About This Module
This module will...

- Briefly summarize Cal-B/C User’s Guides and information
- Describe supplemental and historical Cal-B/C technical documentation
- Highlight other online data sources that can be used to perform a benefit-cost analysis (BCA)
- Identify other online resources for more information about BCA
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
- Modules 4a-e explained how the Cal-B/C tools work and walked through how to use each tool
- Module 5 highlighted the information in the Parameters worksheet and discussed key assumptions used by Cal-B/C
- Modules 6a-e provided detailed information on how Cal-B/C calculates benefits
- Module 7a-e presented the 1-2-3 approach to starting a Cal-B/C analysis
- Modules 8a-e discussed potential data sources that can be used in a Cal-B/C analysis
- Modules 9a-e provided case studies using Cal-B/C tools
Additional Cal-B/C Tool Resources
Cal-B/C Tool Information

- The Instructions Worksheet in each Cal-B/C tool provides a quick source for information.
- This worksheet is designed to print as a convenient reference booklet.
- Cal-B/C AT (Active Transportation) also has a Definitions Worksheet that defines key terms.

Module 10: Additional Cal-B/C Tool Resources
Cal-B/C Additional Resources

- The primary resource for Cal-B/C is the Caltrans Transportation Economics Branch (TEB) website:
  - https://dot.ca.gov/programs/transportation-planning/economics-data-management/transportation-economics

- You can also contact TEB directly with specific questions at:
  - eab@dot.ca.gov

- Subsequent slides summarize key supporting documentation that can be used to help you complete your BCA
Cal-B/C Tool User’s Guides and Technical Documentation

- User’s Guides for each of the 5 Cal-B/C tools are on the Caltrans TEB Cal-B/C website
- Parameter Guide presents assumptions and explanations of default calculations
- Each User’s Guide is structured to provide:
  - Overview of Cal-B/C and the specific Cal-B/C tool
  - User requirements and skills needed to use Cal-B/C
  - Computer system and operating requirements
  - Details on each tool worksheet
  - One or more sample projects
  - Additional technical information
- Note that the latest user guides are for Version 7.1, while the latest tools are Version 7.2
Cal-B/C Sketch Guide

- Updated November 2019
- Analyzes projects using basic travel demand and operational inputs
  - Can estimate impacts of induced demand
- Uses sketch planning methods to assess:
  - Highway Capacity Expansions
  - Transit Capacity Expansions
  - Highway Operational Improvements
  - Transportation Management Systems (TMS)
- Four categories of benefits
  - Travel Time
  - Vehicle Operating Costs
  - Emissions
  - Collisions
Cal-B/C Corridor Guide

- Updated in 2019

- Post processor to calculate benefits using modeled data from micro-simulation and travel demand models

- Cal-B/C Corridor:
  - Can calculate impacts of induced demand
  - Allows the user to specify the number of model and safety groups (e.g., from one to 500 groups)
  - Period of analysis from two to 50 years

- Four categories of benefits
  - Travel Time
  - Vehicle Operating Costs
  - Emissions
  - Collisions
Cal-B/C Park & Ride (PnR) Guide

- Updated in 2019

- Cal-B/C PnR:
  - Evaluates new facilities, lot expansions, leased lots
  - Accounts for lot users who change from:
    - Autos to express bus or to carpool/vanpool
    - Local bus to express bus
    - A more distant lot to the new, closer lot
  - Allows up to 9 user destinations to be evaluated

- Four categories of benefits:
  - Travel time
  - Vehicle operations
  - Collisions
  - Emissions

Module 10: Additional Cal-B/C Tool Resources
Cal-B/C Active Transportation Guide

- Updated in 2019
- Cal-B/C AT evaluates bicycle and pedestrian projects and programs
- Cal-B/C AT evaluates impacts for five benefit categories:
  - Journey Quality
  - Additional Delay Savings
  - Additional Safety Benefits
  - Health Benefits
  - Auto Collision Costs
  - Auto Emissions
Cal-B/C Intermodal Freight Guide

- The newest Cal-B/C Tool Introduced in 2019
- Analyzes intermodal freight, drayage, transloading, and terminal efficiency projects
- Assesses 3 types of benefit:
  - Shipper Costs
  - Collision
  - Emissions
- Calculates benefits for bulk/break bulk and container shipments by mode
- Captures benefits from loading/unloading of commodities.
Cal-B/C Parameter Guide

- Each Cal-B/C Tool has the same Parameters worksheet

- Guide provides latest information on each assumption used by Cal-B/C, including:
  - General Economic Values
  - Highway Operations
  - Benefits Parameters
  - Model-Specific Parameters

- Parameters and assumptions are explained in more detail in Module 5 (Understanding Cal-B/C Parameters)

- Updated every few years (Cal-B/C version 7.2 uses 2016 as base year for economic assumptions)

- Users can adjust parameters as necessary
  - Some parameters may require expert knowledge in order to make adjustments (e.g., locomotive emissions)
Other Resource Guides and Historical Technical Documentation
Cal-B/C Historical Technical Documents

- Most information in these historical documents has been updated and incorporated into the current User’s Guides
- However, these supplements may provide useful background information and details on methodological approaches used in Cal-B/C
- Documents are available on the Caltrans, TEB website
Cal-B/C Technical Supplement

- Released in 1999
- First technical supplement to provide methodological background for the original Cal-B/C model
- Cal-B/C Parameter Guide contains the most recent economic values and parameter updates
- Other technical details from this volume have been incorporated into the Cal-B/C Sketch User’s Guide
Cal-B/C Technical Supplement Vol. 2

- Updated in 2004
- Expanded the Sketch tool analysis capabilities
- Part of Caltrans’ efforts to mainstream ITS and implement Transportation Management System (TMS)
- Allowed Cal-B/C to handle most of the projects included in the State Highway Operation and Protection Program (SHOPP)
- Volume 2 explains updated approaches used to evaluate projects

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Cal-B/C Technical Supplement Vol. 3

- Updated in 2012
- Incorporated technical details for new project types:
  - Queuing projects
  - Rail grade-separation projects
  - High Occupancy Vehicle (HOV) lane requirement changes, the construction of High Occupancy Toll (HOT) lanes, or the conversion of existing HOV lanes
- The technical supplement also contains some information on Cal-B/C Corridor
Cal-B/C Technical Supplement Vol. 4

- Updated in 2017
- First technical supplements to provide methodological background for:
  - Cal-B/C AT (Active Transportation)
  - Cal-B/C PnR (Park and Ride)
  - Cal-B/C IF (Intermodal Freight)
- Volume 4 presents research on Risk Assessment and BCA
Additional Online Data Resources
Module 10: Additional Online Data Resources

**Project Costing Information**

- **Contract Cost Data:** ([https://sv08data.dot.ca.gov/contractcost/](https://sv08data.dot.ca.gov/contractcost/))
  - Searchable historical bid data for Caltrans construction cost data
  - Caltrans Districts 1-12, from 1993 to 2021

- **Coded Items:** ([https://dot.ca.gov/programs/design/ccs-coded-items](https://dot.ca.gov/programs/design/ccs-coded-items))
  - Coded Contract Items
  - Department-Furnished Materials and Supplemental Work Items

- **Other Estimating Resources:** ([https://sv08data.dot.ca.gov/contractcost/resources.html](https://sv08data.dot.ca.gov/contractcost/resources.html))
  - Equipment Rental Rate Information: ([http://www.dot.ca.gov/hq/construc/equipmnt.html](http://www.dot.ca.gov/hq/construc/equipmnt.html))
  - Headquarters' Estimating Site: [http://www.dot.ca.gov/design/pjs/](http://www.dot.ca.gov/design/pjs/)
  - Guidance on Time-Related Overhead (TRO) and Mobilization
Caltrans Performance Measurement System (PeMS)

- Real-time and historical performance data from 1998
- Various formats and presentation styles
- Data available includes speeds and volumes for:
  - Freeway mainline lanes
  - Freeway HOV lane
  - Freeway on-ramps and off-ramps (volumes only)
- CHP incident data, Caltrans TASAS data, and other relevant data for Cal-B/C analysis
- Estimates of truck volumes is also available
- Raw 5-minute, hourly, daily detector data and a wide range of other datasets can be downloaded for analysis outside of PeMS

- [http://pems.dot.ca.gov/](http://pems.dot.ca.gov/)
Federal Transit Administration (FTA) National Transit Database (NTD)

- NTD data products include:
  - Detailed transit capital and operational data
  - National transit profiles: summaries and trends
  - Time series data on transit systems dating back to 1991
  - Up-to-date time series of monthly ridership data

- NTD data support Cal-B/C transit evaluations:
  - Ridership and service trends
  - Estimate transit in-vehicle speeds and travel times
  - Estimate cars per train based

https://www.transit.dot.gov/ntd
Caltrans Traffic Operations Data Sources

- Traffic Census Program

- Caltrans Traffic Counts are summarized annually into four categories:
  - Traffic Volumes: Annual Average Daily Traffic (AADT)
  - Truck Traffic: Annual Average Daily Truck Traffic
  - Ramp Volumes
  - Peak Hour Volume Data

- [https://dot.ca.gov/programs/traffic-operations/census](https://dot.ca.gov/programs/traffic-operations/census)
Federal Highway Administration (FHWA) – Truck Speeds

- FHWA Planning, Environment, Realty (HEPGIS) website has geo-spatial maps and data
- FHWA National Performance Management Research Data Set (NPMRDS) contains travel time data on the National Highway System
- Monthly Travel Time Reliability Index Layer has data to calculate truck speeds

https://hepgis.fhwa.dot.gov/
Traffic Accident Surveillance and Analysis System (TASAS) - Transportation Systems Network (TSN) Reports

- Highway inventory database housing and historical data for State Highway System (SHS) ramps, intersections, and roadways on the State Highway System (SHS)
- Inventory data
  - Examples: district, county, route, post mile, number of lanes, geometric attributes of lanes, shoulders, medians, intersections and ramps) continuously
- Data/Reports only accessible through Caltrans Staff
CHP Statewide Integrated Traffic Records System (SWITRS)

- Collision data collected for all incidents reported to law enforcement for both arterials and State Highways
- Source for collision data not on the SHS
- Account is required to access detailed data
- California accident data by locations, dates, and collision types
- Data is available in either report or raw formats

https://iswitrs.chp.ca.gov/Reports/jsp/index.jsp
Caltrans Office of Pavement Management

- **Pavement data for the State Highway System (SHS)**
  - Pavement Management System (PaveM) – current and historical pavement condition, current programmed projects, traffic, and climate data
  - Automated Pavement Condition Survey (APCS) - PaveM input and validates pavement performance prediction models
  - State of the Pavement Report (SOP) - Annual report based the APCS
  - [https://dot.ca.gov/programs/maintenance/pavement/pavement-management](https://dot.ca.gov/programs/maintenance/pavement/pavement-management)

- **Local Agencies may have their own Pavement Programs/ Data Systems**
  - May have inventory data for all roads within the city or county
  - May assess pavement condition based on distress information
  - May identify all pavement segments that need rehab or replacement
U.S. Census Bureau - American Community Survey (ACS)

- Population, socioeconomic, demographic, journey-to-work data available for high-level planning and forecasting
- Mode share data available by census tract
- Grant applications for improvements often request ACS-based information

https://www.census.gov/programs-surveys/acs
Emissions Data

- Some users may wish to evaluate the impacts of improved technologies (e.g., more fuel-efficient locomotives)

- This type of edit requires advanced expert knowledge to identify and to convert emissions factors into a parameter consistent with Cal-B/C

- Association of American Railroads (https://www.aar.org/)

- California Air Resources Board (https://arb.ca.gov/)

- California Air Resources Board emissions inventory EMFAC 2017 (https://arb.ca.gov/emfac/)
Crowd-Sourced Data

- **INRIX** ([https://inrix.com](https://inrix.com))
  - Speed and travel time data at a very detailed spatial network and for various time intervals

- **HERE** ([https://www.here.com](https://www.here.com))
  - Speed and travel time data similar to INRIX. May include truck speeds

- **Streetlight** ([https://www.streetlightdata.com](https://www.streetlightdata.com))
  - AADT, VMT, Speeds, & Travel Times at various spatial network scales and time intervals

- **ReplicaHQ** ([https://replicahq.com](https://replicahq.com))
  - Mobility and economic data at census-tract level
  - Detailed, activity-based travel models, region- and time-specific
  - Forecasting and impact analysis, built on Places data
Field Data Collection

- Field data collection can be used where other automatically collected data may not be available or of sufficient data quality
- Travel Time Studies (Probe / Floating Vehicles)
- Vehicle Classification and Occupancy Counts
- Average Daily Traffic (ADT) counts
Additional BCA Learning Resources
Additional Benefit Cost Analysis Resources

- Transportation Research Board (TRB) Transportation Economics Subcommittee
  - http://bca.transportationeconomics.org/

- FHWA Transportation Systems Management and Operations BCA Compendium

- OnTrackNorthAmerica Lifecycle Freight Cost And Benefit Analysis

- ASCE Library Highway Project Level Life-Cycle Benefit/Cost Analysis under Certainty, Risk, and Uncertainty

- Minnesota DOT Planning & Programming
  - https://www.dot.state.mn.us/planning/program/benefitcost.html

- Victoria Transport Policy Evaluating Active Transport Benefits and Costs
Closing Remarks

- This is the last module in the Cal-B/C Suite web-based training course
- In this module we provided some additional resources where you can find:
  - User's Guides and supplemental technical information about Cal-B/C from Caltrans Transportation Economics Branch website
  - Data sources to assist you in performing your BCA
  - Additional resources to learn more about BCA