



User's Guide

Version 2011.1

Prepared for:
South Coast Air Quality Management District
Diamond Bar, California

Prepared by:
ENVIRON International Corporation
Emeryville, California

Date:
February 2011

Acknowledgements

This program has been developed by ENVIRON International Corporation (ENVIRON) in collaboration with South Coast Air Quality Management District (SCAQMD). The following individuals should be recognized for their contributions to this program

SCAQMD Staff

Susan Nakamura	CEQA Planning and Rules Manager
Mike Krause	CEQA Special Projects Supervisor
Ian MacMillan	CEQA Intergovernmental Review Supervisor
Steve Smith	CEQA Supervisor
James Koizumi	Air Quality Specialist - CEQA
Jeffrey Inabinet	Air Quality Specialist - CEQA
Barbara Radlein	Air Quality Specialist - CEQA
Ernie Lopez	Air Quality Specialist - Transportation
Francis Goh	Systems and Programming Supervisor
Dan Garcia	Air Quality Specialist - CEQA

Beta Testers

Jamesine Rogers	California Air Resources Board
Dave Vintze	Bay Area AQMD
Alison Kirk	Bay Area AQMD
Monica Soucier	Imperial County APCD
Sam Longmire	Northern Sierra AQMD
Jean Getchell	Monterey Bay Unified APCD
David Craft	Monterey Bay Unified APCD
Angel Rinker	Placer County APCD
Larry Robinson	Sacramento Metropolitan AQMD
Karen Huss	Sacramento Metropolitan AQMD
Joseph Carle	Sacramento Metropolitan AQMD
Arnaud Marjollet	San Joaquin Valley APCD
Dan Barber	San Joaquin Valley APCD
Leland Villalvazo	San Joaquin Valley APCD
Patia Siong	San Joaquin Valley APCD
Georgia Stewart	San Joaquin Valley APCD
Jessica Willis	San Joaquin Valley APCD
Aeron Arlin Genet	San Luis Obispo County APCD

Andy Mutziger	San Luis Obispo County APCD
Melissa Guise	San Luis Obispo County APCD
Molly Pearson	Santa Barbara County APCD
Eric Gage	Santa Barbara County APCD
Chuck Thomas	Ventura County APCD
Elaine Searcy	Ventura County APCD
Jessica Range	City of San Francisco Planning Department
Eliza Laws	Albert A. Webb Associates
Katie Gallagher	Albert A. Webb Associates
Dave Deckman	Dudek
Debbie Bright-Stevens	Environmental Audit, Inc
Marcia Baverman	Environmental Audit, Inc
Michael Choi	Environmental Audit, Inc
Joe O'Bannon	Chambers Group
Vince Mirabella	Michael Brandman Associates
Cori Wilson	Michael Brandman Associates
Tin Cheung	The Planning Center
Nicole Vermilion	The Planning Center
John Vang	The Planning Center

ENVIRON Staff

Shari Libicki	Principal and Air Quality Practice Leader
Greg Yarwood	Principal
Lit Chan	Senior Manager
Michael Masonjones	Senior Manager
David Kim	Manager
Jennifer Schulte	Senior Associate
Tejas Shah	Associate
Piti Piyachaturawat	Associate

Traffic Technical Consultants

Jerry Walters	Fehr & Peers
Meghan Mitman	Fehr & Peers
Tien-Tien Chan	Fehr & Peers

Copyright

California Emission Estimator Model (CalEEMod)TM Version 2011.1
Copyright © 2011 South Coast Air Quality Management District (SCAQMD)
Developed by ENVIRON International Corporation in collaboration with SCAQMD and other
California Air Districts.

Contents

	Page
Acknowledgements	ii
Copyright	iv
1 Introduction	1
1.1 Purpose of Model	1
2 Program Installation	3
2.1 Operating System Requirements	3
2.2 Installation Procedures	3
2.3 Starting CalEEMod	5
3 Using CalEEMod	6
3.1 Home	8
3.2 Defining a Project	8
3.3 Altering Default Data	8
3.4 Mitigation	8
3.5 Reporting	9
4 Detailed Program Screens	10
4.1 Project Characteristics	10
4.2 Land Use	13
4.3 Construction	20
4.3.1 Construction Phase	20
4.3.2 Off-Road Equipment	22
4.3.3 Dust from Material Movement	22
4.3.4 Demolition	23
4.3.5 Trip and VMT	23
4.3.6 On-Road Fugitive Dust	23
4.3.7 Architectural Coatings	24
4.4 Mobile	25
4.4.1 Vehicle Trips	25
4.4.2 Vehicle Emissions	26
4.4.3 Road Dust	27
4.5 Area	28
4.5.1 Hearths and Woodstoves	28
4.5.2 Consumer Products	29
4.5.3 Area Architectural Coating	29
4.5.4 Landscape Equipment	29
4.6 Energy Use	30
4.7 Water and Wastewater Use	31
4.8 Solid Waste	32
4.9 Vegetation	33

4.9.1	Sequestration	33
4.10	Mitigation	34
4.10.1	Construction Mitigation	34
4.10.2	Traffic Mitigation	35
4.10.3	Area Mitigation	36
4.10.4	Energy Mitigation	37
4.10.5	Water Mitigation	38
4.10.6	Solid Waste Mitigation	38
4.11	Reporting	39

List of Appendices

Appendix A:	Calculation Details
Appendix B:	Glossary
Appendix C:	Acronym List
Appendix D:	Default Data Tables
Appendix E:	Technical Source Documentation
Appendix F:	Climate Zone Lookup

1 Introduction

This User's Guide (Guide) to the California Emission Estimator Model (CalEEMod)TM is meant to give the user an introduction on how to use the program as well as document the detailed calculations and default assumptions made in associated appendices. The purpose of CalEEMod is to provide a uniform platform for government agencies, land use planners, and environmental professionals to estimate potential emissions associated with both construction and operational use of land use projects. It is intended that these emission estimates are suitable for use in California Environmental Quality Act (CEQA) compliant documents for air quality and climate change impacts. In addition individual districts may develop additional uses for the model's emission estimates to show compliance with local agency rules.

CalEEMod utilizes widely accepted models for emission estimates combined with appropriate default data that can be used if site-specific information is not available. These models and default estimates use sources such as the United States Environmental Protection Agency (USEPA) AP-42 emission factors, California Air Resources Board (ARB) vehicle emission models, studies commissioned by California agencies such as the California Energy Commission (CEC) and Calrecycle. In addition, local air districts were given the opportunity to provide default values and existing regulation methodologies to use in their specific regions. If no information was provided by local air districts, appropriate state-wide values were utilized if regional differences could not otherwise be defined. Since new information and regulations are always changing, local agencies should be consulted to determine any recommended values to use that may differ from the defaults currently used in CalEEMod. User's of CalEEMod should keep in mind the assumptions and limitations of the default data in CalEEMod. A large majority of the default data associated with locations and land use is based on surveys of existing land uses. Caution should be taken if the project deviates significantly from the types and features included in the survey that forms the substantial evidence supporting the default data. In these situations site specific data that is supported by substantial evidence should be used if available.

The model provides a number of opportunities for the user to change the defaults in the model, however, users are recommended to provide justification for changing the defaults (e.g., reference more appropriate data) in the "Remarks" box provided at the bottom of the screen. Further, the user is reminded that CalEEMod is an emissions model and not an enforcement mechanism, thus, the user should ensure correct data is inputted, including the choice and percent reduction of mitigation most applicable to the land use project being evaluated.

1.1 Purpose of Model

CalEEMod provides a simple platform to calculate both construction emissions and operational emissions from a land use project. It calculates both the daily max and annual average for criteria pollutants as well as total or annual greenhouse gas (GHG) emissions which can be used in support of analyses in CEQA documents such as Environmental Impact Reports (EIRs) and Negative Declarations. In addition, default values for water and energy use are quantified which may be useful for other sections in an EIR or represent opportunities to incorporate the rigorous site-specific information from the other EIR sections. Specifically the model aids the user in the following calculations:

- Short term construction emissions associated with demolition, site preparation, grading, building, coating, and paving from the following sources
 - Off-road construction equipment
 - On-road mobile equipment associated with workers, vendors, and hauling
 - Fugitive dust associated with grading, demolition, truck loading, and roads (Fugitive dust from wind blown sources such as storage piles are not quantified in CalEEMod which is consistent with approaches taken in other comprehensive models.)
 - Volatile emissions of reactive organic gasses (ROG) from architectural coating and paving.
- Operational emissions associated with the fully built out land use development
 - On-road mobile vehicle traffic generated by the land uses
 - Fugitive dust associated with roads
 - Volatile emissions of ROG from architectural coating
 - Off-road emissions from landscaping equipment
 - Volatile emissions of ROG from consumer products and cleaning supplies
 - Wood stoves and hearth usage
 - Natural gas usage in the buildings
 - Electricity usage in the buildings (GHG only)
 - Water usage by the land uses (GHG only)
 - Solid waste disposal by the land uses (GHG only)
- One-time vegetation sequestration changes
 - Permanent vegetation land use changes
 - New tree plantings
- Mitigation impacts to both short-term construction and operational emissions
 - Several of the mitigation measures describe in CAPCOA's Quantifying Greenhouse Gas Mitigation Measures¹ have been incorporated into CalEEMod.

¹ Available at : <http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>

2 Program Installation

The program is distributed and maintained by South Coast Air Quality Management District (SCAQMD)². The most recent version can be downloaded from www.caleemod.com.

2.1 Operating System Requirements

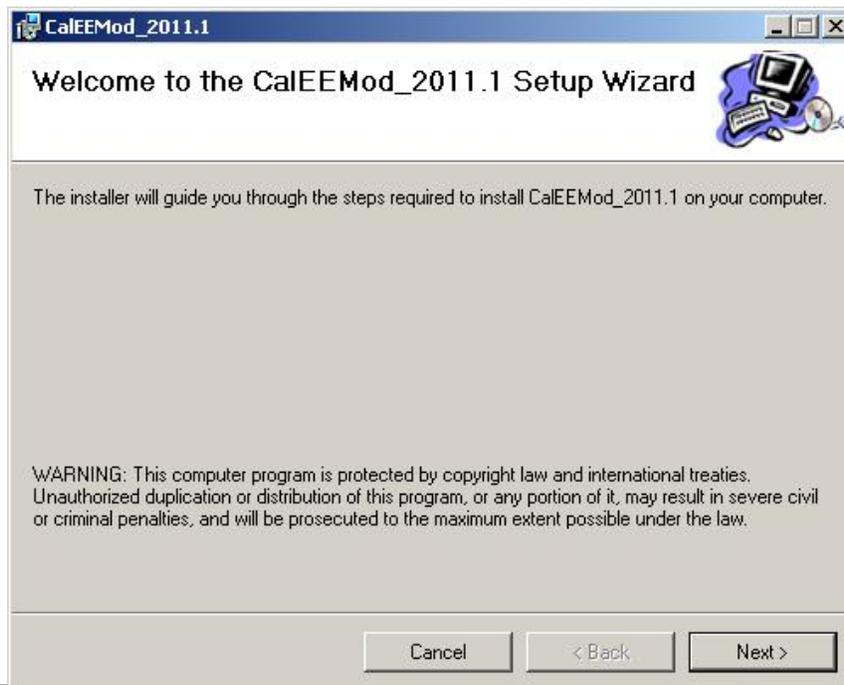
CalEEMod was programmed by ENVIRON using Microsoft SQL Compact Edition in conjunction with a Visual Basic Graphical User Interface (GUI). CalEEMod requires the following system requirements:

- Microsoft Windows XP, Vista, or 7 Operating System
- Microsoft .Net Framework 3.5 or higher
- 90 Mb hard drive space available

2.2 Installation Procedures

To install

1. Ensure you have the required Microsoft .Net framework 3.5 or higher installed on your machine. If not install this first. It is available free from Microsoft at <http://www.microsoft.com/net/download.aspx>
2. Download the installation files (setup.exe and CalEEMod_2011.1.msi).
3. Click the setup.exe file that you downloaded. This should walk you through the rest of the installation.



2 © 2010 All Rights Reserved by South Coast Air Quality Management District (SCAQMD).

4. The default directory for CalEEMod is C:\CalEEMod\. The user may select alternative locations for installation³. The user will also be prompted to select to install CalEEMod for everyone who uses the computer or just the current user.



5. Click "Next" until the installation has completed. Then click close to exit the installer.
6. Click the link below to install SQL Server Compact 3.5 SP2

<http://www.microsoft.com/downloads/details.aspx?familyid=E497988A-C93A-404C-B161-3A0B323DCE24&displaylang=en>

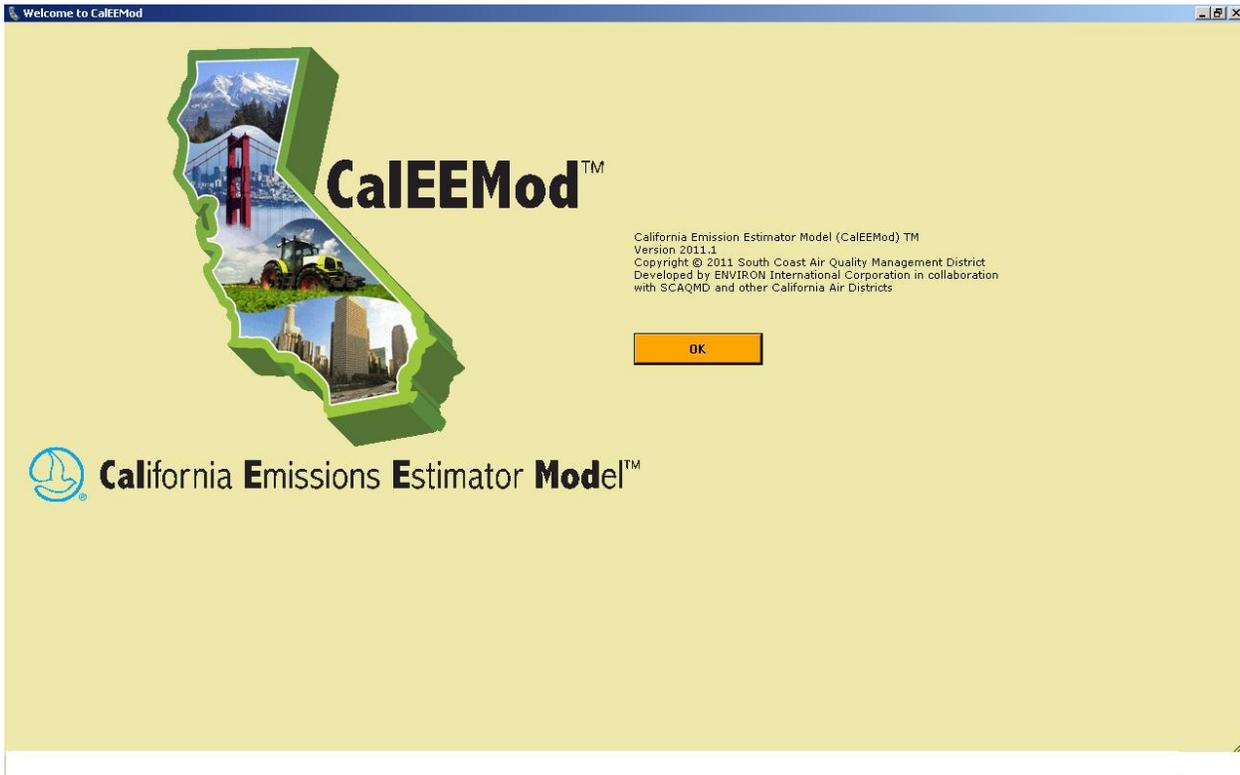
Once this file is downloaded, unzip the file anywhere on your computer and run the installation file (setup.exe).

7. If you have any further trouble installing CalEEMod, make sure you have appropriate user privileges and the system requirements.

³ If you use windows Vista or 7, please be aware of file privileges which may not allow access rights to some folders during program operations such as C:\Program Files\

2.3 Starting CalEEMod

The installation will create a short cut icon on the desktop as well as add CalEEMod to the Programs available from the Start Button. Select CalEEMod from the program files or double click on the CalEEMod short cut. This will open CalEEMod. Click on OK to advance the main program.



3 Using CalEEMod

Figure 3.1 identifies some key features of CalEEMod which are described below.

1. **Menu Bar:** A drop down menu found on all screens. The “Home” menu controls file features such as New Project, Open Project, Save Project, and Save As Project. The “Help” will link to appropriate information for the relevant screen from this User’s Guide. All other menus will allow navigation between screens in any order.
2. **Screen Name:** Identifies the name of the current screen.
3. **Default Button:** This button allows the restoration of program defaults if the user has changed any values on the screen. User entered values will be highlighted yellow to clearly indicate that they have been changed from the defaults. The user will be prompted if they would like to restore default for the current or last cell or the whole page.

Import CSV Button: This button will allow a user to load in a csv file for a specific data grid. An excel spreadsheet can be imported wholly into the model under "Open Project". Alternatively, each tab saved as a "csv" file can be imported under the corresponding screen page - e.g., Land Use tab imported into the Land Use screen. The csv file needs the appropriate row header names and any text strings must match the values used in CalEEMod exactly. A template to assist with filling out individual tabs can be downloaded from the CalEEMod website.

Cancel Button: This button cancels the previous actions that have occurred on the screen since the last time the file was saved.

4. **Remarks:** This section at the bottom of each screen allows the user to enter comments regarding any user defined values entered on this screen. This is meant to assist reviewers of the program in determining justification for values selected.
5. **Next Button:** This button when clicked will take the user to the next sequential step. Later modules will also have a “Previous” button that will take the user back to the previous sequential step.
6. **Data Grid:** This is a common box where values for the variables defined across the top to be filled in. The number of rows will automatically be adjusted based on the number of rows of information required to define the information. The last row is indicated with an asterisk (*) and once information is started to be added to this row a new row will be added at the end. To delete a row select the desired row to delete, and hit the delete button on your keyboard (This is allowed unless the data grid is a fixed list such as the Pollutant selection list.). Scroll bars (both horizontal and vertical) will occur automatically if necessary.

The next sections will give you some quick details on how to get started with a project in CalEEMod. Section 4 gives more specific details about each individual screen the user can encounter in CalEEMod.

The screenshot shows the CalEEMod 2011.1 software interface. The menu bar at the top includes Home, Project Characteristics, Land Use, Construction, Operational, Vegetation, Mitigation, Reporting, and Help. The 'Project Characteristics' screen is active, featuring a 'Project Detail' section with input fields for Project Name, Project Location, Windspeed (m/s), Precipitation Frequency (days), Climate Zone, Land Use Setting (set to Urban), and Operational Year (set to 2011). Below this is the 'Utility Information' section, which includes a note: '*If "User Defined" is selected, user must specify data source in Remarks'. It contains a 'Select Utility Company' dropdown and three intensity factor input fields for CO2, CH4, and N2O, all set to 0. A 'Remarks' text area is located at the bottom left. On the right, the 'Pollutants' section has 'Select All' and 'Clear All' buttons above a data grid. The data grid lists various pollutants with checkboxes in the 'Pollutant Selection' column and their full names in the 'Pollutant Full Name' column. A 'Next >>' button is located at the bottom right.

1. Menu Bar

2. Screen Name

3. Default Button

4. Remarks

5. Next Button

6. Data Grid

Pollutant Selection	Pollutant Full Name
<input checked="" type="checkbox"/>	Reactive Organic Gases (ROG)
<input checked="" type="checkbox"/>	Nitrogen Oxides (NOx)
<input checked="" type="checkbox"/>	Carbon Monoxide (CO)
<input checked="" type="checkbox"/>	Sulfur Dioxide (SO2)
<input checked="" type="checkbox"/>	Particulate Matter 10um (PM10)
<input checked="" type="checkbox"/>	Particulate Matter 2.5um (PM2.5)
<input checked="" type="checkbox"/>	Fugitive PM10um (PM10)
<input checked="" type="checkbox"/>	Fugitive PM2.5um (PM2.5)
<input checked="" type="checkbox"/>	Total Organic Gases (TOG)
<input checked="" type="checkbox"/>	Lead (Pb)
<input checked="" type="checkbox"/>	Biogenic Carbon Dioxide (CO2)
<input checked="" type="checkbox"/>	Non-Biogenic Carbon Dioxide (CO2)
<input checked="" type="checkbox"/>	Carbon Dioxide (CO2)
<input checked="" type="checkbox"/>	Methane (CH4)
<input checked="" type="checkbox"/>	Nitrous Oxide (N2O)
<input checked="" type="checkbox"/>	CO2 Equivalent GHGs (CO2e)

3.1 Home

This is the part of the file menu bar that controls the file saving and opening features. The available options are:

- New Project
- Open Project
- Save
- Save As
- Exit

The user should select Open Project if they wish to load in a project that has been previously saved. Note that this will remove any information that has been entered into the GUI unless it has been saved to a file. Save will save the currently loaded project database as a Microsoft Excel file that can be used to open this project again into CalEEMod. Save As will allow the user to change the name of the saved project file. Exit will close CalEEMod. The Microsoft Excel file can be edited following the format of the save file to quickly make edits outside of the Graphical User Interface (GUI). The user will still need to use the GUI for reporting of results. This can be most useful in making changes to construction lists. Individual tabs can be loaded in as a .csv file in various places in CalEEMod to minimize the data entry.

3.2 Defining a Project

In order to define a project, the user will have to enter information on both the Project Characteristics screen and land use screen. After entering information on these two screens, CalEEMod will populate all of the other information required to calculate unmitigated construction (unless there is demolition, grading, or site preparation) and operation emissions using default data. Demolition, grading, and site preparation requires additional information regarding the amount of material to be demolished and material (debris, soil, etc) transported to or from the site that is entered on the appropriate construction screens. If site specific information will not be used, the user can jump to entering mitigation measures followed by reporting. If the user has any site-specific information that will replace the default information, this should be entered on the appropriate screens before moving on to mitigation and reporting.

3.3 Altering Default Data

CalEEMod was designed to allow for ease in changing default assumptions. Site-specific information that is supported with substantial evidence required by CEQA, is preferred when it is available. However, it is often the case that site-specific information is not available. CalEEMod was designed to assume reasonable default assumptions supported by substantial evidence to the degree available at the time of programming. CalEEMod is based on fully adopted methods and data. Therefore, draft methods and data are not used as defaults.

3.4 Mitigation

Common construction mitigation measures that impact the calculations in CalEEMod have been incorporated as options for the user to select. At this time, required mitigation measures to

comply with individual fugitive dust rules have not been incorporated in unmitigated calculations due to different interpretations of CEQA guidance regarding required mitigation.

Several mitigation measures from CAPCOA's Quantifying Greenhouse Mitigation Measures have been incorporated including combinations and caps when using multiple mitigation measures. Some mitigation measures are not as amenable to simple input information or are less common in their use and therefore not included at this time. CalEEMod was designed to include typical mitigation measures that are some of the more effective measures available to development projects. If mitigation measures are not available as options in CalEEMod, the user can likely alter values in the program that will allow for adjustment of hand calculated reductions due to mitigation that may be less common. This will require separate runs of CalEEMod files in order to properly account for unmitigated and mitigated scenarios.

3.5 Reporting

This is the part of the program that allows the user to select predefined reports that will display the emission calculation results. The user will be able to view these on a screen and save as either a Microsoft Excel file or a pdf file.

4 Detailed Program Screens

4.1 Project Characteristics

The project characteristics screen is where the user enters key location, electricity company information and pollutants they want to analyze. The information on this screen needs to be entered before proper default information can be used in subsequent screens. Changes on this screen will result in over riding user defined data with defaults in subsequent screens where this information is used. Under the Project Detail section the user enters the Project Name which will appear in the reports. The user then selects information from drop down boxes or overrides the default values in the text boxes. Each of the information categories on this screen are described in more detail below.

Project Location

The user selects the region in which the project is located. The user first selects if they want to choose an Air District, Air Basin, County, or State-wide. The second drop down box will give the list of specific locations based on the first drop down box which the user selects. For counties that are divided between air districts, air basins or district requested subregions; the county is followed by the sub-county area which can influence some of the default values selected by modules. Consult your lead agency on their preference for location. This primarily influences on-road vehicle emissions, trip lengths, water supply and treatment electricity use, solid waste disposal rates, amount of paved roads, days of landscaping equipment use, architectural coating emissions, and hearth usage.

Wind Speed and Precipitation Frequency

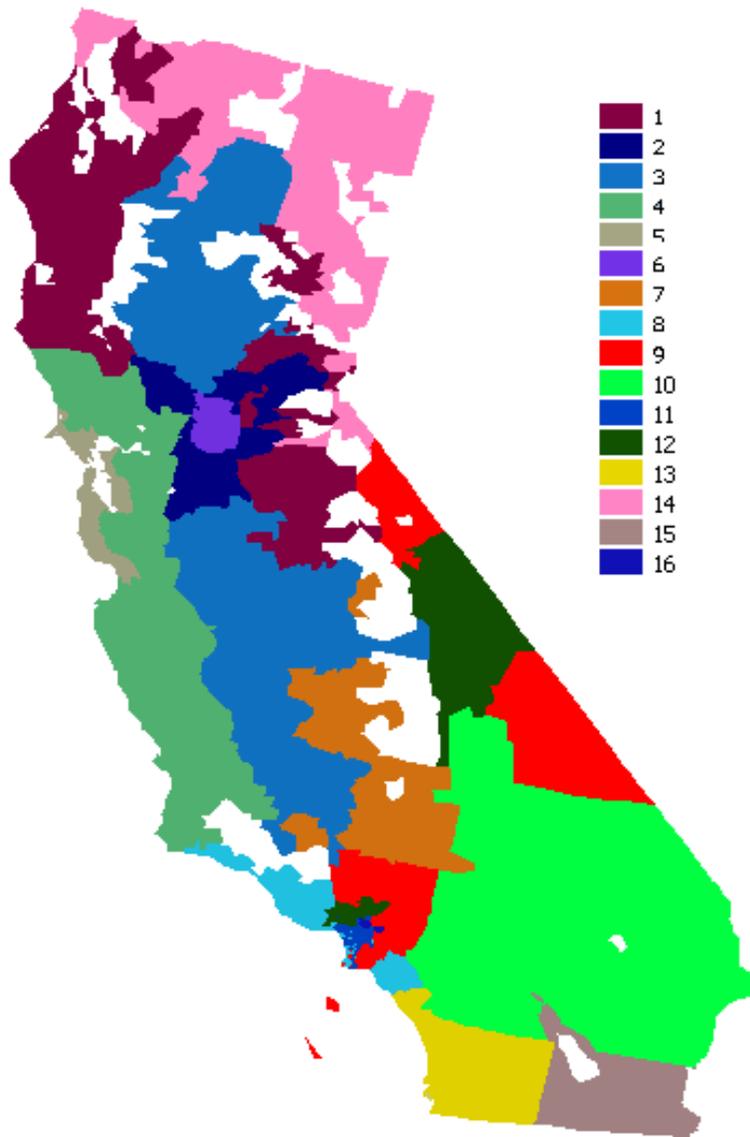
Selection of project location will fill in the default wind speed and precipitation frequency. The user can choose to override this information and type in a different value. The wind speed is in units of meters per second and is used in some fugitive dust calculations. Precipitation frequency is the number of days in a year that has precipitation greater than 0.01 inches in a day and is used in fugitive dust calculations.

Climate Zone

Selection of project location will restrict the climate zones available for the user to choose from based on the climate zones in the project location. The climate zones used are based on CEC forecasting climate zones (different than Title-24 building climate zones) as used in the California Commercial End Use Survey (CEUS) and Residential Appliance Saturation Survey (RASS)⁴. The figure below indicates these climate zones. A spreadsheet that allows the user to look up climate zones based on city/zipcodes will be available from the webpage if user's need further assistance in selecting the appropriate climate zone.

⁴ CalEEMod has not been updated to incorporate the October 2010 version of RASS. This will be incorporated in the next update of default data in future versions of CalEEMod.

CEC Forecast Climate Zones^{5,6}



5 Adapted from Figure 2 of CEC. 2004. Residential Appliance Saturation Survey. Available online at: <http://www.energy.ca.gov/appliances/rass/>

6 White spaces represent national parks and forests.

Land Use Setting

This is where the user indicates if the project is located in a rural or urban setting. The user should contact their local air districts for guidance on the appropriate land use setting to select as the definition used may differ based on the definitions used to support the urban and rural trip lengths in the relevant air basin.

Operational Year

The user should indicate the first year the project will be fully operational that they wish to use as a basis for determining emission factors for all operational modules. CalEEMod can handle the following years: 1990, 2000, 2005, 2010-2025, 2030, 2035, and 2040. This was done to limit the file size associated with vehicle emission factors.

Utility Information

The user should select the appropriate electricity utility provider from the list or select “user defined”. If a specific utility is entered, the default GHG intensity factors will be filled in. The user will need to enter values if “user defined” is selected. These values are used to determine the GHG emissions associated with electricity use in various modules. The default values are based on ARB’s Local Government Operations Protocol (LGO)⁷(CO₂) and E-Grid values (CH₄ and N₂O). The values for Pacific Gas and Electric (PG&E) has been modified at the request of air districts to have the CO₂ intensity based on PG&E’s 2008 Public Utility Protocol (PUP) Reports CO₂ intensity. Imperial Irrigation district is based on its 2008 PUP Report since it was not included in the ARB LGO Protocol. Modesto Irrigation District is based on its 2007 PUP Report since it was not included in the ARB LGO Protocol and this is the most recent available.

Pollutants

The grid to the left automatically has all boxes checked. Uncheck any pollutants you don’t want reported. Some of the pollutants are a combination of other identified pollutants such as Carbon dioxide (CO₂) is made up of biogenic and non-biogenic carbon dioxide. CO₂ Equivalent GHGs is the Global Warming Potential (GWP) weighted value of all GHGs. GWPs are based on the IPCC’s Second Assessment Report⁸.

Remarks

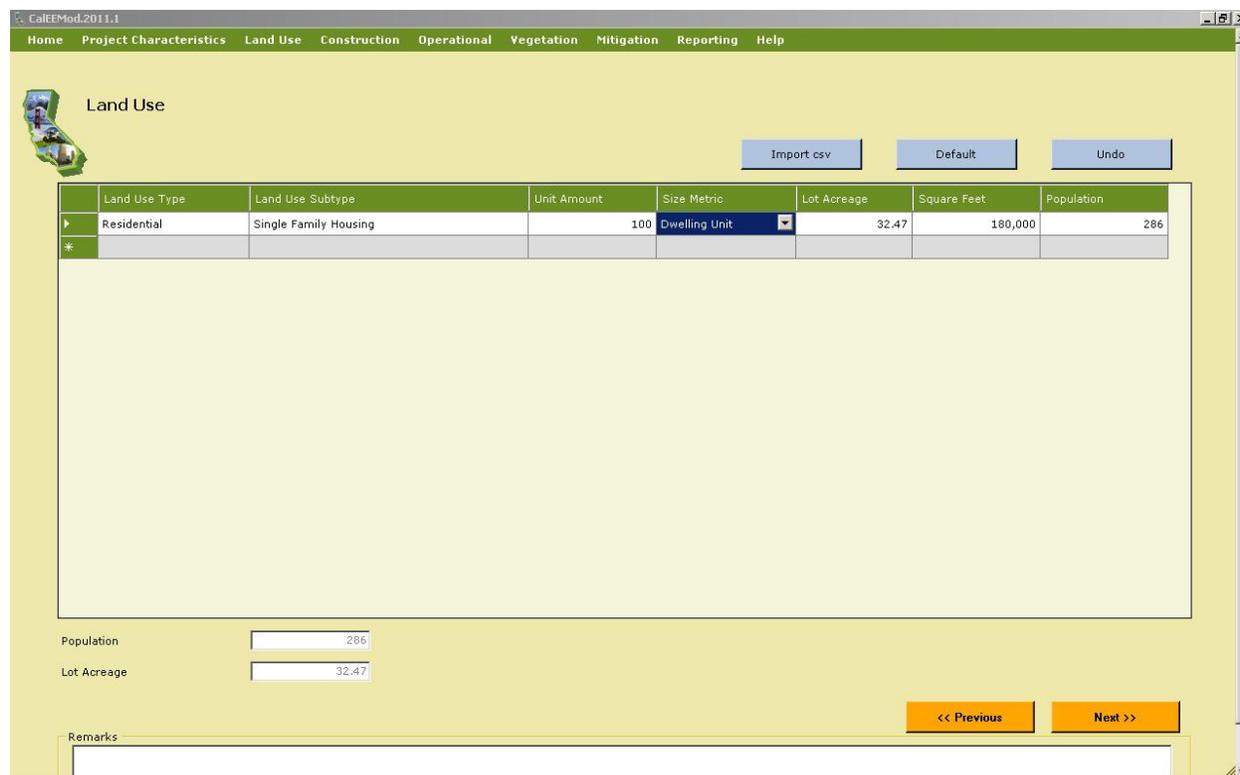
The user can enter any remarks to describe any use of non-default values or to add additional detail regarding the basis for information used such as relevant EIR sections.

7 Available at: <http://www.arb.ca.gov/cc/protocols/localgov/localgov.htm>

8 Available at: <http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf>

4.2 Land Use

This screen is used to define the specific land uses that will occur at the project site. The land uses, size features and population are used throughout CalEEMod in determining default variables and calculations.



Land Use Type

The user selects from the drop down list the main land use type: Commercial, Educational, Industrial, Residential, Retail, Recreational, and **Parking**. This program specifically designates parking areas as a separate land use rather than as a part of an associated land use. Two options are available: parking lots or structures. Parking as a separate land use made the estimate of default acreage and paving area easier. Each land use type has a blank land use subtype associated with it that the user can use if the other land use subtypes do not fit the types listed. There is no default data associated with the blank land uses and all information that is based on land uses will need to be entered by the user otherwise no emissions will be calculated.

Land Use Subtype

Tabbing over to the next column in a row, the user selects from a drop down list of available land use subtypes based on the land use type selected. The user also has the option to select blank land use, however, no default data will be available and the user will have to enter in subsequent screens the appropriate values. Land use subtypes are based primarily on the ITE land use definitions used for trip generation rate information. All apartment and condo/townhouse land uses use the same trip rate for a low rise apartment building to be

consistent with the baseline necessary for applying the mitigation measures. In some cases similar generalized land uses or surrogate data was mapped to some land use subtypes in order to generate the default data needed for various modules.

Table 1: Land Use Sub Type Descriptions

Land UseSubType	Description¹	ITE Number
Single Family Housing	All single-family detached homes on individual lots typical of a suburban subdivision	210
Apartments Low Rise	Low-rise apartments are units located in rental buildings that have 1-2 levels.	221
Apartments Mid Rise	Mid-rise apartments in rental buildings that have between 3 and 10 levels.	223
Apartments High Rise	High-rise apartments are units located in rental buildings that have more than 10 levels and most likely have one or more elevators.	222
Condo/Townhouse	These are ownership units that have at least one other owned unit within the same building structure.	230
Condo/Townhouse High Rise	These are ownership units that have three or more levels.	232
Mobile Home Park	Mobile home parks consist of manufactured homes that are sited and installed on permanent foundations and typically have community facilities such as recreation rooms, swimming pools and laundry facilities.	240
Retirement Community	These communities provide multiple elements of senior adult living. Housing options may include various combinations of senior adult housing, congregate care, assisted living, and skilled nursing care aimed at allowing the residents to live in one community as their medical needs change.	255
Congregate Care (Assisted Living)	These facilities are independent living developments that provide centralized amenities such as dining, housekeeping, transportation and organized social/recreational activities. Limited medical services may or may not be provided.	253
Day-Care Center	A day care center is a facility where care for pre-school age children is provided, normally during the daytime hours. Day care facilities generally include classrooms, offices, eating areas and playgrounds.	565
Elementary School	Elementary schools typically serve students attending kindergarten through the fifth or sixth grade. They are usually centrally located in residential communities in order to facilitate student access and have no student drivers.	520
Junior High School	Junior High schools serve students who have completed elementary school and have not yet entered high school.	522
High School	High schools serve students who have completed middle or junior high school.	530
Junior College (2Yr)	This land use includes two-year junior, community, or technical colleges.	540
University/College (4Yr)	This land use includes four-year universities or colleges that may or may not offer graduate programs.	550

Table 1: Land Use Sub Type Descriptions

Land UseSubType	Description ¹	ITE Number
Library	A library is a facility that consists of shelved books; reading rooms or areas; and sometimes meeting rooms.	590
Place Of Worship	A church is a building in which public worship services are held. A church houses an assembly hall or sanctuary; it may also house meeting rooms, classrooms and occasionally dining catering or party facilities.	560
City Park	City parks are owned and operated by a city.	411
Golf Course	Golf courses include 9, 18, 27 and 36 hole courses. Some sites may also have driving ranges and clubhouses with a pro shop, restaurant, lounge and banquet facilities.	430
Recreational Swimming Pool	This is a typical recreational swimming pool that may be associated with community centers, parks, swim clubs, etc.	
Racquet Club	These are privately-owned facilities that primarily cater to racquet sports.	491
Health Club	These are privately-owned facilities that primarily focus on individual fitness or training. Typically they provide exercise classes; weightlifting, fitness and gymnastics equipment; spas; locker rooms; and small restaurants or snack bars.	492
Movie Theater (No Matinee)	Movie theaters consist of audience seating, single or multiple screens and auditoriums, a lobby and a refreshment stand. Movie theaters without matinees show movies on weekday evenings and weekends only; there are no weekday daytime showings.	443
Arena	Arenas are large indoor structures in which spectator events are held. These events vary from professional ice hockey and basketball to non-sporting events such as concerts, shows, or religious services. Arenas generally have large parking facilities, except when located in or around the downtown of a large city.	460
Quality Restaurant	This land use consists of high quality, full-service eating establishments with typical turnover rates of at least one hour or longer. Quality restaurants generally do not serve breakfast, some do not serve lunch; all serve dinner. This type of restaurant usually requires reservations and is generally not part of a chain. Patrons commonly wait to be seated, are served by a waiter, order from menus and pay for meals after they eat.	931
High Turnover (Sit Down Restaurant)	This land use consists of sit-down, full-service eating establishments with turnover rates of approximately one hour or less. This type of restaurant is usually moderately priced and frequently belongs to a restaurant chain.	932
Fast Food Restaurant With Drive Thru	This category includes fast-food restaurants with drive-through windows.	934
Fast Food Restaurant W/O Drive Thru	This land use includes fast-food restaurants without drive-through windows. Patrons generally order at a cash register and pay before they eat.	933
Hotel	Hotels are places of lodging that provide sleeping accommodations and supporting facilities such as restaurants; cocktail lounges; meeting and banquet rooms or convention facilities; limited recreational facilities and other retail and service shops.	310

Table 1: Land Use Sub Type Descriptions

Land UseSubType	Description ¹	ITE Number
Motel	Motels are places of lodging that provide sleeping accommodations and often a restaurant. Motels generally offer free on-site parking and provide little or no meeting space and few supporting facilities.	320
Parking Lot	This is a typical single surface parking lot typically covered with asphalt.	
Parking Structure	This is a parking structure that may be above or below ground. It is not covered in asphalt.	
Free-Standing Discount Store	Discount stores offer centralized cashiering and sell products that are advertised at discount prices. These stores offer a variety of customer services and maintain long store hours seven days a week.	815
Free-Standing Discount Superstore	The discount superstore is similar to the free-standing discount stores with the addition that they also contain a full-service grocery department under the same roof that shares entrances and exits with the discount store area.	813
Discount Club	A discount club is a discount store or warehouse where shoppers pay a membership fee in order to take advantage of discounted prices on a wide variety of items such as food, clothing, tires and appliances. Many items are sold in large quantities or in bulk.	857
Regional Shopping Center	A shopping center is an integrated group of commercial establishments that is planned, developed, owned and managed as a unit. A shopping center's composition is related to its market area in terms of size, location and type of store.	820
Electronic Superstore	These are free-standing facilities that specialize in the sale of electronic merchandise.	863
Home Improvement Superstore	These are free-standing facilities that specialize in the sale of home improvement merchandise.	862
Strip Mall	Small strip shopping centers contain a variety of retail shops and specialize in quality apparel, hard goods and services such as real estate offices, dance studios, florists and small restaurants.	814
Hardware/Paint Store	These stores sell hardware and paint supplies and are generally free-standing buildings.	816
Supermarket	Supermarkets are free-standing retail stores selling a complete assortment of food: food preparation and wrapping materials; and household, cleaning items. Supermarkets may also contain the following products and services: ATMs, automobile supplies, bakeries, books and magazines, dry cleaning, floral arrangements, greeting cards, limited-service banks, photo centers, pharmacies and video rental areas.	850
Convenience Market (24 Hour)	These markets sell convenience foods, newspapers, magazines and often beer and wine. They do not have gasoline pumps.	851
Convenience Market With Gas Pumps	These markets sell gasoline, convenience foods, newspapers, magazines and often beer and wine. This includes convenience markets with gasoline pumps where the primary business is the selling of convenience items, not the fueling of motor vehicles.	853

Table 1: Land Use Sub Type Descriptions

Land UseSubType	Description ¹	ITE Number
Automobile Care Center	An automobile care center houses numerous businesses that provide automobile-related services, such as repair and servicing; stereo installation; and seat cover upholstery.	942
Gasoline/Service Station	This land use includes gasoline/service stations where the primary business is the fueling of motor vehicles. They may also have ancillary facilities for servicing and repairing motor vehicles.	944
Bank (With Drive-Through)	Drive-in banks provide banking facilities for motorists who conduct financial transactions from their vehicles; many also serve patrons who walk into the building.	912
General Office Building	A general office building houses multiple tenants where affairs of businesses commercial or industrial organizations or professional persons or firms are conducted. If information is known about individual buildings, it is suggested that this land use be used instead of the more generic office park.	710
Office Park	Office parks are usually suburban subdivisions or planned unit developments containing general office buildings and support services, such as banks, restaurants and service stations, arranged in a park-or campus-like atmosphere. This should be used if details on individual buildings are not available.	750
Research & Development	R&D centers are facilities devoted almost exclusively to R&D activities. The range of specific types of businesses contained in this land use category varies significantly. R&D centers may contain offices and light fabrication areas.	760
Government Office Building	This is an individual building containing either the entire function or simply one agency of a city, county, state, federal, or other governmental unit.	730
Government (Civic Center)	A group of government buildings that are interconnected by pedestrian walkways.	733
Pharmacy/Drugstore With Drive Thru	These are retail facilities that primarily sell prescription and non-prescription drugs. These facilities may also sell cosmetics, toiletries, medications, stationery, personal care products, limited food products and general merchandise. The drug stores in this category contain drive-through windows.	881
Pharmacy/Drugstore W/O Drive Thru	These are retail facilities that primarily sell prescription and non-prescription drugs. These facilities may also sell cosmetics, toiletries, medications, stationery, personal care products, limited food products and general merchandise. The drug stores in this category do not contain drive-through windows.	880
Medical Office Building	This is a facility that provides diagnoses and outpatient care on a routine basis but is unable to provide prolonged in-house medical and surgical care. One or more private physicians or dentists generally operate this type of facility.	720
Hospital	A hospital is any institution where medical or surgical care and overnight accommodations are provided to non-ambulatory and ambulatory patients. However, it does not refer to medical clinics or nursing homes.	610

Table 1: Land Use Sub Type Descriptions

Land UseSubType	Description¹	ITE Number
Unrefrigerated Warehouse-No Rail	This is a warehouse that does not have refrigeration and no rail spur.	150
Unrefrigerated Warehouse-Rail	This is a warehouse that does not have refrigeration but has a rail spur.	150
Refrigerated Warehouse-No Rail	This is a warehouse that has refrigeration but no rail spur.	150
Refrigerated Warehouse-Rail	This is a warehouse that has refrigeration and a rail spur.	150
General Light Industry	Light industrial facilities are free-standing facilities devoted to a single use. The facilities have an emphasis on activities other than manufacturing and typically have minimal office space. Typical light industrial activities include printing, material testing and assembly of data processing equipment.	110
General Heavy Industry	Heavy industrial facilities usually have a high number of employees per industrial plant and are generally limited to the manufacturing of large items.	120
Industrial Park	Industrial parks contain a number of industrial or related facilities. They are characterized by a mix of manufacturing, service and warehouse facilities with a wide variation in the proportion of each type of use from one location to another. Many industrial parks contain highly diversified facilities.	130
Manufacturing	Manufacturing facilities are areas where the primary activity is the conversion of raw materials or parts into finished products. It generally also has office, warehouse, R&D functions at the site.	140

Notes

1. Based on land use descriptions in ITE Trip Generation 8th Edition.

Unit Amount

Tabbing over to the next column, the user enters the appropriate size of the land use in terms of the size metric selected. This will be used to calculate the rest of the columns in this datagrid.

Size Metric

Tabbing over to the next column in a row, the user can select another size metric unit if it is available for that land use subtype. Square footage means the building square footage and not the building footprint or lot acreage.

Lot Acreage (datagrid)

The user should override the default value if known. For multi-use, multistory building, the square footage should be preserved for each individual land use and the acreage assigned to the residential portion or split between non-residential land uses if there is no residential. Acreage is used to estimate housing density as needed for calculations and total acreage for the project is used in assigning construction default data.

Table 2: Default Housing Density

Land Use Sub Type	Density (Dwelling Units/Acre)
Single Family Housing	3
Apartments low rise	16
Apartments mid rise	38
Apartments high rise	62
Condo/townhouse	16
Condo/townhouse high rise	64
Mobile Home Park	8
Retirement Community	5
Congregate care (Assisted Living)	16

Notes:

1. Based on the density assumed in ITE Trip Generation 8th Edition

Square Footage

The user should override the default value if known. This is the total building square footage.

Population (datagrid)

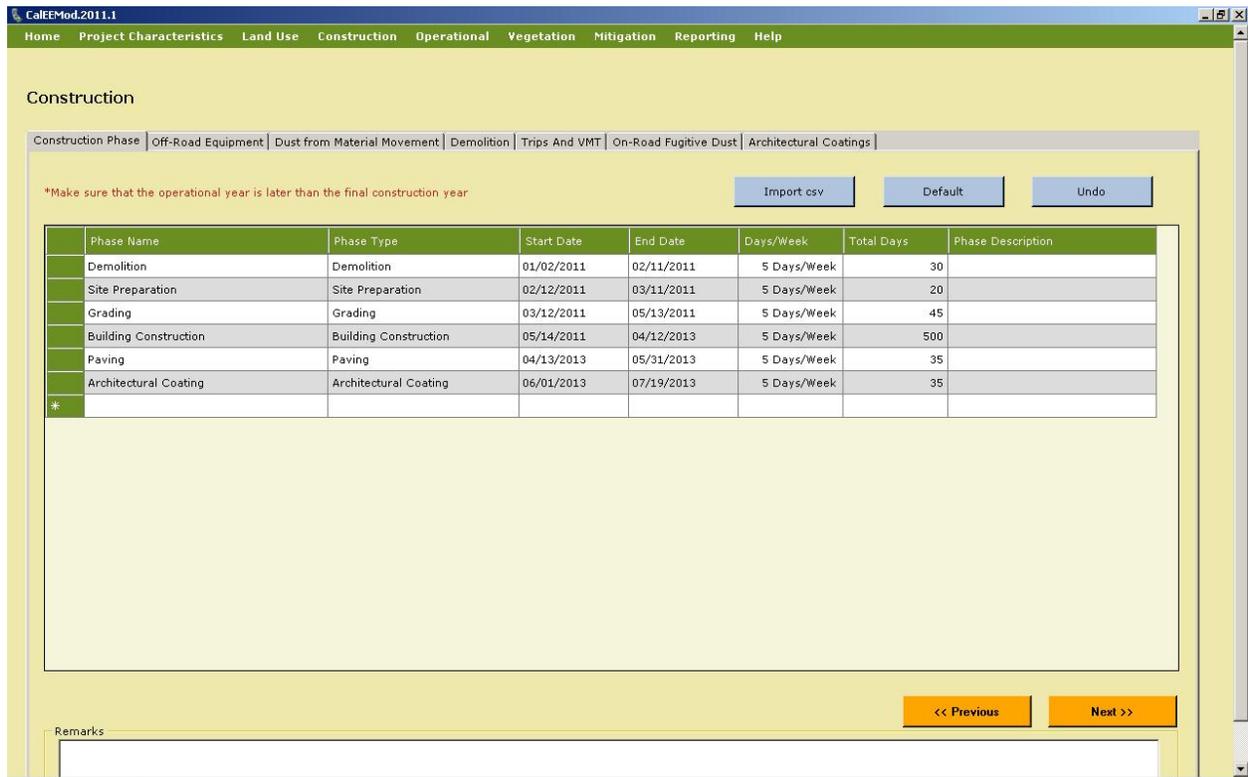
This is the population estimated for this row's land use. The user should override the default value if known.

Population and Lot Acreage (text box)

This is the total population and acreage of all land uses entered in the data grid. This is for informational purposes of values that will be used by the program and can't be changed by the user.

4.3 Construction

Default information is based on a survey of construction sites grouped by construction phase and lot acreage performed by SCAQMD which can be found in Appendix E. Thus, the phase length is based on total acreage, equipment types from surveys and one crew. The default construction equipment list and phase length are most appropriate for the size and types surveyed while the survey has been extrapolated to indicate default values, more detailed site specific equipment and phases are highly suggested in these cases for the most accurate results. CalEEMod uses the SCAQMD construction survey data, but rather than fit all construction activities into one year (as some models do), the construction schedules are based on the estimated actual time it would take for all phases of construction to occur, based generally on the same construction fleet derived from small construction sites. If the user changes the construction schedule, the number of construction equipment and worker trips would need to be adjusted to reflect the appropriate equipment operated daily to accomplish the task within the modified schedule. The user will be expected to justify the adjustment. General conservative guidance dictates if the construction schedule is halved, the daily number of construction equipment is doubled (e.g., two crews operating daily as opposed to one crew).



4.3.1 Construction Phase

This is the screen where the user enters the type of each construction phase and the date range of these phases. Default phases are based on the total lot acreage of the project. Depending on the project being modeled, not all phases will be necessary. In addition multiple phases of similar types may be used for large projects with build out in stages. If the project has demolition, grading, and site preparation phases, additional project specific data will need to be

entered on Demolition subscreen and Dust from Material Movement subscreen. Since data regarding trenching activities associated with different size projects is not available at this time, there are no defaults available for trenching phases. The user can add trenching as a phase type if they have the required information regarding equipment used during this type of construction phase.

Phase Name

The user should enter a unique name for the phase in the text box.

Phase Type

The user selects from the drop down list the type of construction phase: Site preparation, demolition, grading, building construction, paving, and architectural coating. This influences the types of calculations and default assumptions for on-road vehicle trips and fugitive emissions that occur in subsequent construction subscreens. The definitions of the default data phases are as follows:

- Demolition involves tearing down of buildings or structures.
- Site Preparation involves clearing vegetation (grubbing and tree/stump removal) and stones prior to grading.
- Grading involves the cut and fill of land to ensure the proper base and slope for the construction foundation.
- Building Construction involves the construction of structures and buildings.
- Architectural Coating involves the application of coatings to both the interior and exterior of buildings or structures
- Paving involves the laying of concrete or asphalt such as in parking lots or roads.

Start Date and End Date

The user can enter with the aid of a calendar, the start and end dates. The default start date is 1/2/2011 starting with demolition with subsequent phases starting the next day after the previous phase's end date. Changes to these cells will alter the total days estimated for the phase.

Days per Week

The user can select from a drop down box the number of days per week (5, 6, or 7) the project will operate. Five days per week is assumed to be Monday through Friday, and six days per week is Monday through Saturday.

Total Days

The total number of days in the construction phase is indicated. If the end date or the days per week are changed, clicking in this cell will recalculate the number of days. If this value is changed, than once leaving this cell, the program will adjust the end date if necessary.

4.3.2 Off-Road Equipment

This subscreen shows the off-road equipment usage for each phase. Since equipment lists can be lengthy, the user must go through a different subscreen for each phase. This is done by selecting the appropriate phase name from the drop down list or the Previous or Next buttons located next to the phase name. The emission calculations associated with this screen are from off-road equipment engine use based on the equipment list and phase length. The fugitive emissions from off-road equipment performing work are associated with additional information in other construction screens.

The user enters in the datagrid each piece of equipment in the phase in a new row. The user enters the unit amount and hours per day of equipment usage. Horsepower and load factors are loaded with the default average values of the mode tier according to population based on OFFROAD2007, but the user can override these values⁹. Since CalEEMod is restricted in the years of OFFROAD emission factors, CalEEMod will use the lower end year if a construction year is in between a year of OFFROAD values in the database. For example if a construction phase is in 2027, CalEEMod will use OFFROAD emission factors from 2025.

For site specific construction equipment lists including equipment not specifically listed can be added under the Other Equipment categories or Off-Highway Trucks listed in CalEEMod matching the closest in horsepower to the missing equipment. For inclusion of water trucks and cement trucks specifically can be considered in two ways. The first is to use the Off-Highway Trucks category in this screen. The second is to add these as additional vendor trips in the Trips and VMT screen.

4.3.3 Dust from Material Movement

This subscreen is used to enter the information necessary to calculate the fugitive dust emissions associated with grading phases. Three distinct fugitive dust calculations are performed as described in Appendix A: dust from dozers moving dirt around, dust from graders or scrapers leveling the land, and loading or unloading the dirt into haul trucks. These methods have been adapted from USEPA's AP-42 method for Western Coal Mining. The user needs to enter the amount of material imported and exported to the site in order for CalEEMod to estimate hauling trips correctly from material transport. There is an option to select either ton of debris or cubic yards. The user also selects if the import and export of material are phased. If they are phased a truck comes in with material and leaves with another load of material to export. Non-phased trips have one-way of the haul trip performed with an empty truck. Phasing material import and export reduces the number of haul trips. The number of acres that are displayed represent the total acres traversed by grading equipment assuming a blade width of 12 feet. In order to properly grade a piece of land multiple passes with equipment may be required. The acres is based on the equipment list and days in grading or site preparation

⁹ Since CalEEMod uses final and adopted methodologies and emission factors as its basis, recent changes considered by ARB regarding off-road equipment emission factors are not included at this time since they are not yet final. The most significant value impacting CalEEMod is likely load factors which can be changed by the user if deemed appropriate.

phase according to the anticipated maximum number of acres a given piece of equipment can pass over in an 8-hour workday¹⁰. See Appendix A for the equipment specific grading rates.

4.3.4 Demolition

This subscreen is used to enter the amount of material that is demolished if demolition phases are selected. The user can enter either the ton of material or the building square footage. Fugitive dust emissions from the demolition are then calculated. Demolition fugitive dust emissions are based on the methodology described in the report prepared for the USEPA by Midwest Research Institute, Gap Filling PM10 Emission Factors for Selected Open Area Dust Sources.

4.3.5 Trip and VMT

This subscreen is used to provide the number and length of on-road vehicle trips for workers, vendors, and hauling. It also allows the user to select different weightings of vehicle fleet mixes and is either the EMFAC mix for the region, or an mix of the vehicle classes listed. HHDT, MHDT is a 50/50 percent mix of heavy-heavy duty trucks and medium-heavy duty trucks. LDA, LDT1, LDT2 is 50/25/25 percent mix of light duty autos, light duty truck class 1 and light duty truck class 2. Since CalEEMod is restricted in the years of EMFAC emission factors, CalEEMod will use the lower end year if a construction year is in between a year of EMFAC values in the database. For example if a construction phase is in 2027, CalEEMod will use EMFAC emission factors from 2025.

The number of workers is 1.25 times the number of pieces of equipment for all phases except building construction and architectural coating. Building construction estimates the number of workers based on the types of land use and their size based on an analysis of a study conducted by SMAQMD. This study and its analysis are included in Appendix E. The number of workers for architectural coating is based on 20% of the building construction workers.

The number of vendor trips for building construction is based on a study performed by SMAQMD based on land use types and their size. This number can be modified to account for other types of trucks such as cement and water trucks if not chosen to be accounted for as OFFROAD equipment. Hauling trips are based on the assumption that a truck can handle 20 tons of material per load. This is further adjusted based on if the trip is phased or not.

4.3.6 On-Road Fugitive Dust

This subscreen defines the variables that will be used to determine the fugitive dust emissions from construction on-road vehicles over paved and unpaved roads. The emission calculations are based on USEPA's AP-42 November 2006 versions for paved and unpaved roads (the 2010 draft versions are not used at this time). The variables in this datagrid are the same as those defined in the appropriate AP-42 sections.

¹⁰ If the User chooses only dozer equipment, the "Dust from Material Movement" screen will show "0" acres disturbed. This is due to the fact that fugitive dust from dozer activity is calculated based on time of activity and not acreage (see Appendix A).

4.3.7 Architectural Coatings

This subscreen allows the user to override any of the default interior and exterior surface area estimated for residential and non-residential buildings. In addition, each of these surface types has a different emission factor indicating the VOC content of the paint in grams per liter. See Appendix A for the method of estimating surface areas from building square footage.

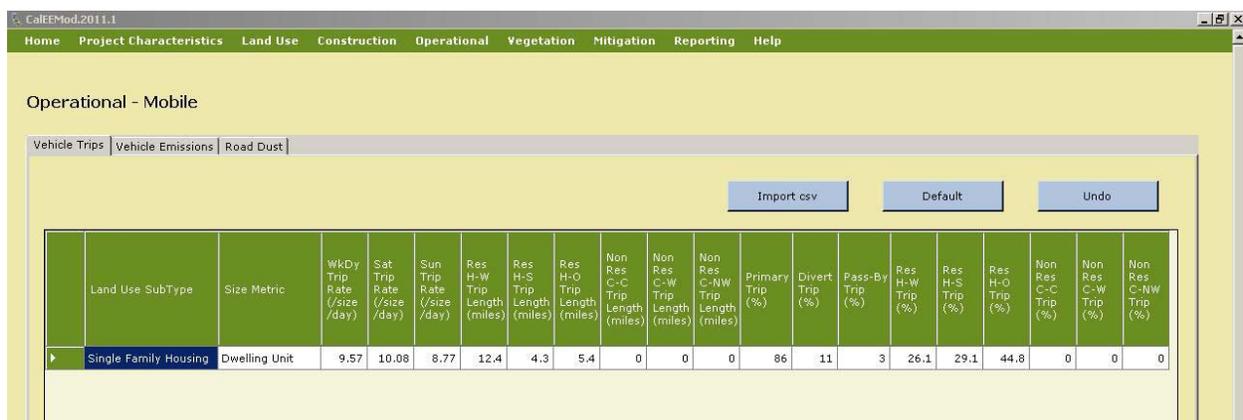
4.4 Mobile

The mobile screen is made up of 3 subscreens: Vehicle Trips, Vehicle Emissions, and Road Dust. These screens are used in defining the information necessary to calculate the emissions associated with operational on-road vehicles.

4.4.1 Vehicle Trips

This subscreen's datagrid lists the trip rate, trip lengths, trip purpose, and trip type percentages for each land use subtype in the project. The user can edit any of this information by entering a new value in the appropriate cell. Trip rates are in terms of the size metric defined on the land use screen and are listed for weekday, Saturday and Sunday if available. Trip lengths are for primary trips. Trip purposes are primary, diverted, or pass-by trips. Diverted trips are assumed to take a slightly different pass than a primary trip and are assumed to be 25% of the primary trip lengths. Pass-by trips are assumed to be 0.1 miles in length and are a result of no diversion from the primary route. Residential trip types are defined as home-work (H-W), home-shop (H-S), and home-other (H-O). Non-residential trip types are defined as commercial –customer (C-C), commercial-work (C-W), and commercial-nonwork (C-NW) such as delivery trips.

In most cases the trip rate is based on ITE's average trip rate for the respective land use category. For residential uses, in order to match the baseline scenario from the CAPCOA GHG Reduction Guidance, only two land use trip rates are used, 'single family detached' and 'low-rise apartment' (for all multi-family residential uses). Further, VMT for both residential land uses assumes they are located in suburban areas. Any reductions in VMT associated with higher density residential land uses are accounted for in Traffic Mitigation (see section 4.10.2). For warehouses, SCAQMD evaluated the primary data from ITE along with other recent studies regarding warehouses and concluded that it was more appropriate to break out the warehouses based on access to a rail spur and refrigeration. In addition, they concluded that it was more appropriate to use the 95th percentile from the studies rather than the average. A detailed memorandum describing the justification for these values is contained in Appendix E.



The screenshot shows the 'Operational - Mobile' interface with a data grid for 'Single Family Housing'. The grid includes columns for trip rates and lengths for weekdays, Saturdays, and Sundays, as well as percentages for various trip types (Primary, Diverted, Pass-By, Residential, and Non-Residential).

Land Use SubType	Size Metric	WkDy Trip Rate (/size /day)	Sat Trip Rate (/size /day)	Sun Trip Rate (/size /day)	Res H-W Trip Length (miles)	Res H-S Trip Length (miles)	Res H-O Trip Length (miles)	Non Res C-C Trip Length (miles)	Non Res C-W Trip Length (miles)	Non Res C-NW Trip Length (miles)	Primary Trip (%)	Divert Trip (%)	Pass-By Trip (%)	Res H-W Trip (%)	Res H-S Trip (%)	Res H-O Trip (%)	Non Res C-C Trip (%)	Non Res C-W Trip (%)	Non Res C-NW Trip (%)
Single Family Housing	Dwelling Unit	9.57	10.08	8.77	12.4	4.3	5.4	0	0	0	86	11	3	26.1	29.1	44.8	0	0	0

4.4.2 Vehicle Emissions

This subscreen is a large datagrid containing the detailed vehicle emission factors and fleet mix based on EMFAC2007. See Appendix A for information on how these emission factors were developed based on burden mode EMFAC runs and the post-processor to adjust for Pavley (Clean Car Standards) and Low Carbon Fuel Standards. The adjustments for Pavley and Low Carbon Fuel Standards are only applicable for future years and do not impact EMFAC values prior to these regulations implementations (i.e, 1990, 2000, 2005, etc). It is anticipated that most users will not edit data in this subscreen. There is a separate tab for annual, summer, and winter values. If the user wants to alter the breakdown of fuel types (cat, ncat, other) within a vehicle class, they will have to provide their own data as this will likely be an infrequent change due to CEQA enforceability requirements. For details on how EMFAC data was processed see Appendix A.

This screen along with the previous screen (Vehicle Trips) will calculate the emissions associated with on-road motor vehicle use. It does not include the fugitive dust emissions from travel over roads as these are associated with the next screen (Road Dust).

Operational - Mobile

Vehicle Trips | Vehicle Emissions | Road Dust

Annual | Summer | Winter

Import csv | Default | Undo

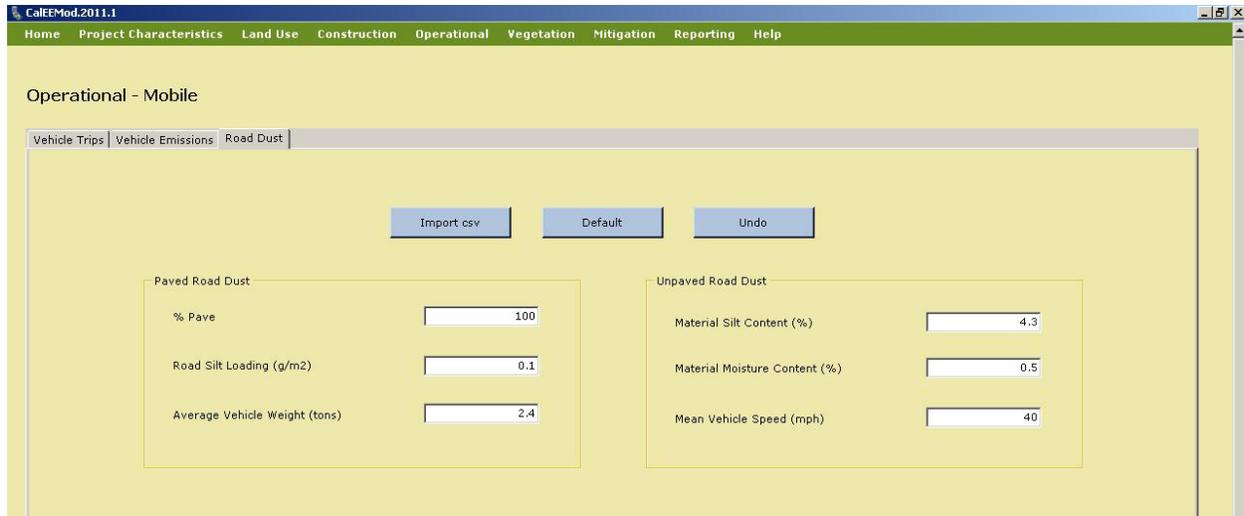
Fleet Mix / Emission Type	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
FleetMix	0.531148	0.068434	0.226787	0.097919	0.019317	0.005895	0.015557	0.023739	0.001491	0.002202	0.004391	0.000857	0.002263
CH4_IDLEX	0	0	0	0	0.0015	0.0014	0.0009	0.1	0.0012	0	0	0.03	0
CH4_RUNEX	0.02	0.03	0.03	0.04	0.03	0.02	0.01	0.06	0.02	0.05	0.23	0.03	0.05
CH4_STREX	0.02	0.02	0.02	0.04	0.04	0.03	0.03	0.16	0.02	0.06	0.15	0.02	0.06
CO_IDLEX	0	0	0	0	0.21	0.19	0.14	8.63	0.18	0	0	5.41	0
CO_RUNEX	2.18	3.85	2.98	3.89	5.11	2.71	3.39	7.12	2.44	8.16	35.62	6.77	14.22
CO_STREX	4.54	5.77	5.73	7.8	9.13	6.04	7.78	39.53	7.97	13.92	9.65	7.32	17.22
CO2_IDLEX	0	0	0	0	7.9999	8.4887	12.5286	1,199.9...	11.3216	0	0	553.1736	0
CO2_RUNEX	396.3366	493.0642	495.7475	678.1603	670.1504	630.8888	1,360.3...	1,826.9...	1,213.1...	2,299.0...	150.2035	1,401.5...	756.7035
CO2_STREX	71.81	88.6278	89.0568	122.5329	38.2341	32.2192	16.0497	26.6731	21.117	38.1643	49.865	17.7954	39.8301
NOX_IDLEX	0	0	0	0	0.01	0.04	0.17	20.34	0.12	0	0	8.66	0
NOX_RUNEX	0.19	0.32	0.37	0.51	1.65	2.91	7.3	14.11	3.86	17.37	1.19	9.82	2.01
NOX_STREX	0.29	0.34	0.53	0.71	1.84	1.53	0.8	3.31	1.06	1.5	0.31	0.44	1.31
PM10_IDLEX	0	0	0	0	0.0001	0.0005	0.0022	0.29	0.0014	0	0	0.12	0
PM10_PMBW	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.0063	0.01	0.01
PM10_PMTW	0.008	0.008	0.008	0.008	0.01	0.01	0.01	0.03	0.01	0.009	0.004	0.01	0.01
PM10_RUNEX	0.01	0.01	0.02	0.02	0.01	0.02	0.18	0.68	0.08	0.27	0.03	0.37	0.01

Remarks

<< Previous | Next >>

4.4.3 Road Dust

This subscreen is used to change any of the default values that are used in the USEPA's AP-42 methods for calculating fugitive emissions from paved and unpaved roads.



4.5 Area

The area source screen consists of four subscreens: Hearths, Consumer Products, Area Architectural Coatings, and Landscaping Equipment. Natural gas emission variables from all uses except hearths are included in the energy use screen.

4.5.1 Hearths and Woodstoves

This subscreen allows the user to enter the number of woodstoves and hearths of various types as well as the usage of these devices. Woodstoves are separate from fireplaces since a home may have both and these devices may have different use patterns. The number entered is the total number for a particular land use and it should already account for the number of dwelling units. See Appendix A for calculation details of variables that the user can not override. Some of these emissions may be classified as biogenic and are therefore reported as CO₂-Biogenic. For most locations a default percent of hearths and stoves was provided by districts and is multiplied through. The number was chosen for CalEEMod instead of a percentage to allow for incorporation of various districts rules regarding hearths and woodstoves in new residences without having specialized screens. The amount of wood mass and number of days per year are not currently linked in CalEEMod. If changes are made to one of these the user should consider the impact on the other variable. Commercial land uses by default do not have any hearths or woodstoves in CalEEMod. These are included for those cases where they may occur such as in restaurants or hotels.

The screenshot shows the 'Area' subscreen in CalEEMod. It features a navigation menu at the top with options: Home, Project Characteristics, Land Use, Construction, Operational, Vegetation, Mitigation, Reporting, and Help. Below the menu, there are tabs for 'Hearths', 'Consumer Products', 'Area Architectural Coatings', and 'Landscape Equipment'. The 'Woodstoves' section contains a table with the following data:

Residential Land Use Subtype	# Conventional	# Catalytic	# Non-Catalytic	# Pellet	Days/Year	Wood Mass (lb/year)
Apartments high rise	0	5	5	0	25	999.6
Parking Lot	0	0	0	0	25	999.6
Parking Structure	0	0	0	0	25	999.6
Strip Mall	0	0	0	0	25	999.6

The 'Fireplaces' section contains a table with the following data:

Residential Land Use Subtype	# Wood	# Gas	# Propane	# No Fireplace	Hours/Day	Days/Year	Wood Mass (lb/year)
Apartments high rise	5	85	0	10	3	75	1,019.2
Parking Lot	0	0	0	0	3	75	1,019.2
Parking Structure	0	0	0	0	3	75	1,019.2
Strip Mall	0	0	0	0	3	75	1,019.2

At the bottom of the interface, there is a 'Remarks' field and navigation buttons: '<< Previous' and 'Next >>'.

4.5.2 Consumer Products

Consumer products are various solvents used in non-industrial applications which emit VOCs during their product use. These typically include cleaning supplies, kitchen aerosols, cosmetics and toiletries. SCAQMD has developed an emission factor based on the total of all building square footage for both residential and non-residential buildings. Details of how this emission factor was developed can be found in Appendix E. The user can change this emission factor if they have more relevant data.

4.5.3 Area Architectural Coating

This subscreen has text boxes for the reapplication rate and paint VOC content for each building surface type. The reapplication rate is the frequency at which surfaces get repainted every year. A default of 10% is used which means that 10% of the surface area is repainted or surfaces are completely repainted once every 10 years. Daily emissions divide the annual rate by 365 days per year. This is based on assumptions used by SCAQMD in their district rules regarding architectural coatings. Some districts provided details on their coating regulations that phase in over time which have been incorporated to the extent feasible given the general classifications of paint (interior or exterior for residential and non-residential). As not all districts submitted their architectural coating regulations, consult your local agency for any suggested values that may be lower than the state regulations.

4.5.4 Landscape Equipment

This subscreen has two text boxes to show the number of snow days or summer days. The number of days are applied to the appropriate landscape equipment types available in OFFROAD2007 using the average horsepower and load factors of the population mode. The derivation of emission factors used for each equipment type from OFFROAD2007 is described in Appendix A.

4.6 Energy Use

The energy use screen is used to gather the information necessary to estimate the emissions associated with building electricity and natural gas usage (non-hearth). The electricity energy use is in kilowatt hours per size metric for each land use subtype and natural gas use is in kiloBritish Thermal Units (kBTU) per size metric for each land use subtype. The electricity use is split into three areas: Title-24, non-Title 24, and lighting. The Title 24 uses are defined as the major building envelope systems covered by California's Building Code Title 24 Part 6 such as space heating, space cooling, water heating, and ventilation. Lighting was separated out since it can be both part and not part of Title-24. Since lighting is not considered as part of the building envelope energy budget, CalEEMod does not consider lighting to have any further association with Title 24 references in the program. Non-Title 24 is everything else such as appliances and electronics. Natural gas is just distinguished as Title 24 or Non-Title 24. The default values are based on the CEC sponsored California Commercial End Use Survey (CEUS) and Residential Appliance Saturation Survey (RASS) studies¹¹. For climate zones not included in these surveys a data from the closest climate zone was used as a surrogate. Since these studies are based on older buildings, adjustments have been made to account for changes to Title 24 building codes as described in Appendix A. A user should select the use historical box if they only want an adjustment to the 2005 standards which were in effect when ARB developed its Scoping Plan 2020 No Action Taken predictions. After selecting the historical button, the user must also click the default button to load the historical default values.



Land Use Subtype	Title-24 Electricity Energy Intensity (kWhr/size/yr)	Nontitle-24 Electricity Energy Intensity (kWhr/size/yr)	Lighting Energy Intensity (KWhr/size/yr)	Title-24 Natural Gas Energy Intensity (kBTU/size/yr)	Nontitle-24 Natural Gas Energy Intensity (kBTU/size/yr)
Single Family Housing	589.69	4,476.23	1,478.48	32,629.98	5,955.4

11 CEC. 2004. Residential Appliance Saturation Survey. Available online at:

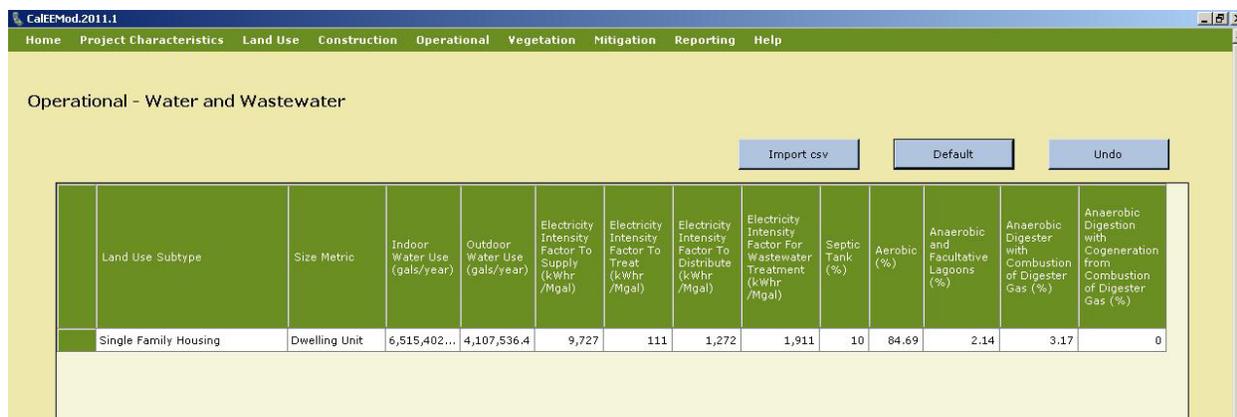
<http://www.energy.ca.gov/appliances/rass>

CEC. 2006. Commercial End-Use Survey. Available online at: <http://www.energy.ca.gov/ceus/>

4.7 Water and Wastewater Use

This module only estimates the land uses contribution of GHG emissions associated with supplying and treating the water and wastewater. This screen is used to enter the amount of water in gallons used indoors and outdoors for each land use subtype¹². The indoor water is also used to estimate the amount of wastewater. The electricity intensity for various phases of providing water is broken out. Depending on the specific water supply used or treatment method used these numbers can vary over a wide range. Supplying water is bringing the water from its primary source such as the ground, river, or snowpack to the treatment plant. Distributing the water is bringing the water from the treatment plant to the end users. The electricity intensities are multiplied by the utility intensity factors for the GHGs and are classified as indirect emissions. The default electricity intensity is from the CEC's 2006 Refining Estimates of Water-Related Energy Use in California using the average values for Northern and Southern California¹³. The location will automatically select the appropriate values if using these defaults. Since the electricity can vary greatly based on locations, the user should override these values if they have more specific information regarding their specific water supply and treatment.

Wastewater may also have direct emissions of GHGs. These depend on the type of wastewater treatment system used and therefore the wastewater treatment type percentages are variables. Each type has associated GHG emission factors. Some of these may be classified as biogenic. Not all of the biogenic emissions are accounted for since there are not adequate emissions factors at this time.



Land Use Subtype	Size Metric	Indoor Water Use (gals/year)	Outdoor Water Use (gals/year)	Electricity Intensity Factor To Supply (kWhr/Mgal)	Electricity Intensity Factor To Treat (kWhr/Mgal)	Electricity Intensity Factor To Distribute (kWhr/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWhr/Mgal)	Septic Tank (%)	Aerobic (%)	Anaerobic and Facultative Lagoons (%)	Anaerobic Digester with Combustion of Digester Gas (%)	Anaerobic Digestion with Cogeneration from Combustion of Digester Gas (%)
Single Family Housing	Dwelling Unit	6,515,402...	4,107,536.4	9,727	111	1,272	1,911	10	84.69	2.14	3.17	0

12 Gleick, P.H.; Haasz, D.; Henges-Jeck, C.; Srinivasan, V.; Cushing, K.K.; Mann, A. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California. Published by the Pacific Institute for Studies in Development, Environment, and Security. Full report available online at: http://www.pacinst.org/reports/urban_usage/waste_not_want_not_full_report.pdf. Appendices available online at: http://www.pacinst.org/reports/urban_usage/appendices.htm

Dziegielewski, B.; Kiefer, J.C.; Optiz, E.M.; Porter, G.A.; Lantz, G.L.; DeOreo, W.B.; Mayer, P.W.; Nelson, J.O. 2000. Commercial and Institutional End Uses of Water. Published by the American Water Works Association Research Foundation.

Northern California Golf Association. Improving California Golf Course Water Efficiency. <http://www.owue.water.ca.gov/docs/2004Apps/2004-079.pdf>

¹³ CEC-500-2006-118.

4.8 Solid Waste

The solid waste module determines the GHG emissions associated with disposal of solid waste into landfills. In order to estimate the eventual contribution of GHG emissions from solid waste for the waste disposed by a land use annually, the total amount of carbon dioxide and methane that would be evolved over the span of many years is calculated. This is based on the IPCC's methods for quantifying GHG emissions from solid waste using the degradable organic content of waste¹⁴. Waste disposal rates by land use and overall composition of municipal solid waste in California was primarily based on Calrecycle data. The amount of methane emitted depends on characteristics of the landfill, and therefore the default percentage is based on the types of landfills assumed by ARB in their GHG emission inventories. Portions of these emissions are biogenic.

Land Use Subtype	Size Metric	Solid Waste Generation Rate (tons/year)	Landfill No Gas Capture (%)	Landfill Capture Gas Flare (%)	Landfill Capture Gas Energy Recovery (%)
Single Family Housing	Dwelling Unit	117.26	6	94	0

14 IPCC. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 5 Waste.

4.9 Vegetation

The vegetation module is used to estimate the one-time change in carbon sequestration capacity of a vegetation land use type. The methods used are based on IPCC¹⁵. The user enters the vegetation land use type, the initial and final acreage of the vegetation land use type, and the annual carbon dioxide equivalent accumulation per acre if the user chooses to over ride the default value. Settlement land use acreage is not considered since it is a net zero at steady state unless trees are added.



4.9.1 Sequestration

This subscreen to vegetation is used to estimate the GHG emissions associated with the sequestration of net new trees added to the project site. Consistent with IPCC recommendations a 20 year active growth period is assumed. The user enters the tree type or miscellaneous if it is not known, and the total number of trees. The user can override the default carbon sequestration rate.



15 IPCC. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4.

4.10 Mitigation

The mitigation module screen consists of six subscreens that the user can indicate and supply the necessary information to estimate the emissions after mitigation measures have been implemented. The mitigation measures included in CalEEMod are largely based on the recent CAPCOA Quantifying Greenhouse Gas Mitigation Measures (<http://www.capcoa.org/wp-content/uploads/downloads/2010/09/CAPCOA-Quantification-Report-9-14-Final.pdf>) document. Therefore, this user's guide focuses on key aspects of the program screens that user's should pay attention to.

Be sure appropriate mitigation is chosen and that is applicable to the land use project being evaluated. It is recommended the user notes in the "Remarks" box the justification for the percent reduction anticipated to be achieved.

4.10.1 Construction Mitigation

This screen consists of a datagrid to apply mitigation to off-road construction equipment and check boxes with supplemental information for fugitive dust emissions.

The screenshot displays the 'Mitigation' screen in CalEEMod 2011.1. The interface includes a menu bar with 'Home', 'Project Characteristics', 'Land Use', 'Construction', 'Operational', 'Vegetation', 'Mitigation', 'Reporting', and 'Help'. The 'Mitigation' section is active, showing a sub-menu for 'Construction' with options for 'Traffic', 'Area', 'Energy', 'Water', and 'Solid Waste'. The main content area is titled 'Mitigation' and features a table for 'Off-Road Equipment' and a section for 'Fugitive Dust' with various input fields and checkboxes. At the bottom, there is a 'Remarks' field and navigation buttons for '<< Previous' and 'Next >>'.

Equipment Type	Fuel Type	Engine Tier	Number Of Equipments Mitigated	Total Number Of Offroad Equipments	DPF Level	Using Oxidation Catalyst (%Reduction)
Air Compressors	Diesel		0	1		0
Concrete/Industrial Saws	Diesel		0	1		0
Cranes	Diesel		0	1		0
Excavators	Diesel		0	5		0
Forklifts	Diesel		0	3		0
Generator Sets	Diesel		0	1		0
Graders	Diesel		0	1		0

Fugitive Dust

Soil Stabilizer for Unpaved Roads

PM10 (% Reduction)

PM2.5 (% Reduction)

Water Exposed Area

Frequency (per day)

PM10 (% Reduction)

PM2.5 (% Reduction)

Unpaved Road Mitigation

Moisture Content (%)

Vehicle Speed (mph)

Clean Paved Road

% PM Reduction

*The mitigation should be applicable to land use project evaluated.
*Remarks" box should contain percent reduction justification.

Remarks

<< Previous Next >>

To apply mitigation to construction equipment, the user selects the equipment type and the number of equipment noting the total number displayed based on construction equipment lists, and type of mitigation to apply. If substantial evidence supporting reductions was available at the time of development, options include fuel type (diesel, CNG, electric, hybrid, biodiesel), engine tier (typically will select Tier 4), diesel particulate filter tiers (Tier 3 being the best), and oxidative catalyst reduction. The program estimates how much if any increase or decrease in

emissions to apply for each pollutant. Some mitigation measures have trade-offs in pollutant reductions and therefore may result in increases of some pollutants.

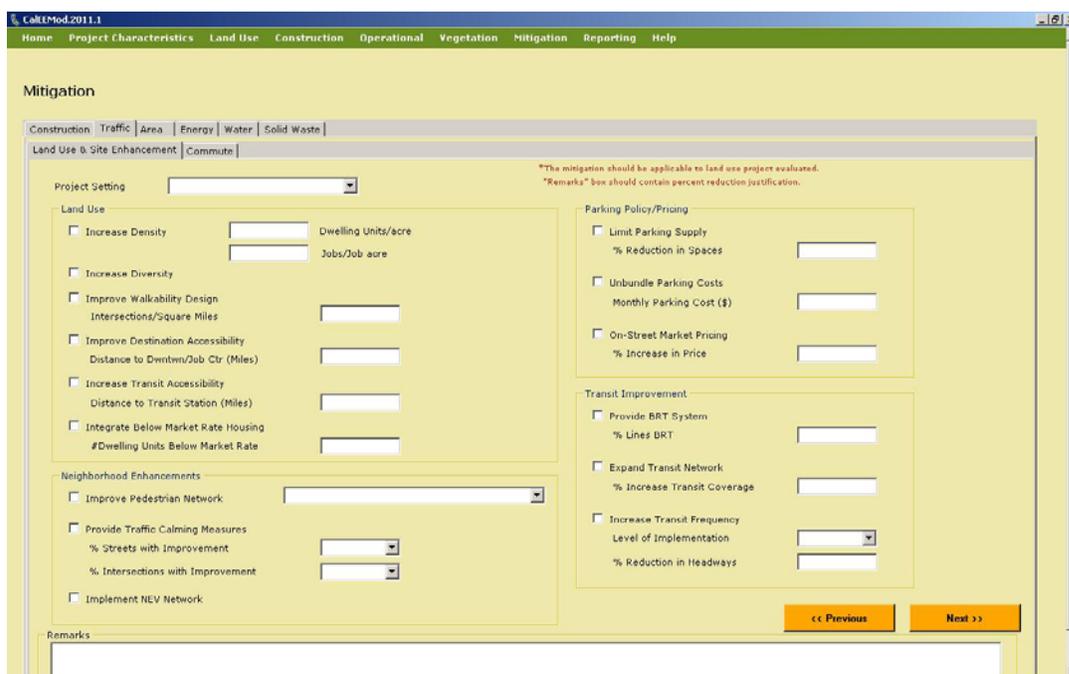
To apply mitigation to fugitive dust from construction, the user selects the check box in front of the mitigation measure name, and enters in the appropriate information in the drop down or text boxes. Some fugitive dust mitigation required by some districts do not appear here since the fugitive dust source they mitigate is not quantified by CalEEMod. In particular this includes fugitive dust generated by wind over land and storage piles. Since they are not quantified it is not appropriate to apply the reduction.

4.10.2 Traffic Mitigation

There are two traffic mitigation subscreens that the user can select from. First the user must select the Project Setting as defined in the CAPCOA document (pages 59-60).

- Suburban: An area characterized by dispersed, low-density, single-use, automobile dependent land use patterns, usually outside of the central city (a suburb).
- Suburban Center: serves the population of the suburb with office, retail and housing which is denser than the surrounding suburb.
- Urban: an area which is located within the central city with higher density of land uses than you would find in the suburbs. It may be characterized by multi-family housing and located near office and retail.
- Compact Infill/Urban Center: A project which is located within or contiguous with the central city. Examples may include redevelopment areas, abandoned sites, or underutilized older buildings/sites.

If the CAPCOA measure did not distinguish between suburban center and suburban values for suburban were used. Similarly, if urban center and urban values were not distinguished urban values were used.



The user checks the box next to each mitigation measure and fills in the appropriate information as required. The maximum reduction caps defined in the CAPCOA document are integrated into these calculations. Included CAPCOA Measure numbers include: LUT-1, LUT-3, LUT-9, LUT-4, LUT-5, LUT-6, SDT-1, SDT-2, SDT-3, PDT-1, PDT-2, PDT-3, TST-1, TST-3, TST-4, TRT-1, TRT-4, TRT-15, TRT-14, TRT-6, TRT-7, TRT-11, TRT-3, and TRT-13. The NEV network mitigation measure assumes the low end of the CAPCOA recommendations. Users need to ensure chosen mitigation measures are applied appropriately. For example, where trip generation rates and project VMT provided by the user are derived from another source, the VMT reductions must be adjusted to reflect any “discounts” already applied.

4.10.3 Area Mitigation

The user can select from a few area source mitigation measures by checking the appropriate box and supplying any additional information in the text boxes. These measures include all natural gas hearths, no hearths, electric landscaping equipment use, reduced VOC coatings, and reduced consumer product VOC content.

CalEEMod.2011.1

Home Project Characteristics Land Use Construction Operational Vegetation Mitigation Reporting Help

Mitigation

Construction Traffic Area Energy Water Solid Waste

Hearth

Only Natural Gas Hearth

No Hearth

Consumer Products

Use Low VOC Cleaning Supplies

*The mitigation should be applicable to land use project evaluated.
Remarks box should contain percent reduction justification.

Architectural Coatings

EF (g/L)

Use low VOC Paint (Residential Interior)

Use low VOC Paint (Residential Exterior)

Use low VOC Paint (Non-residential Interior)

Use low VOC Paint (Non-residential Exterior)

Landscape Equipment

% Electric Lawnmower

% Electric Leafblower

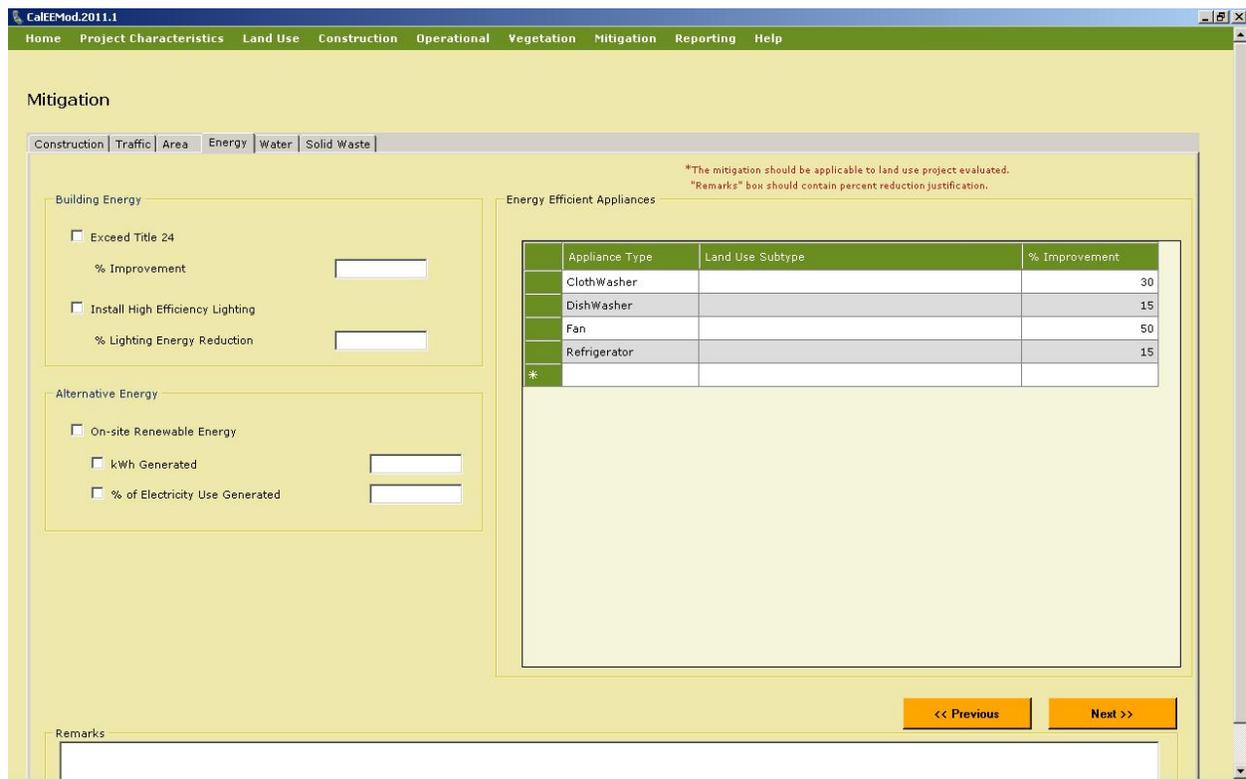
% Electric Chainsaw

Remarks

<< Previous Next >>

4.10.4 Energy Mitigation

The user selects mitigation measures by using check boxes or a datagrid. These correspond to CAPCOA Mitigation Measures BE-1, AE-1, and BE-4. The lighting is a percentage reduction in lighting as supplied by the user. The datagrid is used to enter the land use subtypes that will use energy efficient appliances. The percent improvement is the typical percent improvement above standard appliances according to the 2008 Energy Star Annual Report¹⁶. Alternative Energy has two methods to enter the amount of alternative energy. The first is the amount of kWh generated. The second is the percentage of the total electricity use by buildings that is generated. At this time alternative energy methods that are not carbon neutral are not quantified.



CalEEMod.2011.1

Home Project Characteristics Land Use Construction Operational Vegetation Mitigation Reporting Help

Mitigation

Construction Traffic Area Energy Water Solid Waste

Building Energy

Exceed Title 24

% Improvement

Install High Efficiency Lighting

% Lighting Energy Reduction

Alternative Energy

On-site Renewable Energy

kWh Generated

% of Electricity Use Generated

Energy Efficient Appliances

*The mitigation should be applicable to land use project evaluated.
Remarks box should contain percent reduction justification.

Appliance Type	Land Use Subtype	% Improvement
ClothWasher		30
DishWasher		15
Fan		50
Refrigerator		15
*		

Remarks

<< Previous Next >>

16 Available at <http://www.epa.gov/cpd/annualreports/annualreports.htm>

4.10.5 Water Mitigation

Water mitigation can either be estimated as the percent reduction based on a water conservation strategy or the other individual mitigation measures. The CAPCOA measures included are WSW-1 & 2, WUW-1 through 5. For CAPCOA Mitigation Measure WSW- 3, the user should alter the energy intensity values in water and run a separate CalEEMod run to accommodate these values.

The screenshot shows the CalEEMod 2011.1 software interface for the Water Mitigation section. The top navigation bar includes Home, Project Characteristics, Land Use, Construction, Operational, Vegetation, Mitigation, Reporting, and Help. The main content area is titled "Mitigation" and has sub-tabs for Construction, Traffic, Area, Energy, Water, and Solid Waste. A note states: "*The mitigation should be applicable to land use project evaluated. 'Remarks' box should contain percent reduction justification." The interface is divided into three main sections: Water Conservation Strategy, Water Supply, and Indoor/Outdoor Water Use. The Water Conservation Strategy section has a checkbox for "Apply Water Conservation Strategy" and input fields for "% Reduction Indoor" and "% Reduction Outdoor", both set to 0. The Water Supply section has checkboxes for "Use Reclaimed Water" and "Use Grey Water", each with input fields for "% Indoor Water Use" and "% Outdoor Water Use", all set to 0. The Indoor Water Use section has checkboxes for "Install Low-flow Bathroom Faucet", "Install Low-flow Kitchen Faucet", "Install Low-flow Toilet", and "Install Low-flow Shower", with input fields for "% Reduction in flow" set to 32, 18, 20, and 20 respectively. The Outdoor Water Use section has checkboxes for "Turf Reduction" and "Use Water-Efficient Irrigation Systems", with input fields for "Turf Reduction Area (acres)", "% Reduction turf", and "% Reduction" set to 0, 0, and 6.1 respectively. There are also input fields for "MAWA (gal/yr)" and "ETWU (gal/yr)", both set to 0. At the bottom, there is a "Remarks" text area and navigation buttons for "<< Previous" and "Next >>".

4.10.6 Solid Waste Mitigation

The user can get a reduction for recycling waste.

The screenshot shows the CalEEMod 2011.1 software interface for the Solid Waste Mitigation section. The top navigation bar includes Home, Project Characteristics, Land Use, Construction, Operational, Vegetation, Mitigation, Reporting, and Help. The main content area is titled "Mitigation" and has sub-tabs for Construction, Traffic, Area, Energy, Water, and Solid Waste. A note states: "*The mitigation should be applicable to land use project evaluated. 'Remarks' box should contain percent reduction justification." The interface is divided into one main section: Solid Waste Mitigation. It has a checkbox for "Institute Recycling and Composting Services" and an input field for "% Reduction in waste disposed". At the bottom, there is a "Remarks" text area and navigation buttons for "<< Previous" and "Next >>".

4.11 Reporting

The user initiates final calculations by selecting the report and clicking on the button. The available reports include: Annual, Summer Daily, or Winter Daily. A separate report viewer will come up. From this report viewer, the user can view their report on-screen, print reports, save as Microsoft excel file or save as a pdf file.

The report does not list the input parameters (e.g., construction phase times, construction equipment, horsepower, percent mitigation, etc.) so the user should consider providing those inputs along with the report to support the analysis and enable project reviewers to replicate the calculations independently. The input data can be found in the Excel spreadsheet compiled when saving the project.

