



Caltrans Training Module 7d

How to Start a Cal-B/C Park-and-Ride (PnR) Analysis

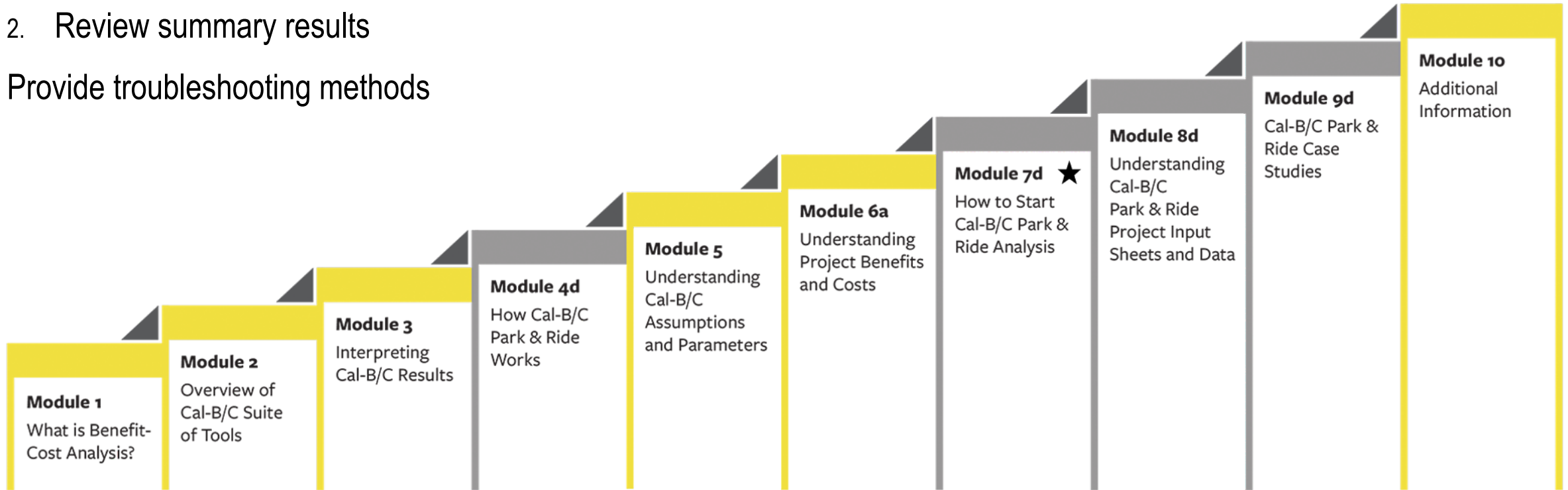


01

About This Module

This module will...

- Walk through a two-step process to start an analysis in Cal-B/C Park-and-Ride
 1. Enter project information
 2. Review summary results
- Provide troubleshooting methods



★ *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
- **Module 3** presented the Cal-B/C results page, detailed what each output measure means, and explained how they are calculated
- **Module 4d** presented an overview of how Cal-B/C Park-and-Ride works including a review of all worksheets and inputs
 - **It is strongly recommended to review Module 4d before starting Module 7d**
- **Module 5** highlighted the information in the Parameters worksheet and discussed key assumptions used by all Cal-B/C tools
- **Module 6d** provided detailed information on how Cal-B/C Park-and Ride calculates benefits

02

Step 1, Enter Project Information

Project Information Worksheet

Section 1A:
Project Data

Section 1C:
Destination Information

Section 1D: Project Costs

District:

PROJECT:

EA:

PPNO:

Enter all project costs (in today's dollars) in columns 1 to 7. Costs during construction should be entered in the first eight rows. Project costs (including maintenance and operating costs) should be net of costs without project.

1A PROJECT DATA

Type of Project:

Project Location (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural):

Length of Construction Period: years

1B PARK-AND-RIDE LOT INFORMATION

Lot Design: Number of Parking Spaces

No Build	Build
<input type="text" value="0"/>	<input type="text" value="100"/>

Park-and-Ride Demand

	No Build	Build
Typical Percent Filled (for current or opening year)	<input type="text" value="0%"/>	<input type="text" value="50%"/>
Number of Years until Lot Reaches Capacity	<input type="text" value="0"/>	<input type="text" value="3"/>
Number of Bicycle/Pedestrian Users	<input type="text" value="0"/>	<input type="text" value="5"/>
Average Vehicle Occupancy of Lot Users	<input type="text" value="1.00"/>	<input type="text" value="1.00"/>

1C DESTINATION INFORMATION

Destination Description	Dest 1	Dest 2	Dest 3
Destination Name	OC	LA	RIV
Distance from Park-and-Ride Lot (miles)	15.0	42.0	30.0
Distance to Next Lot (miles)	10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)	\$2.00	\$5.00	\$2.00

Demand for Travel to Destination	Dest 1	Dest 2	Dest 3
Percent of Lot Users to Destination	35%	50%	15%
Distribution (percent)			
New Transit Riders	50%	0%	0%
Existing Transit Riders	0%	0%	0%
New Carpoolers	50%	75%	100%
Existing Carpoolers	0%	25%	0%

Highway Travel to Destination	Dest 1	Dest 2	Dest 3
HOV Travel Time (in min)	25.0	55.0	28.0
Non-HOV Travel Time (in min)	35.0	73.0	32.0
Accident Rate (per million vehicle-miles)	0.89	0.99	0.77
Percent Fatal Accidents (Pct Fat)	0.4%	0.4%	1.0%
Percent Injury Accidents (Pct Inj)	26.5%	28.3%	33.5%

Transit Travel to Destination	Dest 1	Dest 2	Dest 3
Express Bus			
Travel Time (in min)	45.0	0.0	80.0
Average Fare	\$6.00	\$0.00	\$0.00
Headway (in min)	10.0	0.0	60.0
Local Bus			
Travel Time (in min)	50.0	0.0	0.0
Average Fare	\$4.00	\$0.00	\$0.00

Carpool/Vanpool Travel to Destination	Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)	2.0	2.0	2.0
Average Carpool Wait Time (in min)	5.0	7.5	7.5

1D PROJECT COSTS (enter costs in thousands of dollars)

Year	DIRECT PROJECT COSTS							Transit Agency Cost Savings	TOTAL COSTS (in dollars)	
	Project Support	R / W	Construction	Maint./ Op.	Rehab.	Mitigation	Constant Dollars		Present Value	
Construction Period										
1			\$550					\$550,000	\$550,000	
2								0	0	
3								0	0	
4								0	0	
5								0	0	
6								0	0	
7								0	0	
8								0	0	
Project Open										
1				\$40				\$40,000	\$38,462	
2				\$40				40,000	36,982	
3				\$40				40,000	35,560	
4				\$40				40,000	34,192	
5				\$40				40,000	32,877	
6				\$40				40,000	31,613	
7				\$40				40,000	30,397	
8				\$40				40,000	29,228	
9				\$40				40,000	28,103	
10				\$40				40,000	27,023	
11				\$40				40,000	25,983	
12				\$40				40,000	24,984	
13				\$40				40,000	24,023	
14				\$40				40,000	23,099	
15				\$40				40,000	22,211	
16				\$40				40,000	21,356	
17				\$40				40,000	20,535	
18				\$40				40,000	19,745	
19				\$40				40,000	18,986	
20				\$40				40,000	18,255	
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,093,613	

Section 1B:
Park-and-Ride Lot Information

Prepare Model for Next Set of Destinations

Residual Value in Year 21 (in thousands of dollars)

Present Value = Future Value (in Constant Dollars) / (1 + Real Discount Rate) * Year

Project Information – Data Requirements

- **Project Data** – Location, construction start date, project opening year
- **Park-and-Ride Lot Information** – Number of parking spaces, lot occupancy, demand for lot
- **Destination Information** – Data for destination, travel demand, accident rates, transit and highway travel, and carpool/vanpool travel
- **Project Costs** – Capital and on-going operating expenses for the project

Project Information Worksheet

EA or PPNO used for Caltrans internal budgeting and programming, but not for preliminary project planning

1A PROJECT DATA

District: PROJECT:

Type of Project: (Select project type from list)

Project Location: (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural)

Length of Construction Period: years

1B PARK-AND-RIDE LOT INFORMATION

Lot Design: No Build, Build (Number of Parking Spaces)

Park-and-Ride Demand: No Build, Build (Typical Percent Filled)

1C DESTINATION INFORMATION

Destination Description	Dest 1	Dest 2	Dest 3
Destination Name	OC	LA	RIV
Distance from Park-and-Ride Lot (miles)	15.0	42.0	30.0
Distance to Next Lot (miles)	10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)	\$2.00	\$5.00	\$2.00

1D PROJECT COSTS (enter costs in thousands of dollars)

Year	DIRECT PROJECT COSTS						Transit Agency Cost Savings	TOTAL COSTS (in dollars)	
	Project Support	R / W	Construction	Maint./ Op.	Rehab.	Mitigation		Constant Dollars	Present Value
Construction Period									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
Project Open									
1				\$40				\$40,000	\$38,462
2				\$40				40,000	36,982
3				\$40				40,000	35,560
4				\$40				40,000	34,192
5				\$40				40,000	32,877
6				\$40				40,000	31,613
7				\$40				40,000	30,397
8				\$40				40,000	29,228
9				\$40				40,000	28,103
10				\$40				40,000	27,023
11				\$40				40,000	25,983
12				\$40				40,000	24,984
13				\$40				40,000	24,023
14				\$40				40,000	23,099
15				\$40				40,000	22,211
16				\$40				40,000	21,356
17				\$40				40,000	20,535
18				\$40				40,000	19,745
19				\$40				40,000	18,986
20				\$40				40,000	18,255
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,360,000	\$1,093,613

For accountability purposes, description should include Postmile, Highway, or State Route Name or other information used for grant applications

- Optional: input unique project identifiers including Caltrans District, Project Name (with route number and postmiles), Expenditure Authorization (EA) number, Planning and Programming Number (PPNO)

1A) Project Data

Type of Project

- Pull-down menu allows user to select one of 3 project types
 - New Park and Ride Lot
 - Park and Ride Leased Lot
 - Park and Ride Lot Expansion

Project Location

- Used to estimate emission benefits using values appropriate for each region

Length of Construction Period

- Years needed to construct project
- Project opening date assumed to occur at the end of the construction period

	B	C	D	E	F	G	H	I	J
1									
2		District:		HQ					
3									
4		PROJECT:		Hypothetical Project					
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									

1A PROJECT DATA

Type of Project
Select project type from list:

Project Location (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural):

Length of Construction Period: years

1B PARK-AND-RIDE LOT INFORMATION

Lot Design	No Build	Build
Number of Parking Spaces	0	100

Park-and-Ride Demand	No Build	Build
Typical Percent Filled (for current or opening year)	0%	50%
Number of Years until Lot Reaches Capacity	0	3
Number of Bicycle/Pedestrian Users	0	5
Average Vehicle Occupancy of Lot Users	1.00	1.00

1B) Park-and-Ride Lot Information

Lot Design

- Number of Parking Spaces
 - Data is entered for No Build and Build scenarios, as applicable for project type (new lot vs. expansion)

Park-and-Ride Demand

- Typical percent of lot capacity expected to be used in the current year (No Build) and the opening year (Build)
- Number of years until lot reaches capacity
- Number of active transportation users
 - If the lot is located near residential areas that could supply bicycle or walk-up users
- Average Vehicle Occupancy (default value of 1 can be overwritten if better data is available)

The PnR model does not estimate demand for a park-and-ride lot based on increased capacity—this is a user input.

	B	C	D	E	F	G	H	I	J
1									
2		District:		HQ					
3									
4		PROJECT:		Hypothetical Project					
5									
6									
7									
8				PROJECT DATA					
9									
10				Type of Project					
11				Select project type from list		New Park and Ride Lot			
12									
13				Project Location (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural)				1	
14									
15				Length of Construction Period		1	years		
16									
17									
18									
19				PARK-AND-RIDE LOT INFORMATION					
20									
21				Lot Design					
22						No Build	Build		
23				Number of Parking Spaces		0	100		
24									
25				Park-and-Ride Demand					
26						No Build	Build		
27				Typical Percent Filled (for current or opening year)		0%	50%		
28				Number of Years until Lot Reaches Capacity		0	3		
29				Number of Bicycle/Pedestrian Users		0	5		
30				Average Vehicle Occupancy of Lot Users		1.00	1.00		
31									
32									
33									

1C) Destination Information – Destination Description

- This section holds information about the final destinations of park-and-ride users
 - The model handles only three destinations at once

Destination Name

- For informational purposes only
- At least one destination is required

Distance from Park-and-Ride Lot (miles)

- Distance from the lot to the destination

Distance to Next Lot (miles)

- Used if the park-and-ride lot is proposed near an existing lot and may attract users from the other lot

Parking Cost at Destination (avg \$/day)

- Average daily cost for parking at the destination

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)		\$2.00	\$5.00	\$2.00
Demand for Travel to Destination		Dest 1	Dest 2	Dest 3
Percent of Lot Users to Destination		35%	50%	15%
Distribution (percent)	New Transit Riders	50%	0%	0%
	Existing Transit Riders	0%	0%	0%
	New Carpoolers	50%	75%	100%
	Existing Carpoolers	0%	25%	0%
Highway Travel to Destination		Dest 1	Dest 2	Dest 3
HOV Travel Time (in min)		25.0	55.0	28.0
Non-HOV Travel Time (in min)		35.0	73.0	32.0
Accident Rate (per million vehicle-miles)		0.89	0.99	0.77
Percent Fatal Accidents (Pct Fat)		0.4%	0.4%	1.0%
Percent Injury Accidents (Pct Inj)		26.5%	28.3%	33.5%
Transit Travel to Destination		Dest 1	Dest 2	Dest 3
Express Bus	Travel Time (in min)	45.0	0.0	80.0
	Average Fare	\$6.00	\$0.00	\$0.00
	Headway (in min)	10.0	0.0	60.0
Local Bus	Travel Time (in min)	50.0	0.0	0.0
	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

1C) Destination Information – Demand for Travel to Destination

Percent of Lot Users to Destination

- Percent of park-and-ride users (from all modes) that travel to this destination
- Sum of percentages for the destinations must total 100%

Distribution for each destination

- Percent of lot users that are new transit riders
- Percent of users that are existing transit riders
- Percent of users that are new carpoolers
- Percent of users that are existing carpoolers
- Sum of percentages for a given destination must total 100%

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)		\$2.00	\$5.00	\$2.00
Demand for Travel to Destination		Dest 1	Dest 2	Dest 3
Percent of Lot Users to Destination		35%	50%	15%
Distribution (percent)	New Transit Riders	50%	0%	0%
	Existing Transit Riders	0%	0%	0%
	New Carpoolers	50%	75%	100%
	Existing Carpoolers	0%	25%	0%
Highway Travel to Destination		Dest 1	Dest 2	Dest 3
HOV Travel Time (in min)		25.0	55.0	28.0
Non-HOV Travel Time (in min)		35.0	73.0	32.0
Accident Rate (per million vehicle-miles)		0.89	0.99	0.77
Percent Fatal Accidents (Pct Fat)		0.4%	0.4%	1.0%
Percent Injury Accidents (Pct Inj)		26.5%	28.3%	33.5%
Transit Travel to Destination		Dest 1	Dest 2	Dest 3
Express Bus	Travel Time (in min)	45.0	0.0	80.0
	Average Fare	\$6.00	\$0.00	\$0.00
	Headway (in min)	10.0	0.0	60.0
Local Bus	Travel Time (in min)	50.0	0.0	0.0
	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

1C) Destination Information – Highway Travel to Destination

HOV Travel Time (min) for each destination

- Travel time for HOVs to each destination
 - Should include travel on non-HOV lanes where HOV lanes are not available

Non-HOV Travel Time (min) for each destination

- Travel time using non-HOV lanes to each destination

Accident Rate (per MVM) for each destination

- Accident rates for highway travel from the park-and-ride lot to each destination
- Percent fatal and injury accidents

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)		\$2.00	\$5.00	\$2.00
Demand for Travel to Destination		Dest 1	Dest 2	Dest 3
Percent of Lot Users to Destination		35%	50%	15%
Distribution (percent)	New Transit Riders	50%	0%	0%
	Existing Transit Riders	0%	0%	0%
	New Carpoolers	50%	75%	100%
	Existing Carpoolers	0%	25%	0%
Highway Travel to Destination		Dest 1	Dest 2	Dest 3
HOV Travel Time (in min)		25.0	55.0	28.0
Non-HOV Travel Time (in min)		35.0	73.0	32.0
Accident Rate (per million vehicle-miles)		0.89	0.99	0.77
Percent Fatal Accidents (Pct Fat)		0.4%	0.4%	1.0%
Percent Injury Accidents (Pct Inj)		26.5%	28.3%	33.5%
Transit Travel to Destination		Dest 1	Dest 2	Dest 3
Express Bus	Travel Time (in min)	45.0	0.0	80.0
	Average Fare	\$6.00	\$0.00	\$0.00
	Headway (in min)	10.0	0.0	60.0
Local Bus	Travel Time (in min)	50.0	0.0	0.0
	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

1C) Destination Information – Transit Travel to Destination

Express Bus Travel Time, Fare, & Headway for each destination

- Average transit travel time (minutes) for express bus riders
- Average (daily) fare paid by express bus riders
 - Assume 21 workdays per month to convert from a monthly pass
- Express bus headway (time between buses, minutes)
 - The model estimates that riders wait on average one half of the headway time, and no more than 10 minutes

Local Bus Travel Time & Fare for each destination

- Average transit travel time (minutes) for local bus riders
- Average (daily) fare paid by local bus riders
 - Assume 21 workdays per month to convert from a monthly pass

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)		\$2.00	\$5.00	\$2.00
Demand for Travel to Destination		Dest 1	Dest 2	Dest 3
Percent of Lot Users to Destination		35%	50%	15%
Distribution (percent)	New Transit Riders	50%	0%	0%
	Existing Transit Riders	0%	0%	0%
	New Carpoolers	50%	75%	100%
	Existing Carpoolers	0%	25%	0%
Highway Travel to Destination		Dest 1	Dest 2	Dest 3
HOV Travel Time (in min)		25.0	55.0	28.0
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Accident Rate (per million vehicle-miles)		0.89	0.99	0.77
Percent Fatal Accidents (Pct Fat)		0.4%	0.4%	1.0%
Percent Injury Accidents (Pct Inj)		26.5%	28.3%	33.5%
Transit Travel to Destination		Dest 1	Dest 2	Dest 3
Express Bus	Travel Time (in min)	45.0	0.0	80.0
	Average Fare	\$6.00	\$0.00	\$0.00
	Headway (in min)	10.0	0.0	60.0
Local Bus	Travel Time (in min)	50.0	0.0	0.0
	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

1C) Destination Information – Carpool/Vanpool Travel to Destination

Average Carpool Size for each destination

- Average size (people per vehicle) of carpools to each destination

Average Carpool Wait Time for each destination

- Average time (minutes) that people wait for carpools

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)		\$2.00	\$5.00	\$2.00
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Percent of Lot Users to Destination		35%	50%	15%
Distribution (percent)	New Transit Riders	50%	0%	0%
	Existing Transit Riders	0%	0%	0%
	New Carpoolers	50%	75%	100%
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Accident Rate (per million vehicle-miles)		0.89	0.99	0.77
Percent Fatal Accidents (Pct Fat)		0.4%	0.4%	1.0%
Percent Injury Accidents (Pct Inj)		26.5%	28.3%	33.5%
Transit Travel to Destination		Dest 1	Dest 2	Dest 3
Express Bus	Travel Time (in min)	45.0	0.0	80.0
	Average Fare	\$6.00	\$0.00	\$0.00
	Headway (in min)	10.0	0.0	60.0
Local Bus	Travel Time (in min)	50.0	0.0	0.0
	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

Entering Additional Destinations

- The model contains a macro that allows the user to enter additional destination data
- To enter data for the next set of three destinations:
 - Enter all the information through Section 1D
 - Save an interim version of the model
 - Click button “Prepare Model for Next Set of Destinations”
 - Model will prompt to save an interim version before proceeding
 - Enter data for 2nd set of destinations in Section 1C
- The model has the capacity for nine destinations
 - The user can enter the additional destination data by running the macro and entering data for two additional sets of destinations

The screenshot shows a spreadsheet interface with several sections. Section 1C, 'DESTINATION INFORMATION', contains a table with columns for Destination Description, Dest 1, Dest 2, and Dest 3. Section 1D, 'PROJECT COSTS (enter costs in thousands of dollars)', contains a table with columns for Col. no., INITIAL COSTS, SUBSEQUENT COSTS, and Transit Agency Cost. A large red box is drawn around a button labeled 'Prepare Model for Next Set of Destinations' located in the center of the spreadsheet. A smaller red box is drawn around a similar button located at the bottom of the spreadsheet. The spreadsheet also displays various numerical values and formulas, including a 'TOTAL COSTS (in dollars)' column with 'Constant' and 'Present Value' sub-columns.

1D) Project Costs – Overview

- All project costs entered in seven cost columns
- O&M project costs should be entered as incremental rather than total costs
 - Incremental O&M costs are the difference between the No Build and the Build scenarios
- Project costs must be entered in constant dollars, in the same year as the economic parameters used for benefit calculations
 - Current year in Cal-B/C models is 2016
 - Modules 5 and 6a go into more details about year for current dollars in Cal-B/C
- Costs must be entered in thousands of dollars (\$1,000)

1D PROJECT COSTS (enter costs in thousands of dollars)

Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTAL COSTS (in dollars)	
Year	INITIAL COSTS			SUBSEQUENT COSTS		Mitigation	Transit Agency Cost Savings	Constant Dollars	Present Value
	Project Support	R / W	Construction	Maint./ Op.	Rehab.				
Construction Period									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
Project Open									
1				\$40				\$40,000	\$38,462
2				\$40				40,000	36,982
3				\$40				40,000	35,560
4				\$40				40,000	34,192
5				\$40				40,000	32,877
6				\$40				40,000	31,613
7				\$40				40,000	30,397
8				\$40				40,000	29,228
9				\$40				40,000	28,103
10				\$40				40,000	27,023
11				\$40				40,000	25,983
12				\$40				40,000	24,984
13				\$40				40,000	24,023
14				\$40				40,000	23,099
15				\$40				40,000	22,211
16				\$40				40,000	21,356
17				\$40				40,000	20,535
18				\$40				40,000	19,745
19				\$40				40,000	18,986
20				\$40				40,000	18,255
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,313,133

Project Information

1D) Project Costs – Overview

- Up to eight (8) years of initial project costs allowed
- Costs must be entered for each year of construction
 - Should be consistent with “Length of Construction Period” entered in Section 1A
- Following construction, project opens and the 20-year project operating period begins

1D PROJECT COSTS (enter costs in thousands of dollars)

Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTAL COSTS (in dollars)	
Year	DIRECT PROJECT COSTS			SUBSEQUENT COSTS		Mitigation	Transit Agency Cost Savings	Constant Dollars	Present Value
	Project Support	R / W	Construction	Maint./ Op.	Rehab.				
Construction Period									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
Project Open									
1				\$40				\$40,000	\$38,462
2				\$40				40,000	36,982
3				\$40				40,000	35,560
4				\$40				40,000	34,192
5				\$40				40,000	32,877
6				\$40				40,000	31,613
7				\$40				40,000	30,397
8				\$40				40,000	29,228
9				\$40				40,000	28,103
10				\$40				40,000	27,023
11				\$40				40,000	25,983
12				\$40				40,000	24,984
13				\$40				40,000	24,023
14				\$40				40,000	23,099
15				\$40				40,000	22,211
16				\$40				40,000	21,356
17				\$40				40,000	20,535
18				\$40				40,000	19,745
19				\$40				40,000	18,986
20				\$40				40,000	18,255
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,350,000

1D) Project Costs – Direct Project

Initial Costs

- Project support - engineering design and management
- Right-of-way acquisition costs
- Construction costs
- Project should incur no initial project costs in or after the project opening year

Subsequent Costs

- Any costs incurred after the project is constructed and open
 - Operating and Maintenance (O&M) costs
 - Rehabilitation costs
- Module 8d discusses project cost sources, including O&M costs

1D PROJECT COSTS (enter costs in thousands of dollars)									
Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTAL COSTS (in dollars)	
Year	INITIAL COSTS			SUBSEQUENT COSTS		Mitigation	Transit Agency Cost Savings	Constant Dollars	Present Value
	Project Support	R / W	Construction	Maint./ Op.	Rehab.				
Construction Period									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
Project Open									
1				\$40				\$40,000	\$38,462
2				\$40				40,000	36,982
3				\$40				40,000	35,560
4				\$40				40,000	34,192
5				\$40				40,000	32,877
6				\$40				40,000	31,613
7				\$40				40,000	30,397
8				\$40				40,000	29,228
9				\$40				40,000	28,103
10				\$40				40,000	27,023
11				\$40				40,000	25,983
12				\$40				40,000	24,984
13				\$40				40,000	24,023
14				\$40				40,000	23,099
15				\$40				40,000	22,211
16				\$40				40,000	21,356
17				\$40				40,000	20,535
18				\$40				40,000	19,745
19				\$40				40,000	18,986
20				\$40				40,000	18,255
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,093,613

1D) Project Costs – Mitigation, Transit Agency, and Total Costs

Mitigation

- Costs to mitigate community and environmental impacts

Transit Agency Cost Savings

- Savings to transit agency due to efficiency improvements
 - Example: signal prioritization projects speed up buses, which may reduce operating hours, resulting in lower labor and other costs

Total Costs

- Calculated automatically
- Includes project cost in constant dollars and present value for each year
- Values are in total dollars and not in thousands of dollars like other columns

1D PROJECT COSTS (enter costs in thousands of dollars)									
Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTAL COSTS (in dollars)	
Year	INITIAL COSTS			SUBSEQUENT COSTS		Mitigation	Transit Agency Cost Savings	Constant Dollars	Present Value
	Project Support	R / W	Construction	Maint./ Op.	Rehab.				
Construction Period									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
Project Open									
1				\$40				\$40,000	\$38,462
2				\$40				40,000	36,982
3				\$40				40,000	35,560
4				\$40				40,000	34,192
5				\$40				40,000	32,877
6				\$40				40,000	31,613
7				\$40				40,000	30,397
8				\$40				40,000	29,228
9				\$40				40,000	28,103
10				\$40				40,000	27,023
11				\$40				40,000	25,983
12				\$40				40,000	24,984
13				\$40				40,000	24,023
14				\$40				40,000	23,099
15				\$40				40,000	22,211
16				\$40				40,000	21,356
17				\$40				40,000	20,535
18				\$40				40,000	19,745
19				\$40				40,000	18,985
20				\$40				40,000	18,255
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,255,000

1D) Project Costs – Residual Value

Residual Value

- Residual value is counted as a project benefit
- Cal-B/C PnR calculates this value as the sum of the right-of-way costs
- Can be overridden by user if better information is available
- Include any lot improvements that remain after the 20-year lifecycle

The screenshot shows a software interface for entering project costs. A red box highlights the 'Residual Value in Year 21' field, which is currently set to '\$0'. The interface includes sections for 'DESTINATION INFORMATION' and 'PROJECT COSTS'.

DESTINATION INFORMATION (1C)

	Dest 1	Dest 2	Dest 3
Destination Description			
Destination Name	OC	LA	RIV
Distance from Park-and-Ride Lot (miles)	15.0	42.0	30.0
Distance to Next Lot (miles)	10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)	\$2.00	\$5.00	\$2.00
Demand for Travel to Destination			
Percent of Lot Users to Destination	35%	50%	15%
Distribution - New Transit Riders	50%	20%	30%
Transit Travel to Destination			
Express			
Travel Time (in min)	45.0	0.0	80.0
Average Fare	\$6.00	\$0.00	\$0.00
Local Bus			
Travel Time (in min)	50.0	0.0	0.0
Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination			
Average Carpool Size (people/vehicle)	2.0	2.0	2.0
Average Carpool Wait Time (in min)		7.5	7.5

PROJECT COSTS (enter costs in thousands of dollars) (1D)

Year	DIRECT PROJECT COSTS			SUBSEQUENT COSTS			Transit Agency Cost Savings	TOTAL COSTS (in dollars)	
	Project Support	R / W	Construction	Maint/ Op.	Rehab.	Mitigation		Constant Dollars	Present Value
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
9								0	0
10								0	0
11								0	0
12								0	0
13								0	0
14								0	0
15								0	0
16								0	0
17								0	0
18								0	0
19								0	0
20								0	0
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,093,613

Residual Value in Year 21 (in thousands of dollars)

Residual Value in Year 21 (in thousands of dollars)

Present Value = Future Value (in Constant Dollars) / (1 + Real Discount Rate)^ Year

03

Step 2, Review Summary Results

Review Model Results

Review BCA metrics

- Life-Cycle Costs: present values of all incremental project costs
- Life-Cycle Benefits: sum of the monetized benefits for the project in present value
- Net Present Value = Life-Cycle Benefits – Life-Cycle Costs
- Benefit/Cost Ratio = Life-Cycle Benefits/Life-Cycle Costs
- Rate of Return on Investment: Discount rate at which benefits and costs are equal
- Payback Period: number of years it takes for the net benefits to equal the initial costs

2

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	
	Total Over 20 Years	Average Annual	Total Over 20 Years	Average Annual
Travel Time Savings	\$0.5	\$0.0	\$0.5	\$0.0
Veh. Op. Cost Savings	\$4.9	\$0.2	\$4.9	\$0.2
Accident Cost Savings	\$1.4	\$0.1	\$1.4	\$0.1
Emission Cost Savings	\$0.3	\$0.0	\$0.3	\$0.0
Residual Value	\$0.0		\$0.0	
TOTAL BENEFITS	\$7.1			

PERSON-HOURS OF TIME SAVED	Tons		Value (mil. \$)	
	Total Over 20 Years	Average Annual	Total Over 20 Years	Average Annual
Person-Hours of Time Saved	55,897	2,795		
VMT Reduction	22,408,719	1,120,436		

Should benefit-cost results include:

- Induced Travel is not considered
- Vehicle Operating Costs? (y/n) Default = Y
- Accident Costs? (y/n) Default = Y
- Vehicle Emissions? (y/n) includes value for CO₂e Default = Y

EMISSIONS REDUCTION	Tons		Value (mil. \$)	
	Total Over 20 Years	Average Annual	Total Over 20 Years	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

Adjust which benefits are included in the analysis based on the purpose

Review Model Results (cont.)

Review quantified benefits

- Travel time savings (person-hours of time saved)
- Vehicle operating cost savings (VMT reduction)
- Emission reductions: A positive value implies a reduction in emissions

Do the results correspond with your expectation?

- The B/C ratio is 6.5, which is >1 . Is this reasonable?

Do the monetized benefits correspond with the project components and expected impacts?

Model results and how to interpret them were discussed in more detail in Module 3

2

INVESTMENT ANALYSIS SUMMARY RESULTS

Life-Cycle Costs (mil. \$)		ITEMIZED BENEFITS (mil. \$)			
		Total Over 20 Years		Average Annual	
Life-Cycle Costs (mil. \$)	\$1.1	Travel Time Savings	\$0.5	\$0.0	\$0.0
Life-Cycle Benefits (mil. \$)	\$7.1	Veh. Op. Cost Savings	\$4.9	\$0.2	\$0.2
Net Present Value (mil. \$)	\$6.0	Accident Cost Savings	\$1.4	\$0.1	\$0.1
Benefit / Cost Ratio:	6.5	Emission Cost Savings	\$0.3	\$0.0	\$0.0
Rate of Return on Investment:	64.9%	Residual Value	\$0.0		
Payback Period:	2 years	TOTAL BENEFITS	\$7.1		
Should benefit-cost results include:		Person-Hours of Time Saved	55,897	2,795	
1) Induced Travel is not considered		VMT Reduction	22,408,719	1,120,436	
2) Vehicle Operating Costs? (y/n)	<input type="text" value="Y"/>				
3) Accident Costs? (y/n)	<input type="text" value="Y"/>				
4) Vehicle Emissions? (y/n)	<input type="text" value="Y"/>				
		EMISSIONS REDUCTION			
		Tons		Value (mil. \$)	
		Total Over 20 Years	Average Annual	Total Over 20 Years	Average Annual
		CO Emissions Saved	21	1	\$0.0
		CO ₂ Emissions Saved	6,274	314	\$0.2
		NO _x Emissions Saved	1	0	\$0.1
		PM ₁₀ Emissions Saved	0	0	\$0.0
		PM _{2.5} Emissions Saved	0	0	\$0.0
		SO _x Emissions Saved	0	0	\$0.0
		VOC Emissions Saved	1	0	\$0.0

Troubleshooting Issues with Cal-B/C Results

Issue	Potential Reason
My B/C ratio is way too low/high?	Project Costs not entered in thousands of dollars. If actual project costs 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 1000/1

04

Conclusion

In this module, you have learned...

- A two-step process to start an analysis in the Cal-B/C Park-and-Ride tool
- How to interpret results
- How to troubleshoot problems
- Identified other resources including other modules to review

What's Next?

▪ **Module 8d**

- Where to find data for your project

▪ **Module 9d**

- Example of an analysis in the Cal-B/C PnR tool

▪ **Module 10**

- Provides additional information and data sources for BCA