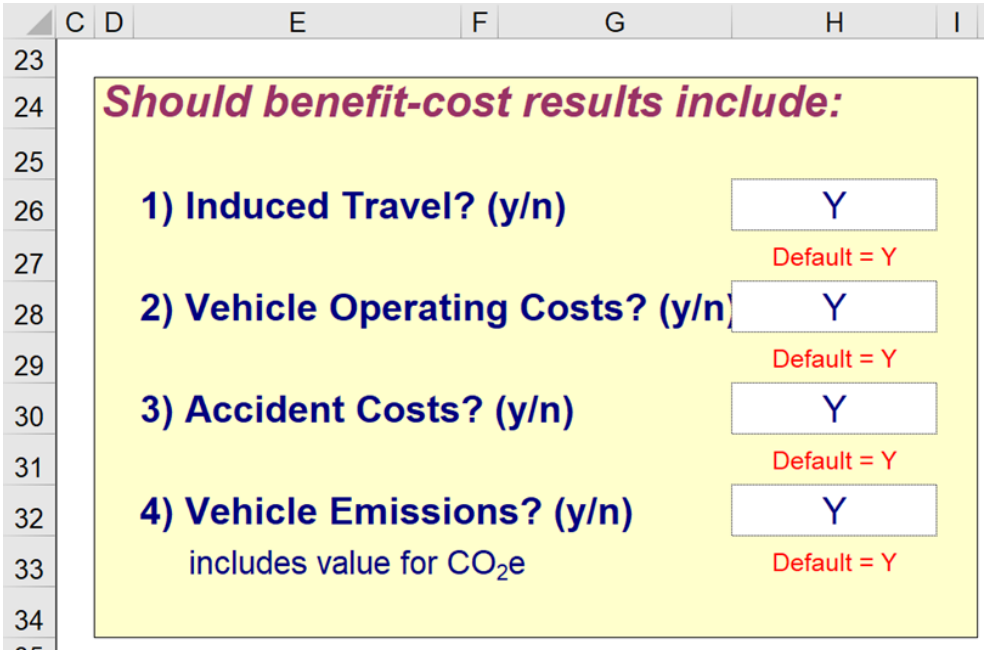
- Each tool has User-Identified Inputs
- Allows user to include or exclude select benefits from analysis
- For example, for a transit project, Cal-B/C Sketch assumes that highway demand is inelastic (i.e., no induced demand occurs)
- For highway projects, if "Y" is selected for induced demand, Cal-B/C will account for induced demand when calculating benefits
- Users can exclude benefits to see how the B/C ratio would be affected



	Results Measure	Units of Measure	Reported in Cal-B/C Tool				
			Sketch	Corridor	Park and Ride	Active Transportation	Intermodal Freight
User-Identified Options	Induced Travel	Yes or No	◆	◆	◆		
	Vehicle Operating Costs	Yes or No	◆	◆	◆		
	Accident Costs	Yes or No	◆	◆	◆		◆
	Vehicle Emissions	Yes or No	◆	◆	◆		◆
	Safe Route to School	Yes or No				◆	
	Intersection Improvements on SRTS	Yes or No				◆	
	Programmatic Initiatives	Yes or No				◆	
	Recreational Benefits	1=Yes, 0=No				◆	
	Shipper Costs	Yes or No					◆

User-Defined Options – Most Cal-B/C Tools

- Common to Cal-B/C Sketch, Corridor, and PnR
- User-identified inputs for other Cal-B/C tools are discussed on subsequent slides



Induced Travel

- Allows user to include/exclude induced demand

Vehicle Operating Costs

- Allows user to include/exclude vehicle operating cost savings (e.g., if these impacts are negative due to induced demand)

Accident Costs

- Allows user to include/exclude accident cost savings

Vehicle Emissions

- Allows user to include/exclude vehicle emissions cost savings (e.g., if a particular area does not want to report emission impacts)

User-Defined Options – Cal-B/C AT

Safe Route to School (SRTS)

- Allows user to include/exclude SRTS benefits

Intersection Improvements on SRTS

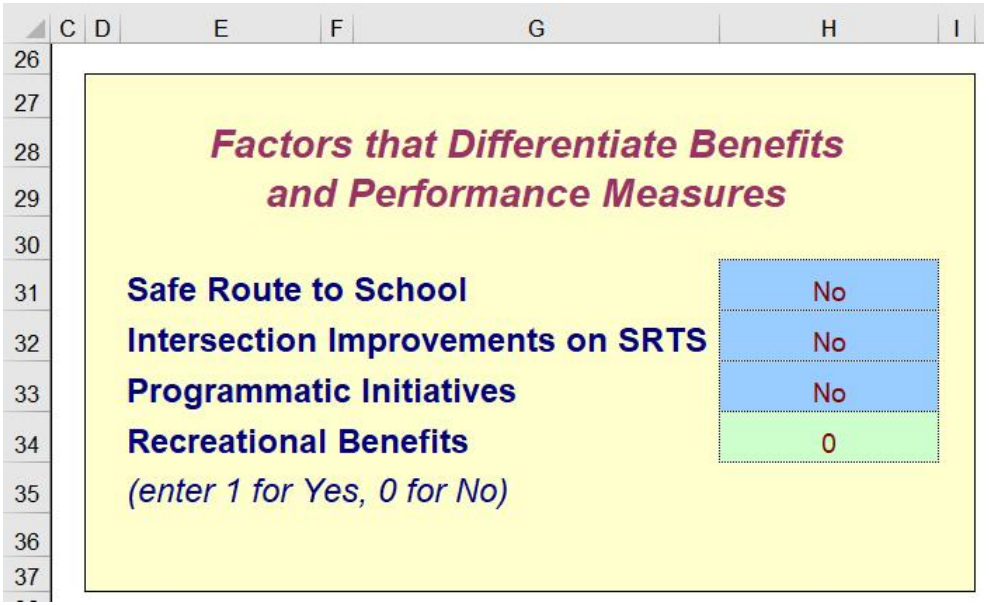
- Allows user to include/exclude intersection improvement benefits related to SRTS

Programmatic Initiatives

- Allows user to include/exclude programmatic initiatives

Recreation Benefits

- Allows user to include/exclude recreational benefits (e.g., if preparing a federal grant application that does not allow recreation benefits to be included)



User-Defined Options – Cal-B/C IF

Shipper Costs

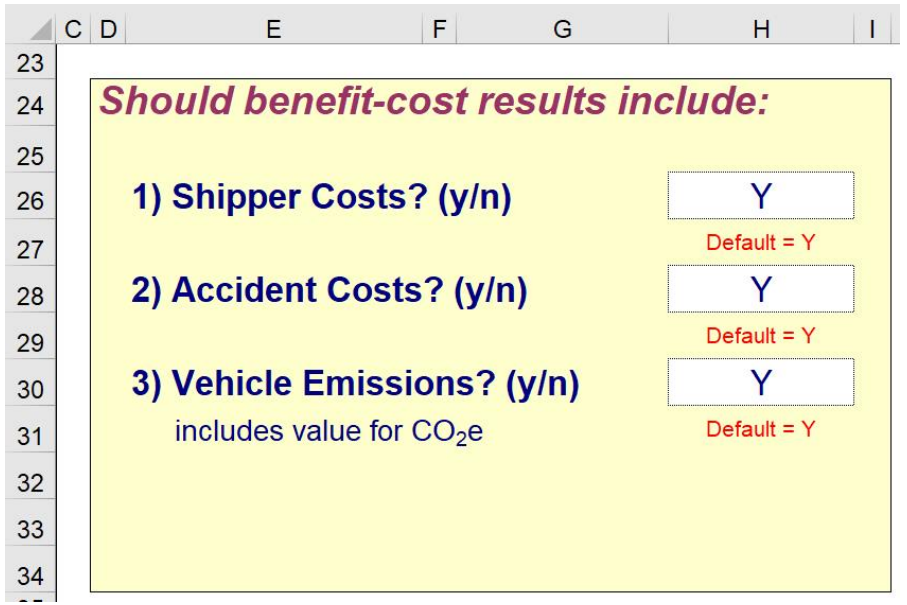
- Allows user to include/exclude shipper cost savings

Accident Costs

- Allows user to include/exclude accident cost savings

Vehicle Emissions

- Allows user to include/exclude vehicle emissions cost savings (e.g., if a particular area does not want to report emission impacts)



05

Itemized Benefits

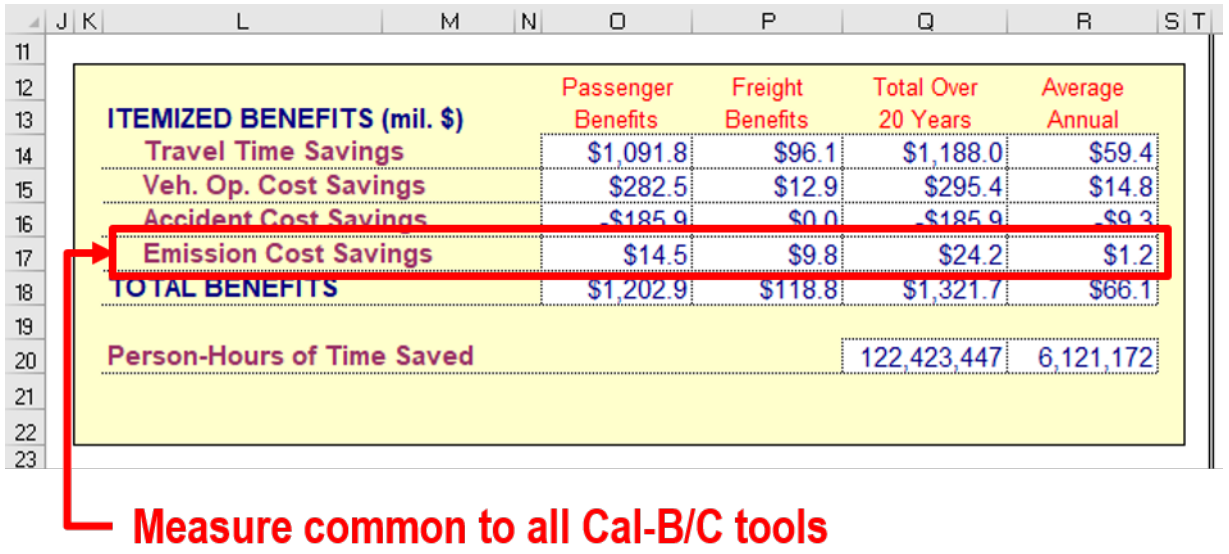
Itemized Benefits

	Results Measure	Units of Measure	Reported in Cal-B/C Tool				
			Sketch	Corridor	Park and	Active Transportation	Intermodal Freight
Itemized Benefits	Travel Time Savings	Million $	◆	◆	◆		
	Vehicle Operating Cost Savings	Million $	◆	◆	◆		
	Accident Cost Savings	Million $	◆	◆	◆		◆
	Emission Cost Savings	Million $	◆	◆	◆	◆	◆
	Person-Hours of Time Saved	Number	◆	◆	◆		
	Fatalities Avoided	Number		◆			
	Injuries Avoided	Number		◆			
	PDO Avoided	Number		◆			
	VMT Reduction	Number			◆		
	Residual Value	Million $			◆		
	Journey Quality	Million $				◆	
	Additional Delay Savings	Million $				◆	
	Additional Safety Benefits	Million $				◆	
	Health Benefits	Million $				◆	
	Journey Quality	Million $				◆	
	Additional Delay Savings	Million $				◆	
	Additional Safety Benefits	Million $				◆	
	Modal Diversion and Freight Network Improveme	Million $					◆
	Shipper Cost Savings	Million $					◆
	Transload and Operational Efficiency Improvemer	Million $					◆

Itemized Benefits – Measures Common to All Cal-B/C Tools

Emission Cost Savings

- Total emission cost savings from reducing emission of pollutants
  - Benefit to society due to reduction in emissions
- Calculated in *Emissions* worksheet (section varies by tool)
  - Function of travel volumes, speeds, and pollutant costs per ton emitted
- Emission reduction by pollutant is described in the next section of this module



Itemized Benefits – Cal-B/C Sketch, Corridor, and PnR Measures

Travel Time Savings

- Calculated in *Travel Time* worksheet
  - Function of change in travel time and value of time for people and trucks
- Typically accounts for majority of benefits for expansion projects

Vehicle Operating Cost Savings

- Fuel + Non-Fuel (tires and maintenance) Savings
- Calculated in *Vehicle Operating Costs* worksheet
  - Function of speed, fuel prices, fuel consumption, VMT, non-fuel costs, depreciation

Accident Cost Savings (also in Cal-B/C IF)

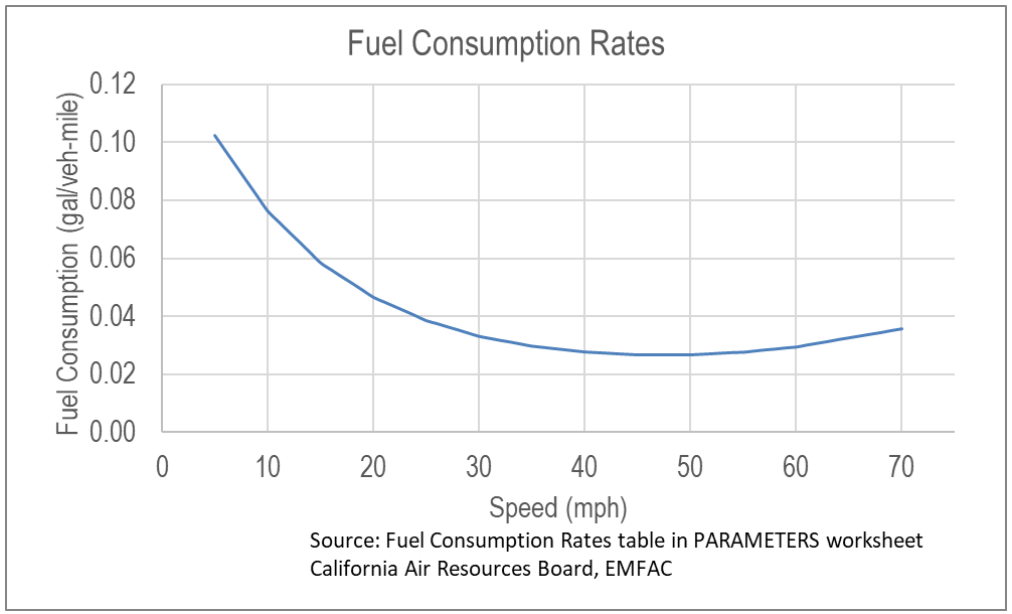
- Difference in number and severity of accidents
- Calculated in *Accident Costs* worksheet
  - Function of VMT, collision rates, and costs per collision severity

Person-Hours of Time Saved

- Reduction in person-hours of travel time due to the project
- Summarized in *Final Calculations* worksheet
  - Function of speed, volumes, and average vehicle occupancy

Measures common to Cal-B/C Sketch, Corridor, and PnR

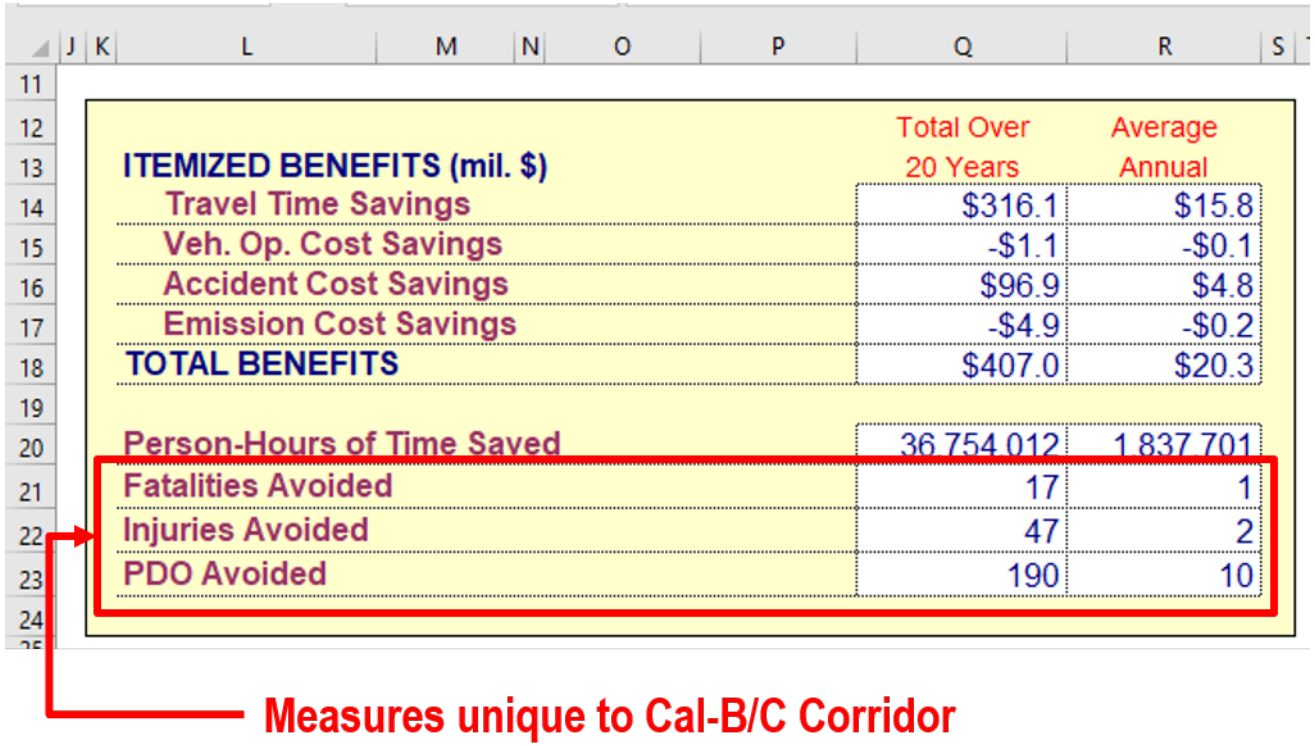
ITEMIZED BENEFITS (mil. $)	Passenger Benefits	Freight Benefits	Total Over 20 Years	Average Annual
Travel Time Savings	$1,091.8	$96.1	$1,188.0	$59.4
Veh. Op. Cost Savings	$282.5	$12.9	$295.4	$14.8
Accident Cost Savings	-$185.9	$0.0	-$185.9	-$9.3
Emission Cost Savings	$14.5	$9.8	$24.2	$1.2
TOTAL BENEFITS	$1,202.9	$118.8	$1,321.7	$66.1
Person-Hours of Time Saved			122,423,447	6,121,172



Itemized Benefits – Cal-B/C Corridor Only Measures

Fatalities, Injuries, Property Damage Only (PDO) Avoided

- Decrease in number and severity of accidents from the project
- Calculated in *Accident Costs* worksheet
  - Function of VMT and collision rates
- Collision rates calculated for fatal, injury, and property damage only (PDO) collisions
  - Based on data inputted by user



ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Travel Time Savings	$316.1	$15.8
Veh. Op. Cost Savings	-$1.1	-$0.1
Accident Cost Savings	$96.9	$4.8
Emission Cost Savings	-$4.9	-$0.2
TOTAL BENEFITS	$407.0	$20.3
Person-Hours of Time Saved	36,754,012	1,837,701
Fatalities Avoided	17	1
Injuries Avoided	47	2
PDO Avoided	190	10

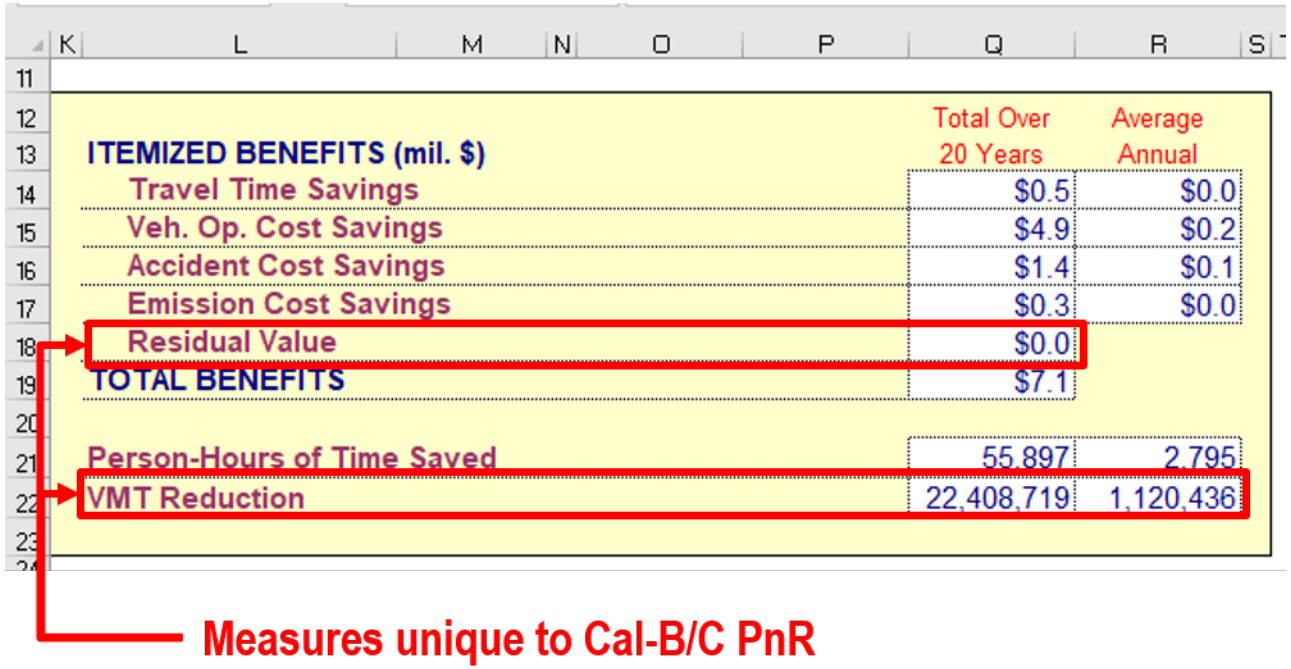
Itemized Benefits – Cal-B/C PnR Only Measures

Residual Value

- Residual value of the park and ride project
- Calculated in Section 1D of the *Project Information* worksheet
- Model automatically includes the residual value of the right-of-way in the analysis (at end of life-cycle, agency still owns real estate purchased for project)

VMT Reduction

- Calculated in *Vehicle Operating Costs* worksheet
- VMT reductions are achieved by switching drivers to transit



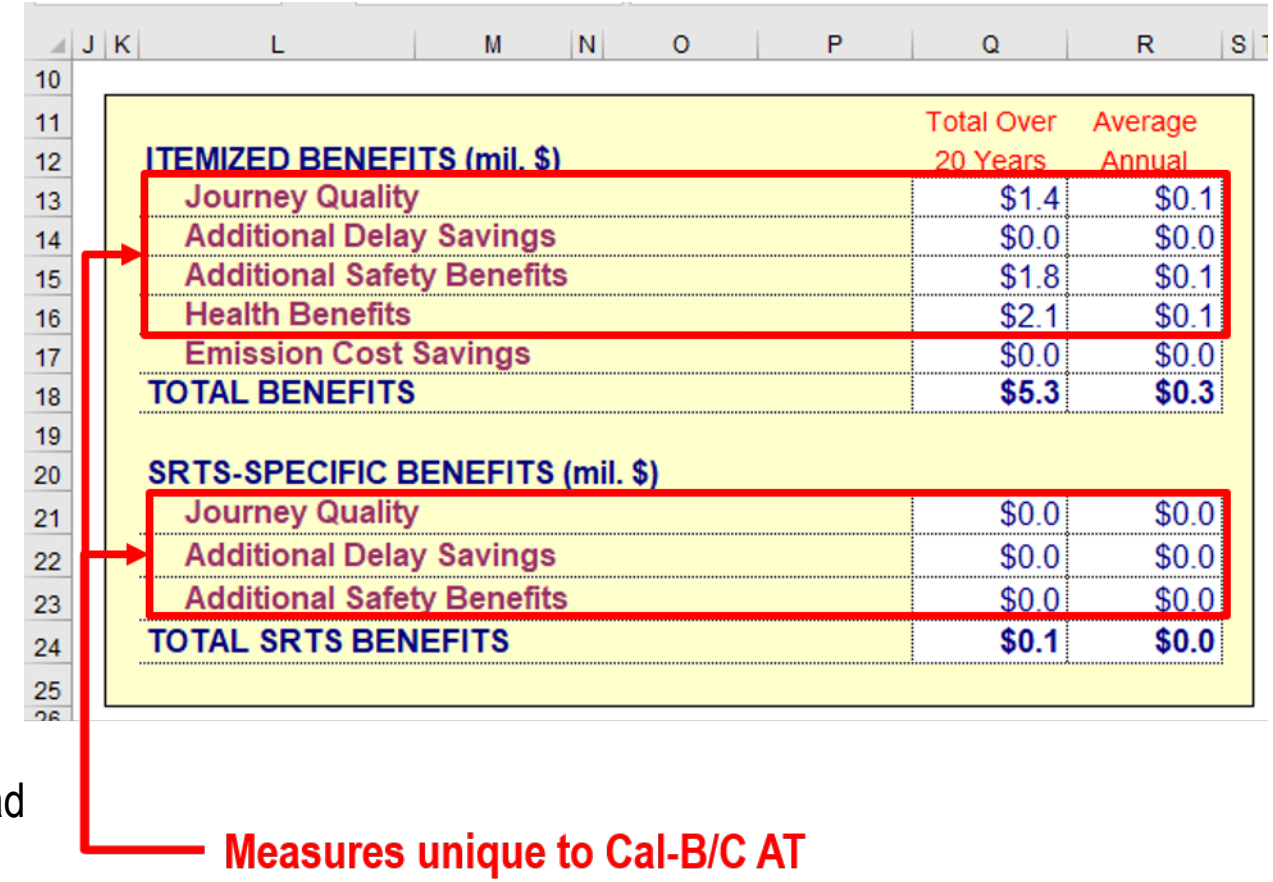
Itemized Benefits – Cal-B/C AT Only Measures

Journey Quality

- Improvements that arise from greater feeling of safety, comfort, aesthetics, and other types of improvements
  - Perception of safety is different than actual safety, so additional collision reduction is excluded from measure to avoid double-counting benefits
- Calculated in *Journey Quality* worksheet

Additional Delay Savings

- Benefits are additional for improvements on existing facilities
- Total reduction in intersection delay due to improvements at intersections on an existing bike/pedestrian facility
  - Function of reduced wait times at intersections
- Improvements to existing intersections (e.g., lights, bridges) can lead to time savings for trips by reducing waiting time at intersections



Itemized Benefits – Cal-B/C AT Only Measures (cont'd)

Additional Safety Benefits

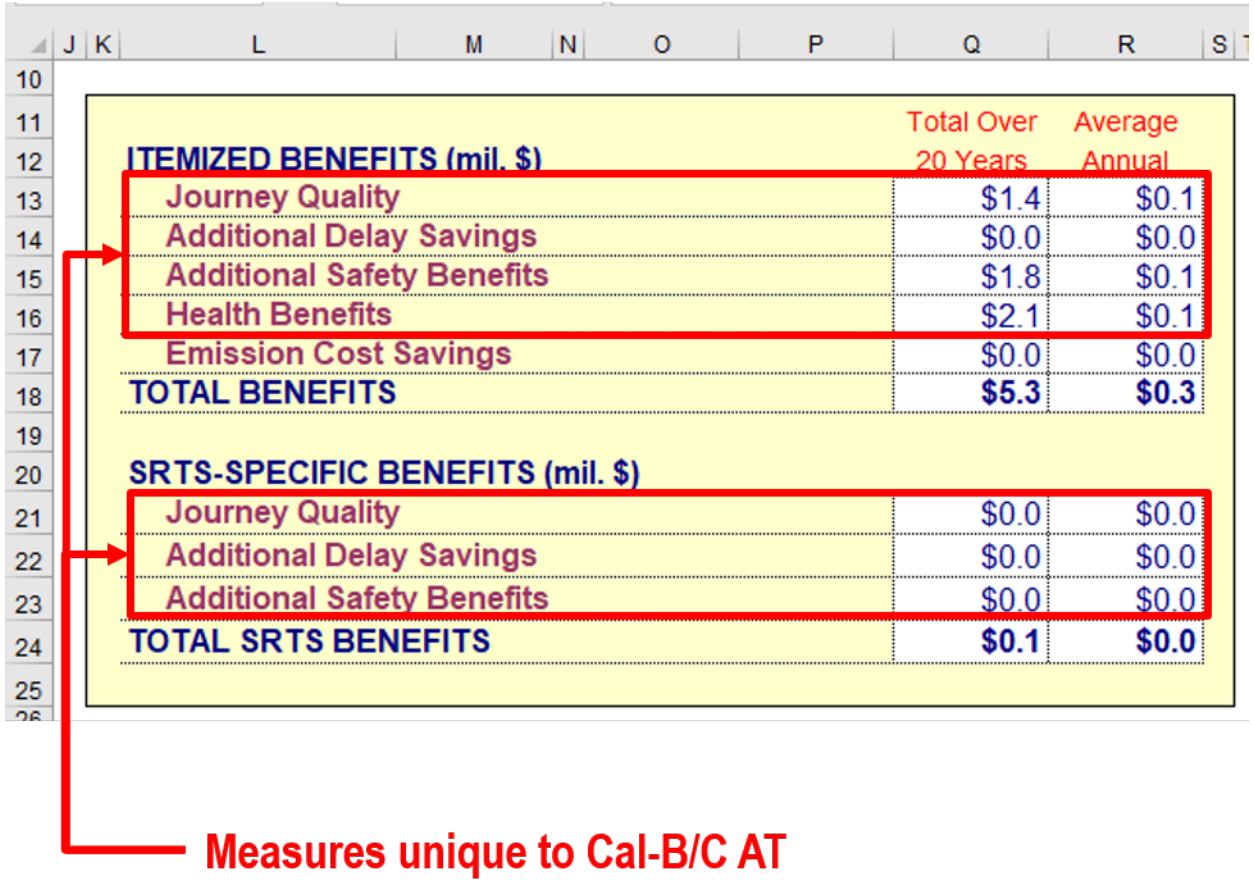
- Benefits are additional for improvements on existing facilities
- Calculated in *Intersection Safety* and *Auto Accident Costs* worksheets
- Improvements to existing intersections (e.g., lights, bridges) can lead to reduced accidents at intersections, reduced auto use, or reduces frequency of accidents

Health Benefits

- Health benefits associated with active transportation improvements
- Calculated in *Health – Absenteeism* and *Health – Reduced Mortality* worksheets
  - Function of reduction in used sick days and reduction in mortality risk
- Health benefits related to reduced absenteeism and improved long-term health and reduced risk of disease and early death

Safe Routes To School (SRTS)

- Users who are school-aged taking the facility to or from school



Itemized Benefits – Cal-B/C IF Only Measures

Shipper Cost Savings

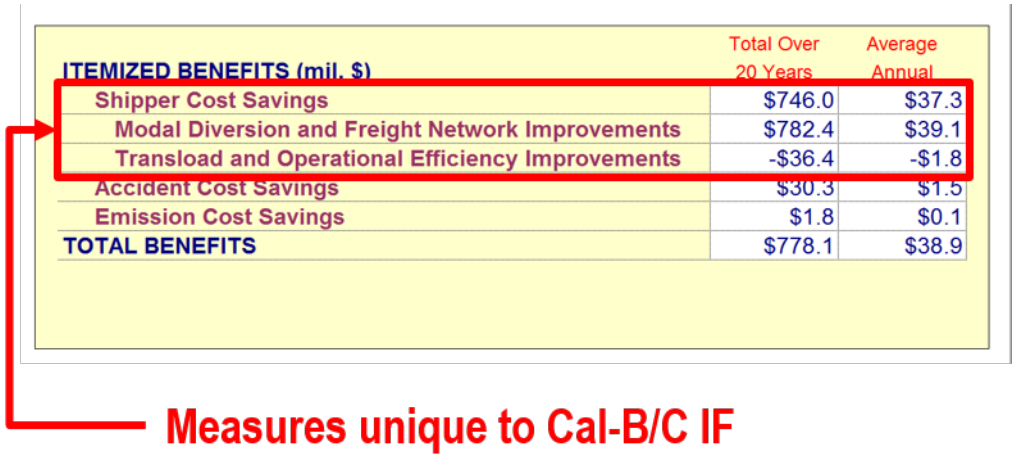
- Total shipper cost benefits for modal diversion, drayage, terminal efficiency, and transload operations
- Calculated in *Shipper Costs* worksheet
- Benefits generally realized through shipments diverted to a less costly mode

Modal Diversion and Freight Network Improvements

- Cost savings by diverting freight volumes from one mode to another
- Calculated in *Shipper Costs* worksheet
- One key cost differential between modes difference in freight capacities by mode

Transload and Operational Efficiency Improvements

- Cost savings from improved intermodal operational efficiency
- Calculated in *Shipper Costs* worksheet
- Arise from enhancements that improve the efficiency of transloading facilities or reduce the need for transloading services altogether



ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Shipper Cost Savings	$746.0	$37.3
Modal Diversion and Freight Network Improvements	$782.4	$39.1
Transload and Operational Efficiency Improvements	-$36.4	-$1.8
Accident Cost Savings	$30.3	$1.5
Emission Cost Savings	$1.8	$0.1
TOTAL BENEFITS	$778.1	$38.9

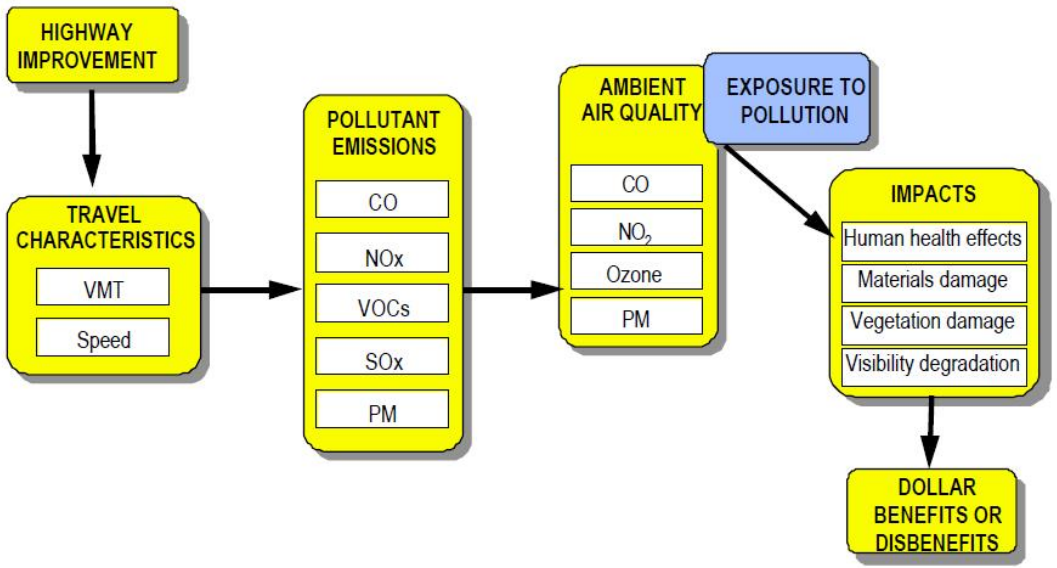
06

Emissions Reductions

Emissions Reductions Measures

- Emission reduction measures are the same across all 5 tools
- Same results layout in all 5 tools
- Function of travel volumes and speeds
- Calculated in *Emissions* worksheet
- Health costs calculated per ton of emissions for CO, CO_2, NO_X, PM_{10}, SO_X, and VOC

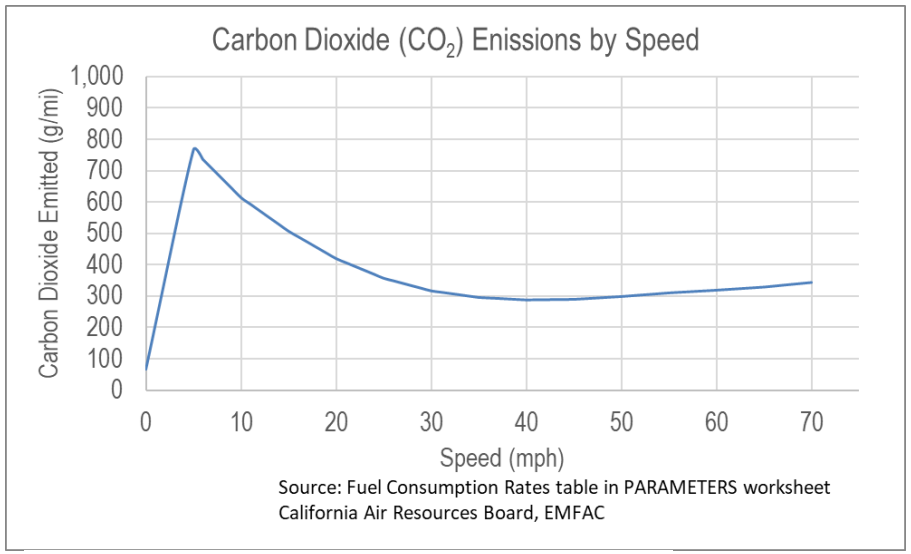
EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	104	5	$0.0	$0.0
CO_2 Emissions Saved	22,124	1,106	$0.7	$0.0
NO_X Emissions Saved	27	1	$1.0	$0.0
PM_{10} Emissions Saved	0.13	0.01	$0.1	$0.0
$PM_{2.5}$ Emissions Saved	0.17	0.01		
SO_X Emissions Saved	0.23	0.01	$0.0	$0.0
VOC Emissions Saved	6.30	0.31	$0.0	$0.0

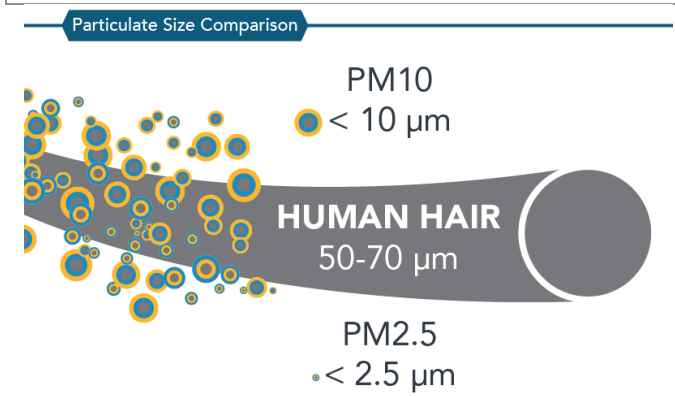


Emission Pollutants

- **CO** Carbon Monoxide reduces oxygen in blood, causes adverse health
- **CO_2** Carbon Dioxide is the primary GHG emission released from fuel combustion
- **NO_x** Nitrogen Oxides is a family of 7 compounds
  - GHG emittant
  - NO_2 produces ozone (O_3) and acid rain
- **PM_{10}** Particulate matter (PM) can adversely impact lung function and lead to premature mortality
- **$PM_{2.5}$** Smaller than PM_{10} and more harmful because it reaches lower levels of lungs
- **SO_x** Sulfur Oxides are released during fuel combustion
  - Sulfur particles contribute to PM and cause adverse health effects and acid rain
- **VOC** Volatile Organic Compounds are emitted as gases from certain solids or liquids and cause adverse health effects when inhaled

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	1,841	92	$0.2	$0.0
CO_2 Emissions Saved	808,022	40,401	$22.7	$1.1
NO_x Emissions Saved	161	8	$5.1	$0.3
PM_{10} Emissions Saved	-16	-1	-$4.9	-$0.2
$PM_{2.5}$ Emissions Saved	7	0		
SO_x Emissions Saved	8	0	$0.9	$0.0
VOC Emissions Saved	147	7	$0.3	$0.0





Source: https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health

07

Troubleshooting Results

Troubleshooting Issues with Cal-B/C Results

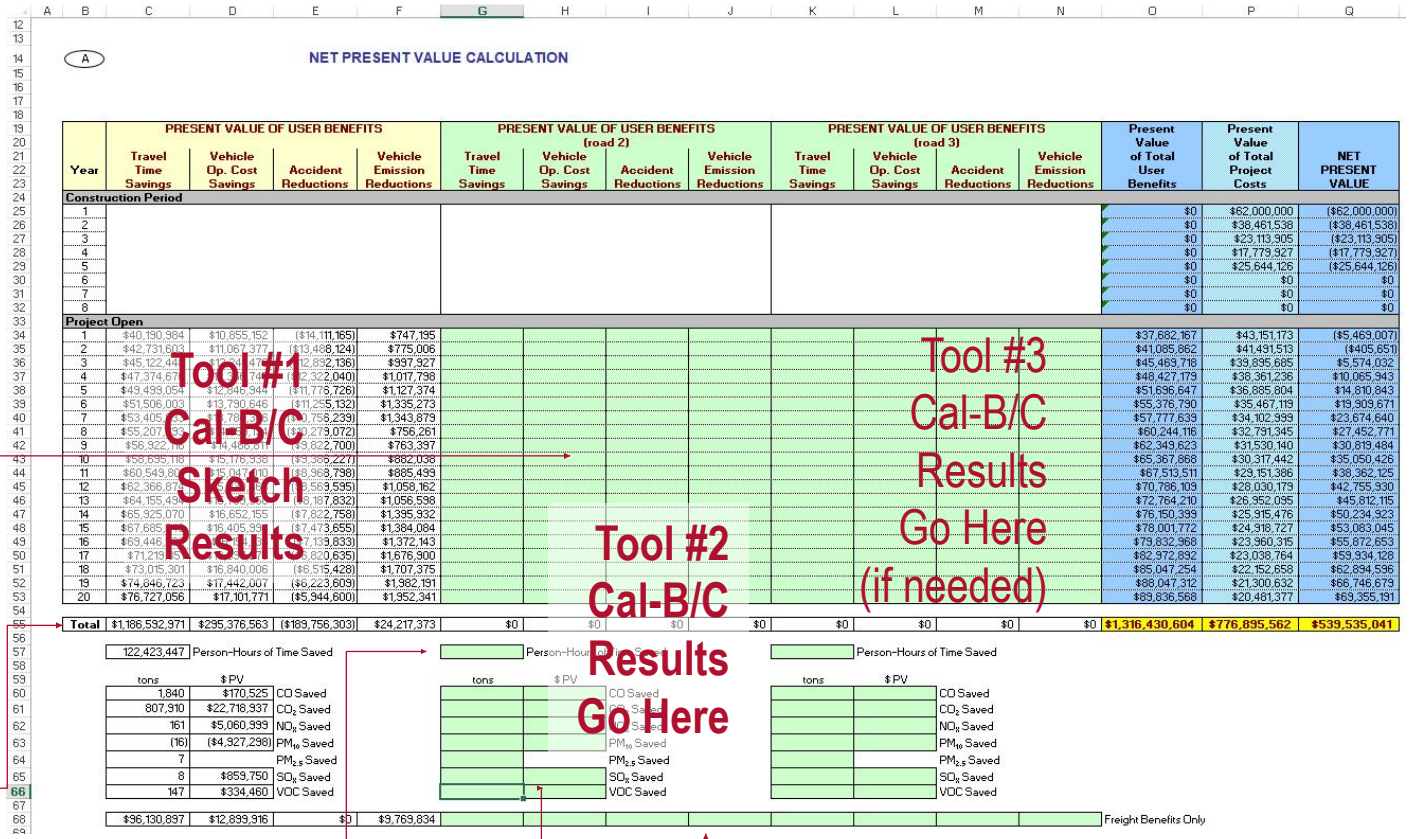
Issue	Potential Reason
My projects B/C Ratio appears to be too low/high. What did I do wrong?	Project Costs not entered in thousands of dollars (1000$). If actual project costs are entered, then B/C ratios will be close to 0.001; If costs entered in millions of dollars, then B/C ratios will be on the order of 1000
I'm getting negative emissions benefits.	Emissions and fuel consumption are "U" shaped functions. If the corridor operates at higher speeds in the No Build case (e.g., around 45 mph or higher), then improvements in speeds may generate higher emissions Rail expansion projects may cause additional PM10 emissions due to steel wheel on steel rail generating “rail dust” or other particulate matter.
Some benefits improve, but others show negative benefits.	Similar to previous question, some benefits are linear (i.e., the faster you go, the more travel time savings you achieve), while others are “U” shaped. In other words, if base year speeds are very congested, the faster you go in the build scenario, the less you pollute and the less fuel you consume. However, if base year speeds are relatively uncongested, then the faster you go in the build scenario the more you pollute and the more fuel you consume (thus increasing your vehicle operating costs)
I’m getting a #NA result for emissions.	You may not have selected a region for the project.
I don’t have any induced demand benefits	Did you enter a difference in demand between the Build and the No Build scenarios? Induced demand benefits are reported with travel time benefits.

08

Combining Results from Multiple Cal-B/C Tools

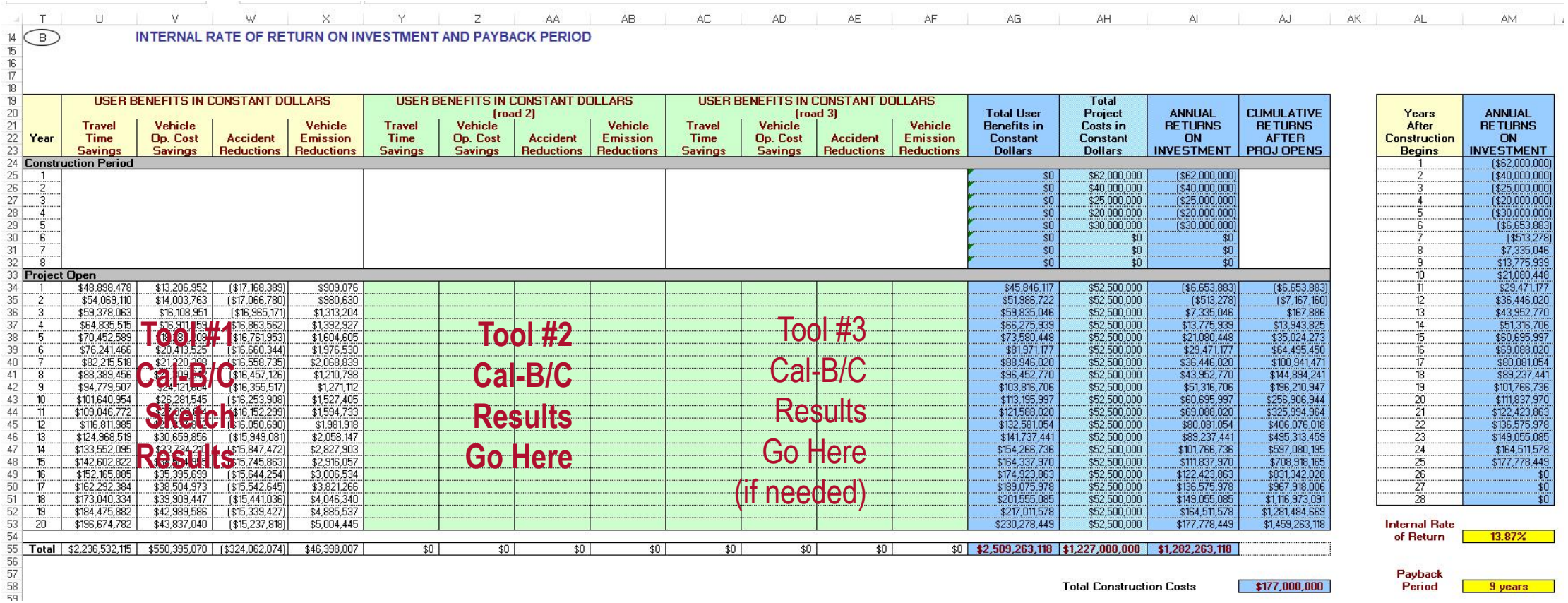
Combining Results From Multiple Cal-B/C Tools – Present Value (Section A)

- Final Calculations Worksheet has additional columns for copying and pasting results from other Cal-B/C Tools
  - Cal-B/C Sketch, Corridor, and PnR have these additional columns
  - Cal-B/C AT and Cal-B/C IF do not have the ability to incorporate results from other tools
- Can include results from two additional tools
- Copy and Paste results from the second tool into appropriate **green**-colored cells
  - Present Value Of User Benefits
  - Person-Hours of Time Saved (where calculated)
  - Tons and Present Value for Emissions
  - Freight Benefits (from Cal-B/C IF)



Combining Results From Multiple Cal-B/C Tools – IRR and Payback Period (Section B)

- Copy and Paste results from the second tool into appropriate **green**-colored cells



B

INTERNAL RATE OF RETURN ON INVESTMENT AND PAYBACK PERIOD

Year	USER BENEFITS IN CONSTANT DOLLARS: Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions	USER BENEFITS IN CONSTANT DOLLARS (road 2): Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions	USER BENEFITS IN CONSTANT DOLLARS (road 3): Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions	Total User Benefits in Constant Dollars	Total Project Costs in Constant Dollars	ANNUAL RETURNS ON INVESTMENT	CUMULATIVE RETURNS AFTER PROJ OPENS
Construction Period																
1													$0	$62,000,000	($62,000,000)	
2													$0	$40,000,000	($40,000,000)	
3													$0	$25,000,000	($25,000,000)	
4													$0	$20,000,000	($20,000,000)	
5													$0	$30,000,000	($30,000,000)	
6													$0	$0	$0	
7													$0	$0	$0	
8													$0	$0	$0	
Project Open																
1	$48,898,478	$13,206,952	($17,168,389)	$909,076									$45,846,117	$52,500,000	($6,653,883)	($6,653,883)
2	$54,069,110	$14,003,763	($17,066,780)	$980,630									$51,986,722	$52,500,000	($513,278)	($7,167,160)
3	$59,378,063	$16,108,951	($16,965,171)	$1,313,204									$59,835,046	$52,500,000	$7,335,046	$167,886
4	$64,835,515	$16,911,959	($16,863,562)	$1,392,927									$66,275,939	$52,500,000	$13,775,939	$13,943,825
5	$70,452,589	$16,[illegible]	($16,761,953)	$1,604,605									$73,580,448	$52,500,000	$21,080,448	$35,024,273
6	$76,241,466	$20,413,525	($16,660,344)	$1,976,530									$81,971,177	$52,500,000	$29,471,177	$64,495,450
7	$82,215,518	$21,220,288	($16,558,735)	$2,068,839									$88,946,020	$52,500,000	$36,446,020	$100,941,471
8	$88,389,456	$[illegible]	($16,457,126)	$1,210,798									$96,452,770	$52,500,000	$43,952,770	$144,894,241
9	$94,779,507	$24,121,604	($16,355,517)	$1,271,112									$103,816,706	$52,500,000	$51,316,706	$196,210,947
10	$101,640,954	$26,281,545	($16,253,908)	$1,527,405									$113,195,997	$52,500,000	$60,695,997	$256,906,944
11	$109,046,772	$[illegible]	($16,152,299)	$1,594,733									$121,588,020	$52,500,000	$69,088,020	$325,994,964
12	$116,811,985	$[illegible]	($16,050,690)	$1,981,918									$132,581,054	$52,500,000	$80,081,054	$406,076,018
13	$124,968,519	$30,659,856	($15,949,081)	$2,058,147									$141,737,441	$52,500,000	$89,237,441	$495,313,459
14	$133,552,095	$33,734,210	($15,847,472)	$2,827,903									$154,266,736	$52,500,000	$101,766,736	$597,080,195
15	$142,602,822	$[illegible]	($15,745,863)	$2,916,057									$164,337,970	$52,500,000	$111,837,970	$708,918,165
16	$152,165,885	$35,395,699	($15,644,254)	$3,006,534									$174,923,863	$52,500,000	$122,423,863	$831,342,028
17	$162,292,384	$38,504,973	($15,542,645)	$3,821,266									$189,075,978	$52,500,000	$136,575,978	$967,918,006
18	$173,040,334	$39,909,447	($15,441,036)	$4,046,340									$201,555,085	$52,500,000	$149,055,085	$1,116,973,091
19	$184,475,882	$42,989,586	($15,339,427)	$4,885,537									$217,011,578	$52,500,000	$164,511,578	$1,281,484,669
20	$196,674,782	$43,837,040	($15,237,818)	$5,004,445									$230,278,449	$52,500,000	$177,778,449	$1,459,263,118
Total	$2,236,532,115	$550,395,070	($324,062,074)	$46,398,007	$0	$0	$0	$0	$0	$0	$0	$0	$2,509,263,118	$1,227,000,000	$1,282,263,118	

Total Construction Costs: $177,000,000

Years After Construction Begins	ANNUAL RETURNS ON INVESTMENT
1	($62,000,000)
2	($40,000,000)
3	($25,000,000)
4	($20,000,000)
5	($30,000,000)
6	($6,653,883)
7	($513,278)
8	$7,335,046
9	$13,775,939
10	$21,080,448
11	$29,471,177
12	$36,446,020
13	$43,952,770
14	$51,316,706
15	$60,695,997
16	$69,088,020
17	$80,081,054
18	$89,237,441
19	$101,766,736
20	$111,837,970
21	$122,423,863
22	$136,575,978
23	$149,055,085
24	$164,511,578
25	$177,778,449
26	$0
27	$0
28	$0

Internal Rate of Return: 13.87%

Payback Period: 9 years

Tool #1 Cal-B/C Sketch Results

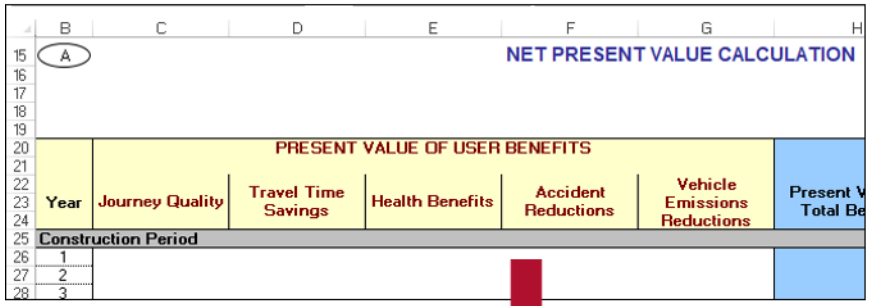
Tool #2 Cal-B/C Results Go Here

Tool #3 Cal-B/C Results Go Here (if needed)

Combining Results From Multiple Cal-B/C Tools – Benefit Correspondence

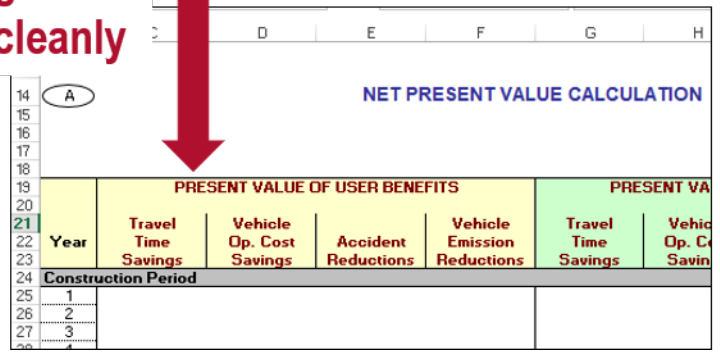
- Cal-B/C AT and Cal-B/C IF report different categories of benefits than the other tools
- There is not a direct correspondence of benefits among tools except for vehicle emission reductions
- Correspondence table for suggested relationship among tool categories
- Must report itemized benefits separately for each tool except for vehicle emissions benefits

Cal-B/C AT Benefits



Benefit categories do not map cleanly

Cal-B/C Sketch Benefits



		Cal-B/C Sketch, Corridor, PnR Benefit Categories			
		Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions
Active Transportation (AT) Benefit Categories	Journey Quality	✓			
	Additional Delay Savings	✓			
	Additional Safety Benefits			✓	
	Health Benefits			✓	
	Emission Cost Savings				✓
Intermodal Freight (IF) Benefit Categories	Transportation Cost Savings		✓		
	Accident Reductions			✓	
	Vehicle Emissions Reductions				✓

Combining Results From Multiple Cal-B/C Tools – Project Costs

- Recommended to put all project costs into one tool to get correct B/C ratio in results sheet

1E

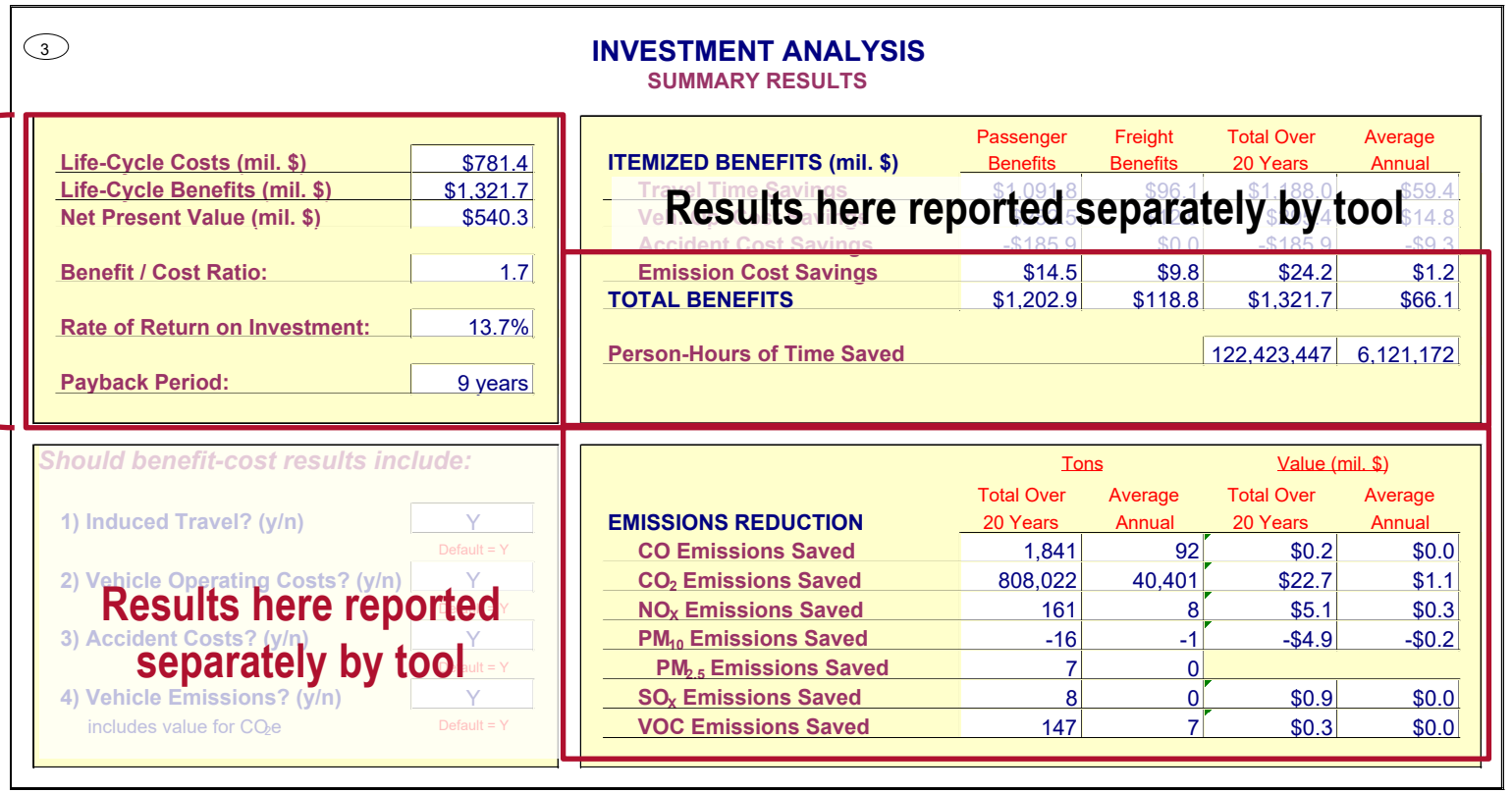
PROJECT COSTS (enter costs in thousands of dollars)

Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
Year	DIRECT PROJECT COSTS: INITIAL COSTS: Project Support	INITIAL COSTS: R / W	INITIAL COSTS: Construction	SUBSEQUENT COSTS: Maint./ Op.	SUBSEQUENT COSTS: Rehab.	Mitigation	Transit Agency Cost Savings	TOTAL COSTS (in dollars): Constant Dollars	TOTAL COSTS (in dollars): Present Value
Construction Period									
1	$20,000	$30,000	$12,000					$62,000,000	$62,000,000
2	15,000	10,000	15,000					40,000,000	38,461,538
3			25,000					25,000,000	23,113,905
4			20,000					20,000,000	17,779,927
5			30,000					30,000,000	25,644,126
6								0	0
7								0	0
8								0	0
Project Open									
1				$52,500				$52,500,000	$43,151,173
2				52,500				52,500,000	41,491,513
3				52,500				52,500,000	39,895,685
4				52,500				52,500,000	38,361,236
5				52,500				52,500,000	36,885,804
6				52,500				52,500,000	35,467,119
7				52,500				52,500,000	34,102,999
8				52,500				52,500,000	32,791,345
9				52,500				52,500,000	31,530,140
10				52,500				52,500,000	30,317,442
11				52,500				52,500,000	29,151,386
12				52,500				52,500,000	28,030,179
13				52,500				52,500,000	26,952,095
14				52,500				52,500,000	25,915,476
15				52,500				52,500,000	24,918,727
16				52,500				52,500,000	23,960,315
17				52,500				52,500,000	23,038,764
18				52,500				52,500,000	22,152,658
19				52,500				52,500,000	21,300,632
20				52,500				52,500,000	20,481,377
Total	$35,000	$40,000	$102,000	$1,050,000	$0	$0	$0	$1,227,000,000	$776,895,562

Tool #1 Costs + Tool #2 Costs

Combining Results From Multiple Cal-B/C Tools – Summed Results

- In the Cal-B/C tool used to combine results, some results represent the combined results
- Emission Cost Savings, Total Benefits, Person-Hours of Time Saved, and the itemized Emissions Reduction results are common among all Cal-B/C tools and can be summed together
- Other benefits should be reported individually by tool (e.g., Journey Quality benefits reported separately from Travel Time Savings



These are the overall combined results from both tools

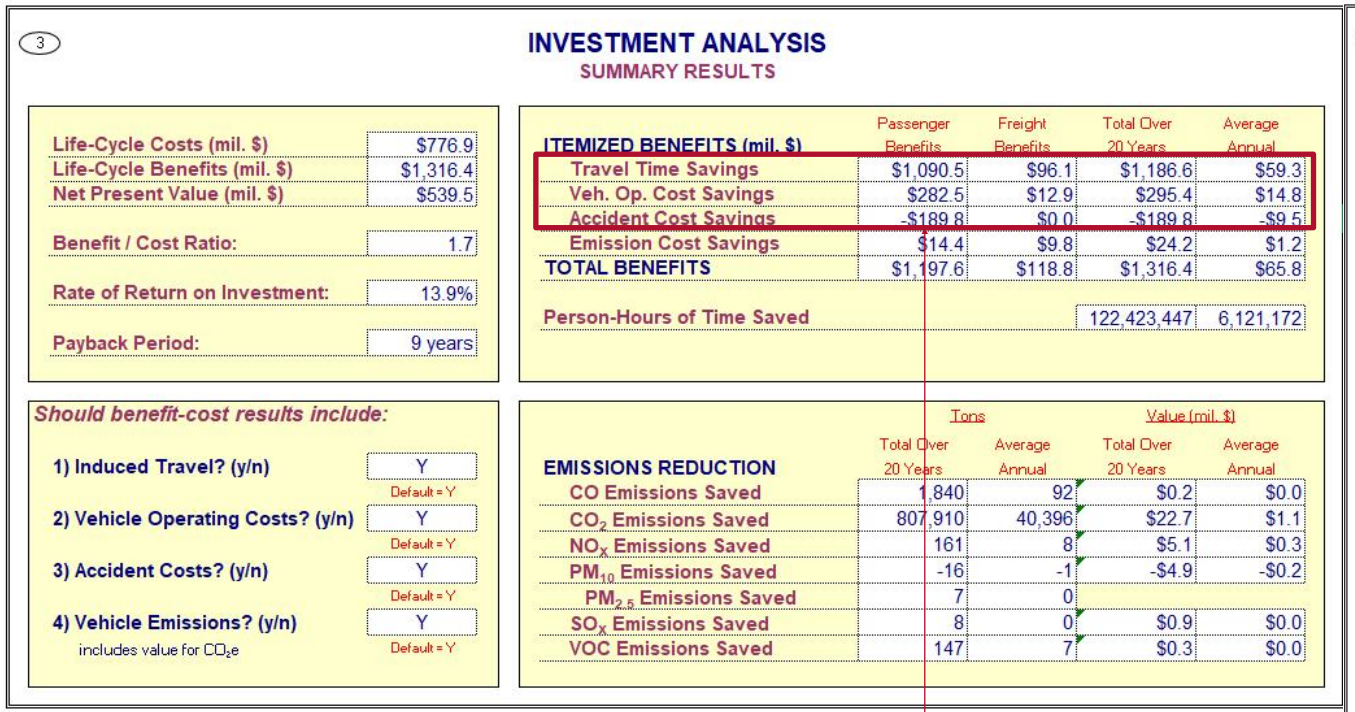
These also are the overall combined results from both tools

Combining Results From Multiple Cal-B/C Tools – Itemized Benefits

- Benefits and costs from each tool can also be presented to show the individual contributions from each project component

Sketch Project Contribution

Active Transportation Project Contribution



3

INVESTMENT ANALYSIS
SUMMARY RESULTS

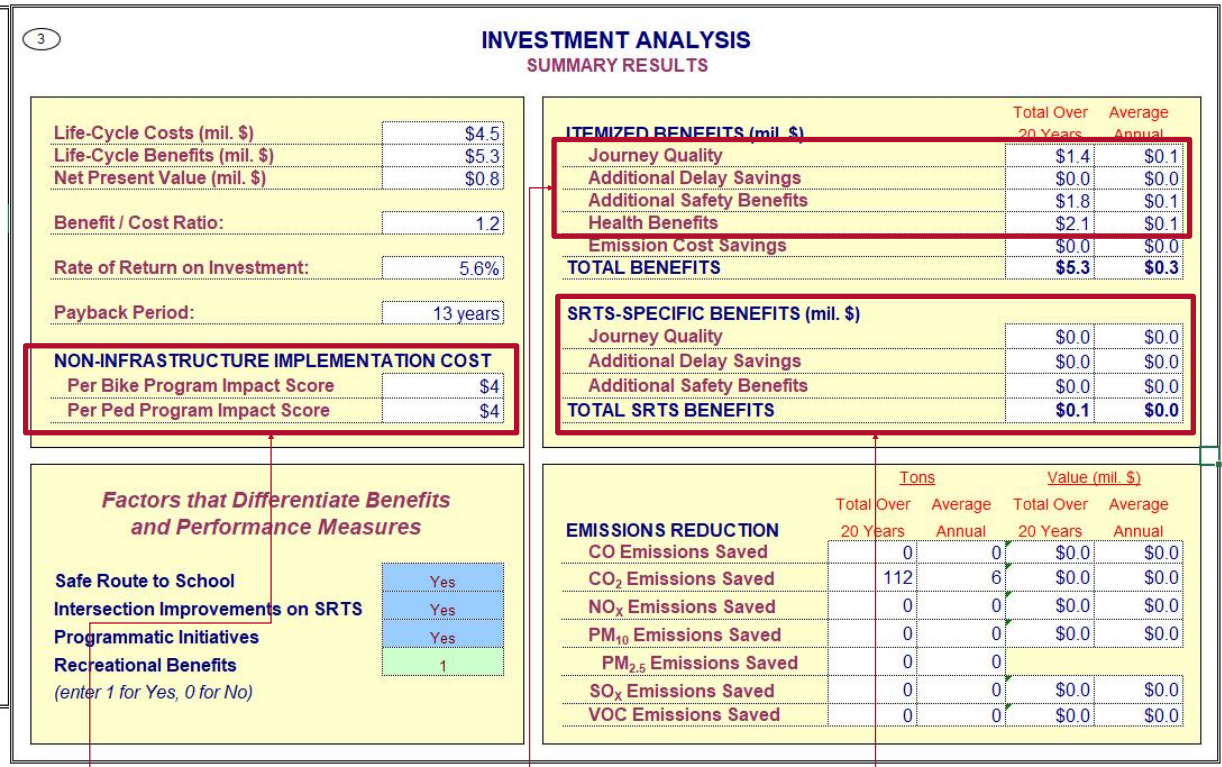
Life-Cycle Costs (mil. $)	$776.9
Life-Cycle Benefits (mil. $)	$1,316.4
Net Present Value (mil. $)	$539.5
Benefit / Cost Ratio:	1.7
Rate of Return on Investment:	13.9%
Payback Period:	9 years

ITEMIZED BENEFITS (mil. $)	Passenger Benefits	Freight Benefits	Total Over 20 Years	Average Annual
Travel Time Savings	$1,090.5	$96.1	$1,186.6	$59.3
Veh. Op. Cost Savings	$282.5	$12.9	$295.4	$14.8
Accident Cost Savings	-$189.8	$0.0	-$189.8	-$9.5
Emission Cost Savings	$14.4	$9.8	$24.2	$1.2
TOTAL BENEFITS	$1,197.6	$118.8	$1,316.4	$65.8
Person-Hours of Time Saved			122,423,447	6,121,172

Should benefit-cost results include:

1) Induced Travel? (y/n)	Y	Default = Y
2) Vehicle Operating Costs? (y/n)	Y	Default = Y
3) Accident Costs? (y/n)	Y	Default = Y
4) Vehicle Emissions? (y/n) includes value for CO_2e	Y	Default = Y

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	1,840	92	$0.2	$0.0
CO_2 Emissions Saved	807,910	40,396	$22.7	$1.1
NO_X Emissions Saved	161	8	$5.1	$0.3
PM_{10} Emissions Saved	-16	-1	-$4.9	-$0.2
$PM_{2.5}$ Emissions Saved	7	0		
SO_X Emissions Saved	8	0	$0.9	$0.0
VOC Emissions Saved	147	7	$0.3	$0.0



3

INVESTMENT ANALYSIS
SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$4.5
Life-Cycle Benefits (mil. $)	$5.3
Net Present Value (mil. $)	$0.8
Benefit / Cost Ratio:	1.2
Rate of Return on Investment:	5.6%
Payback Period:	13 years

NON-INFRASTRUCTURE IMPLEMENTATION COST	
Per Bike Program Impact Score	$4
Per Ped Program Impact Score	$4

ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Journey Quality	$1.4	$0.1
Additional Delay Savings	$0.0	$0.0
Additional Safety Benefits	$1.8	$0.1
Health Benefits	$2.1	$0.1
Emission Cost Savings	$0.0	$0.0
TOTAL BENEFITS	**$5.3**	**$0.3**

SRTS-SPECIFIC BENEFITS (mil. $)		
Journey Quality	$0.0	$0.0
Additional Delay Savings	$0.0	$0.0
Additional Safety Benefits	$0.0	$0.0
TOTAL SRTS BENEFITS	**$0.1**	**$0.0**

Factors that Differentiate Benefits and Performance Measures

Safe Route to School	Yes
Intersection Improvements on SRTS	Yes
Programmatic Initiatives	Yes
Recreational Benefits (enter 1 for Yes, 0 for No)	1

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	0	0	$0.0	$0.0
CO_2 Emissions Saved	112	6	$0.0	$0.0
NO_X Emissions Saved	0	0	$0.0	$0.0
PM_{10} Emissions Saved	0	0	$0.0	$0.0
$PM_{2.5}$ Emissions Saved	0	0		
SO_X Emissions Saved	0	0	$0.0	$0.0
VOC Emissions Saved	0	0	$0.0	$0.0

Itemized Benefits Unique to each tool

09

Conclusion

In this module, you learned…

- How Cal-B/C is used to evaluate projects
- How to interpret Cal-B/C results
- Potential solutions to common problems in interpreting results
- How to combine BCA results from multiple tools in the Cal-B/C suite

What's Next?

- Get more information on specific Cal-B/C tools and how they work
  - **Module 4a** (Cal-B/C Sketch)
  - **Module 4b** (Cal-B/C Corridor)
  - **Module 4c** (Cal-B/C Active Transportation)
  - **Module 4d** (Cal-B/C Park & Ride)
  - **Module 4e** (Cal-B/C Intermodal Freight)
- Start an analysis!
  - **Module 7: How to Start a Cal-B/C Analysis**