

SCAG

Scenario Planning Model (SPM)

Status and Technical Briefing

Presentation to the Modeling Task Force

03/22/2017

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Modeling & Forecasting



Outline

- SPM Overview
 - Introduction
 - Overview of the Current Model Sites
- Technical Overview
 - Data Requirement and Process
 - Ins and Outs of Analysis Modules
- SPM Next Steps
- Q&As

SPM Overview

What is SPM ?

- A web-based land use sketch planning tool for data management, scenario development and modeling

Manage,
Review, &
Update Data

Create
Alternative
Scenarios

Analyze
Scenarios

100% Open
Source

Web-Based

Manage, Review, & Update Data

Serve as a common platform for accessing local, regional and statewide data with options to review and edit

Top Section Menu Pane

The top section menu drop down allows the users to toggle between Project Info, Data Explorer, and Approval/Merge options.

Tools

These tools allow the user to navigate around the map, as well as select and identify map features.

Layers

This section displays layers that have been preloaded into the Scenario Planning Model and that can be turned on for display and activated for selection, editing, and queries. Functionality that allows a user to customize layer ordering and visibility, as well as import and export capability is also available.



Style Editor Window

Style Editor Window allows the user to modify the way a layer is displayed on the map.

User Manager

The User Manager allows managers and admin users to manage users in their jurisdiction.

Charts

This area contains basic statistics for the jurisdiction (population, household, and employment).

Layer Editor

The Layer Editor allows the user to edit or comment upon select layer attributes.

Map Area

This is where all map layers are displayed and where the user makes selections and queries data with tools.

Create Alternative Scenarios

Transform existing local and regional plans into a common language of building and place types

Top Section Menu Pane
The top section menu drop down allows the users to toggle between Project, Data Explorer, and Approval/Merge options.

Tools
These tools allow the user to navigate around the map, as well as select and identify map features.

Layers
This section displays layers that have been preloaded into the Scenario Planning Model as well as scenario and analysis layers, and that can be turned on for display and activated for selection, editing, and queries.

The screenshot displays the SCAG UrbanFootprint Scenario Planning Model interface. Key components include:

- Top Menu Bar:** Scenario A, Base, Base Condition, Future, Scenario A, Scenario B.
- Left Sidebar (Layers):** Background Imagery, Aerial Photo, Open Street Maps, Simple Streets, Orange County, Major Transit Stops, Region Sphere Of Influence, Region General Plan Parcels, Region Existing Land Use Parcels, Sub Regions, Census Tracts, High Quality Transit Corridors, High Quality Transit Areas, Region Jurisdiction Boundary, Transit Priority Areas, County Boundary, Endangered Species, Farmland, Cpud Holdings, Habitat Conservation Areas, Flood Zones, Region Tier Tax, Scenario A, Scenario End State, Scenario Increment, UrbanFootprint Layers, Vehicle Miles Traveled, Water, Energy, Base Feature.
- Central Map:** Search Map, Map navigation tools, and a 'Summary Details: Per Acre' pop-up window showing metrics like Dwelling Units, Jobs, and Employees.
- Right Panels:**
 - Charts:** End State: Dwelling Units By Type (Bar chart showing 345,917 total units, broken down by type: SF Large Lot, SF Small Lot, MF, Attached SF).
 - Charts:** Increments: Employment By Sector (Bar chart showing 926,706 total jobs, broken down by sector: Retail, Office, Industrial, Public, Other).
 - Charts:** End State: Employment By Sector (Bar chart showing 1,130,281 total jobs, broken down by sector: Retail, Office, Industrial, Public, Other).
 - Editor/Analysis Panels:** Summary Details: Per Acre (Table with columns for Building Density, Jobs, Employees, etc.), UF Pictypes (List of land use types like Urban Commercial, Urban Residential, etc.), Active Built Form (Buttons for Urban Commercial, etc.).
- Bottom Status Bar:** 10,865 Dwelling Units, 0 Large Family, 0 Attached SF, 1949 Multifamily, 1,777,112 Employees, 10,232 Jobs, 127,460 Office, 0 Public, 0 Industrial, 238.69 Jobs/Employee, 0 Jobs/Employee.

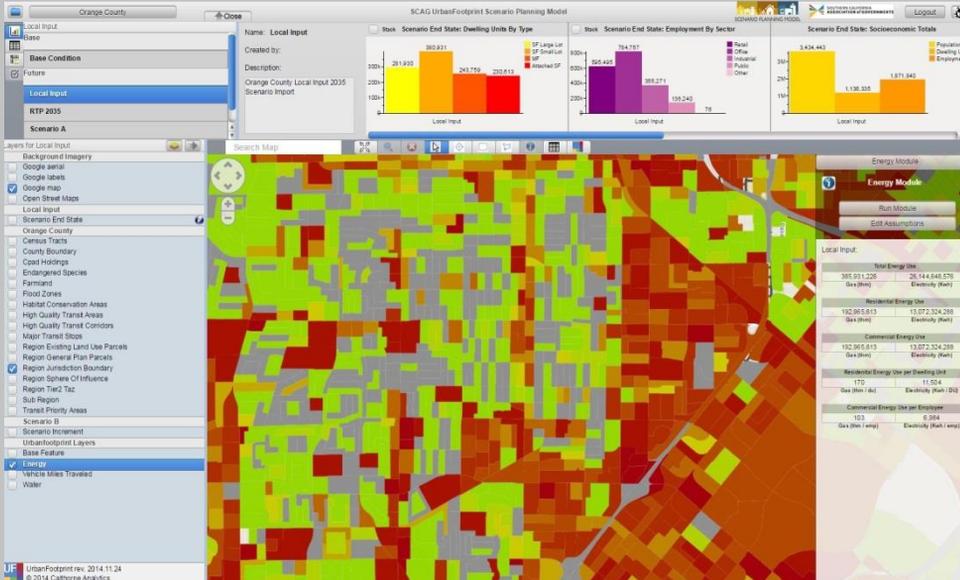
Charts
This area displays basic statistics for the jurisdiction when in Editor mode or summary analysis for scenarios when in Analysis mode.

Editor/Analysis Panels
The collapsible Editor and Analysis Panels allow the user to review, edit or select built form or to select and run analysis modules.

Built Form Manager Window
Built Form Manager Window allows the user to modify predefined place and building types.

Analyze Scenarios

Measure the fiscal, environmental, transportation, and public health of future plans and policy



Built on open source platforms and tools

SERVER OPERATING ENVIRONMENT

Ubuntu Linux 12.04 LTS was chosen for its stability, speed and efficiency, allowing UrbanFootprint to have true, scalable 64-bit computing, including multi-threading capabilities.



DATABASE & GEOSPATIAL ANALYSIS

PostgreSQL is the relational database used by UrbanFootprint. PostGIS integrates with the PostgreSQL database to provide GIS and spatial analysis functionality.



DATA DELIVERY & QUEUING

Django, Celery, Redis, Socket IO and NodeJS play roles in task queues, process management, and communication between servers and UrbanFootprint's web-based user interface.



MAPPING & DISPLAY

Polymaps, Mapnik, and Tilestache are used to serve and display maps in the user interface. D3 is used for charting, and Sproutcore serves as the web framework and controller.

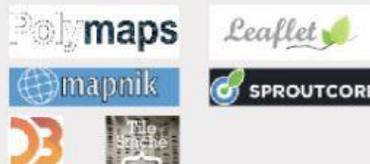
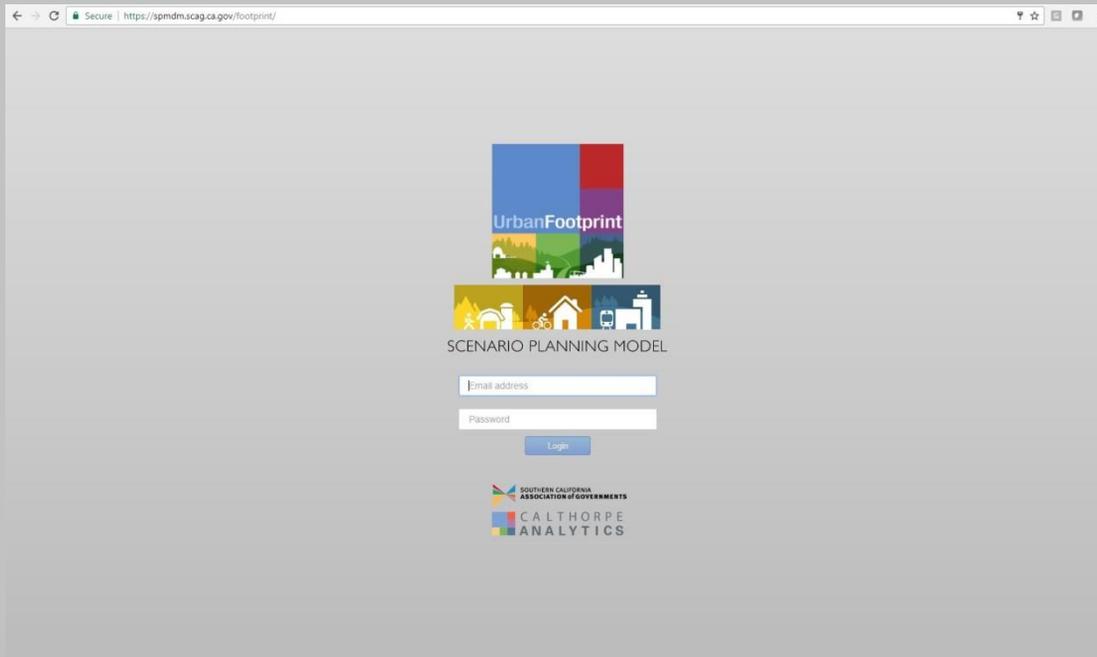


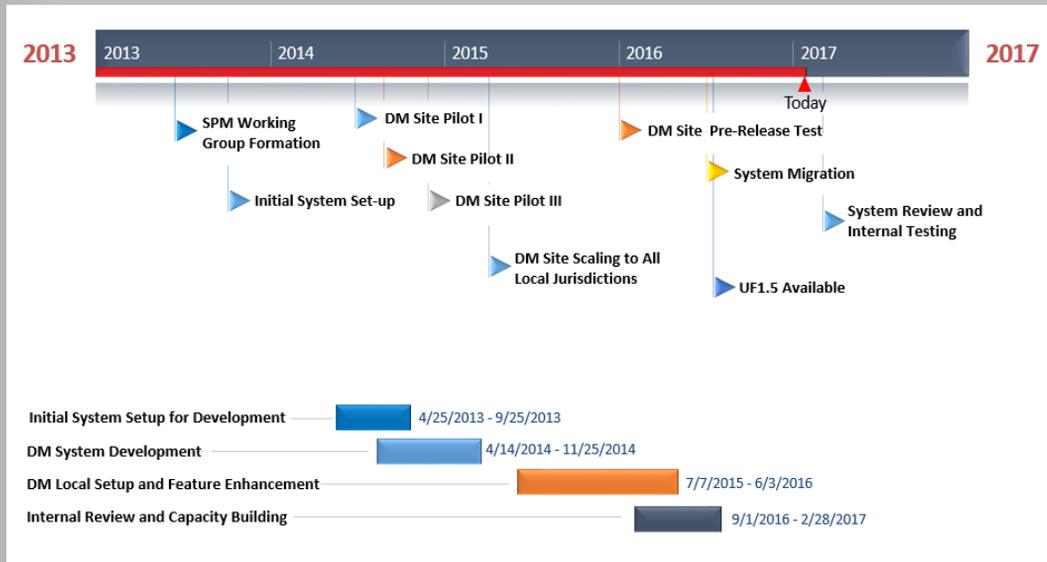
Image courtesy of Calthorpe Analytics

Web-Based

Can be accessed anywhere with internet connection via Google Chrome web browser



Project History



- Built on 'UrbanFootprint' modeling platform developed by Calthorpe Analytics
- Collaborated with other major MPOs in CA
- Built up from group-up with SPM Working Group

SPM Status

SPM Data Management (DM)

SPM Scenario Development & Analysis (SD)

Manage, Review, & Update Data
Completed and available upon request.

Create Alternative Scenarios

Ver1 Completed for Regional Application. Beta Testing ver. 2

Analyze Scenarios

100% Open Source

Web-Based

SPM Data Management Site

Overview



Data Management Site USER INTERFACE

Data Management framework largely consists of four (4) windows: Layer Management, Map Tool Bar, Top Section Menu Pane, and Layer Editor

UrbanFootprint Scenario Planning Model

Population By Year

Year	Population
2015	~100,000
2020	~100,000
2025	~100,000
2030	~100,000
2035	~100,000
2040	~100,000

Households By Year

Year	Households
2015	~40,000
2020	~40,000
2025	~40,000
2030	~40,000
2035	~40,000
2040	~40,000

Employment By Year

Year	Employment
2015	~100,000
2020	~100,000
2025	~100,000
2030	~100,000
2035	~100,000
2040	~100,000

UrbanFootprint Data Manager

SCAG Existing Land Use Parcels 2016

Select an active layer by clicking on the layer name

Existing Land Use 2016
1110. Single Family Residential

Secondary Land Use

Notes

Mapbox: Aerial Photo
Mapbox: Simple Streets
OpenStreetMap: Base Layer

UrbanFootprint rev: 2016.03.31
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Layer Management Window

The user can select an active layer by clicking on the layer name and the active layer will be highlighted in blue. Any map selection, attribute query, export layer, export csv initiated by the user will occur on the active layer.

UrbanFootprint Scenario Planning Model

Active | Burbank

UrbanFootprint Data Manager

SCENARIO PLANNING MODEL

The SPM Data Manager provides local and regional data sets to jurisdictions across Southern California. It is used to view, edit, and comment upon data and serves as a common data bridge across SCAG and the cities and counties in the region. For help, see the [SPM Data Manager user guide](#).

Population By Year

Year	Population
2015	~100,000
2020	~105,000
2025	~110,000
2030	~115,000
2035	~120,000
2040	~125,000

Households By Year

Year	Households
2015	~40,000
2020	~42,000
2025	~44,000
2030	~46,000
2035	~48,000
2040	~50,000

Employment By Year

Year	Employment
2015	~100,000
2020	~105,000
2025	~110,000
2030	~115,000
2035	~120,000
2040	~125,000

Layers

Editable Layers

- Entitlement Parcels 2016
- General Plan Parcels
- SCAG Existing Land Use Parcels 2016
- Scenario Planning Zones
- Tier 2 Taz

Reference

- Bike Lane
- Census Tracts
- City Boundary
- County Boundary
- Cpad Holdings
- Endangered Species
- Farmland
- Habitat Conservation Areas
- High Quality Transit Areas 2012
- High Quality Transit Corridors 2012
- Major Transit Stops 2012
- SCAG Existing Land Use Parcels 2012
- Sea Level Rise
- Sphere Of Influence
- Sub Region
- Transit Priority Areas 2012

Basemaps

- Mapbox: Aerial Photo
- Mapbox: Simple Streets
- OpenStreetMap: Base Layer

Add Data

UrbanFootprint rev 2016 03 31
© 2015 Calthorpe Analytics

Export and manage layers, and edit layer symbology

SCAG Existing Land Use Parcels 2016

Save

User: umh@scag.ca.gov | Selected Records: 10

Existing Land Use 2016
1110: Single Family Residential

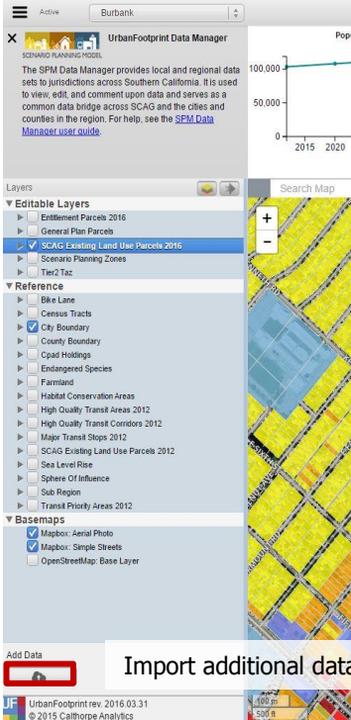
Secondary Land Use

Notes

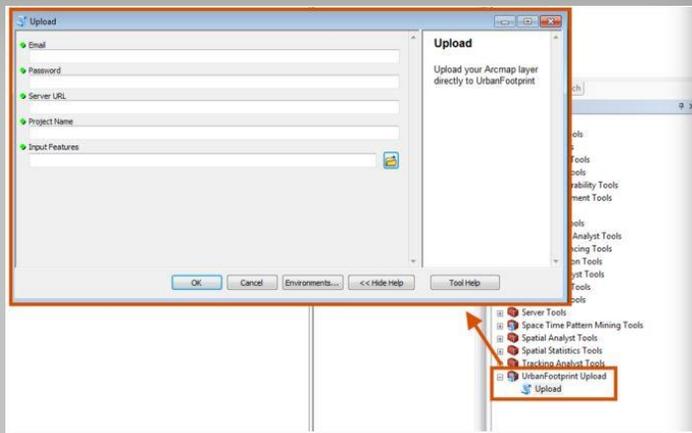
14

Layer Management Window – Layers

Clicking on the layers button  to toggle between Export Active Layer, Layer Symbology, and Manage Layers option.



Import additional data



Upload layers directly from ArcMap (ArcMap 10.3 or higher)

Layer Management Window – Data Upload

The user can import additional data by clicking on the Data Upload button or directly from ArcMap via ArcMap Integration Tool.

UrbanFootprint Scenario Planning Model

Active | Burbank | 4

UrbanFootprint Data Manager

SCENARIO PLANNING MODEL

The SPM Data Manager provides local and regional data sets to jurisdictions across Southern California. It is used to view, edit, and comment upon data and serves as a common data bridge across SCAG and the cities and counties in the region. For help, see the [SPM Data Manager user guide](#).

Population By Year

Year	Population
2015	100,000
2020	105,000
2025	110,000
2030	115,000
2035	118,000
2040	120,000

Households By Year

Year	Households
2015	40,000
2020	42,000
2025	43,000
2030	44,000
2035	45,000
2040	45,000

Employment By Year

Year	Employment
2015	100,000
2020	105,000
2025	110,000
2030	115,000
2035	118,000
2040	120,000

layers

Search Map

Zoom and navigate around the map as well as select and identify

Editable Layers

- Entertainment Parcels 2016
- General Plan Parcels
- SCAG Existing Land Use Parcels 2016
- Scenario Planning Zones
- TimeZ

Reference

- Bike Lane
- Census Tracts
- City Boundary
- County Boundary
- Cpad Holdings
- Endangered Species
- Farmland
- Habitat Conservation Areas
- High Quality Transit Areas 2012
- High Quality Transit Corridors 2012
- Major Transit Stops 2012
- SCAG Existing Land Use Parcels 2012
- Sea Level Rise
- Sphere Of Influence
- Sub Region
- Transit Priority Areas 2012

Basemaps

- Mapbox: Aerial Photo
- Mapbox: Simple Streets
- OpenStreetMap: Base Layer

Add Data

UrbanFootprint rev 2016 03 31
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Edit Layer: SCAG Existing Land Use Parcels 2016

Save

User: um@scag.ca.gov Selected Records: 10

Existing Land Use 2016

1110 Single Family Residential

Secondary Land Use

Notes

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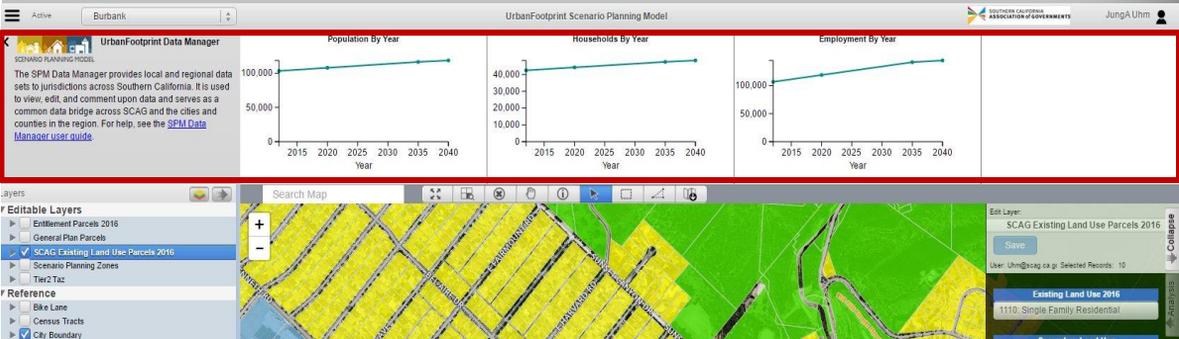
Map Tool Bar

Clicking on an icon on the map tool bar allows the user to zoom and navigate around the map as well as select and identify map features. The user can hover their pointer to get the 'tool tip'.



Toggle between Project Info, Data Explorer, and Approval/Merge

Display charts on Population, Households, and Employment on the current project



Top Section Menu Pane – Project Info

The Top Section Menu drop down allows the user to toggle between Project Info, Data Explorer, and Approval/Merge options. The Project Info section displays basic statistics for the jurisdiction.



View and explore data in a table view and define attribute queries and join tables to explore and select data

Select features from SCAG Existing Land Use Parcels 2016

existing_land_use_parcel_2016_scag_lu = 1800

149 Query/Selection Results

id	apn	fips	scaguid	city	county	scag_lu	acres	
344263	2435018900	6037	370185438	Burbank	Los Angeles	1800	3.45	
348932	2446023910	6037	370190132	Burbank	Los Angeles	1800	1.55	
348934	2446024900	6037	370190133	Burbank	Los Angeles	1800	14.15	
353225	2456012901	6037	370194562	Burbank	Los Angeles	1800	0.61	
353241	2456013901	6037	370194577	Burbank	Los Angeles	1800	0.93	

Layers

Editable Layers

Entirement Parcels 2016
General Parcel Parcels
SCAG Existing Land Use Parcels 2016
Scenarios Planning Zones
Tier2 Tab

Reference

Bike Lane
Census Tracts
City Boundary
County Boundary

SCAG Existing Land Use Parcels 2016
1800. Open Space and Recreation
Secondary Land Use

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Top Section Menu Pane – Data Explorer

The Data Explorer section displays data in a table view and provides the user a number of options to form their query. The user can also join and query spatial tables of different geography types and geographic scales.

Toggle between Project Info, Data Explorer, and Approval/Merge

Review and approve/reject edits

id	apn	fips	scaguid	city	county	scag_lu	acres	scag_lu_sr
353521	2459001001	6037	370195124	Burbank	Los Angeles	1600	0.19	null
353522	2459001005	6037	370195125	Burbank	Los Angeles	1600	0.16	null
353546	2459001062	6037	370195152	Burbank	Los Angeles	1600	0.15	null
353547	2459001064	6037	370195153	Burbank	Los Angeles	1600	0.19	null

Top Section Menu Pane – APPROVAL/MERGE

The Approval/Merging interface is accessible to user with manager or director-level permissions. It allows managers to review and approve/reject edits made by any users.

Active Burbank UrbanFootprint Scenario Planning Model JungA Uhm

X Select features from SCAG Existing Land Use Parcels 2016 4 Query/Selection Results

id	apn	fps	scaguid	city	county	scag_lu	acres	st
353521	2459001091	6037	370195124	Burbank	Los Angeles	1600	0.19	m
353522	2459001005	6037	370195125	Burbank	Los Angeles	1600	0.16	m
353546	2459001062	6037	370195152	Burbank	Los Angeles	1600	0.15	m
353547	2459001064	6037	370195153	Burbank	Los Angeles	1600	0.19	m

Results Limited to Selected Area Clear Query

Layers

- Editable Layers
 - Entitlement Parcels 2016
 - General Plan Parcels
 - SCAG Existing Land Use Parcels 2016**
 - Scenario Planning Zones
 - Tier2 Taz
- Reference
 - Bike Lane
 - Census Tracts
 - City Boundary**
 - County Boundary
 - Cpac Holdings
 - Endangered Species
 - Farmland
 - Flood Zones
 - Habitat Conservation Areas
 - High Quality Transit Areas 2012
 - High Quality Transit Corridors 2012
 - Major Transit Stops 2012
 - SCAG Existing Land Use Parcels 2012
 - Sea Level Rise
 - Sphere Of Influence
 - Sub Region
 - Transit Priority Areas 2012
- Basemaps
 - Mapbox: Aerial Photo**
 - Mapbox: Simple Streets
 - OpenStreetMap: Base Layer

Ad Data

UrbanFootprint rev. 2016.04.26 © 2016 Calthorpe Analytics

Search Map

Click a polygon to select it

Zoom map to selection Export as CSV

100 m 500 ft

1123 changed to 1600 for testing

Edit Layer: SCAG Existing Land Use Parcels 2016 Save Undo Redo Existing Land Use 2016 1600 Mixed Residential and Com. Secondary Land Use Notices

Edit or comment upon select layer attributes

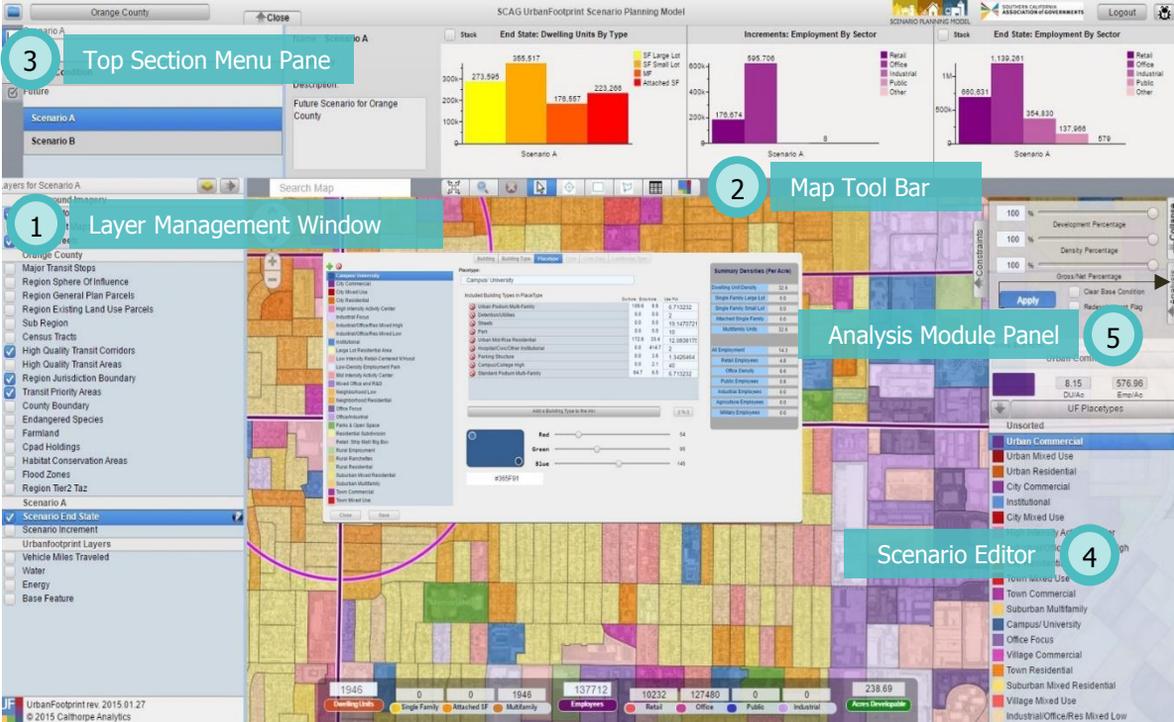
20

Layer Editor Window

The Layer Editor allows the user to edit or comment upon select layer attributes. The undo and redo functionality allows users to undo or redo their most recent changes on the active layer.

SPM Scenario Development/Analysis Site

Overview



Scenario Site USER INTERFACE

Scenario Development/Analysis framework consists of four (5) windows: Layer Management, Map Tool Bar, Top Section Menu Pane, Scenario Editor, and Analysis Modules

Active Ventura County Scenario Planning Model Junga Uhm

13 Query/Selection Results

acres_developable	source_id	region_bu_code	built_form_key	land_development_category	intersection_density_optm	acres_gross	sqft_parcel	acres_parcel
7.1182	601101100460110	mult	pl_low_residential	compact	220.0000	7.1182	310078.8720	4.5863
10.4337	601041100460010	mult	pl_low_residential	compact	220.0000	454493.5698		6.7225
2.9633	601101100460180	mult	pl_low_residential	compact	220.0000	2.9633	129079.5522	1.9093
4.8096	601101100460250	mult	pl_low_residential	compact	220.0000	4.8096	209508.3763	3.0969
5.653	601101100460240	mult	pl_town_residential	compact	220.0000	5.6530	248244.8378	3.6423

Layers

- Analysis Results
 - Energy Demand Output
 - Public Health Output
 - Vehicle Miles Traveled Output
 - Water Demand Output
- Basemaps
 - Mapbox: Aerial Photo
 - Mapbox: Simple Streets
 - OpenStreetMap: Base Layer
- Future Scenario Layers
 - Scenario End State
 - Scenario Increments
 - Reference
 - 2016 SCAO Existing Land Use Parcels
 - Blue Lane
 - Census Tracts
 - City Boundary
 - County Boundary
 - Cosad Holdings
 - Endangered Species
 - Farmland
 - Flood Zones
 - Habitat Conservation Areas
 - High Quality Transit Areas 2012
 - High Quality Transit Corridors 2012
 - Major Transit Stops 2012
 - SCAO Transit Stops 2014
 - Scenario Planning Zones
 - Sea Level Rise
 - Sphere Of Influence
 - Sub Region
 - Two-Ten
 - UF Base Census: 2012
 - Vn 2040 S3
 - Vn City C03
 - Vn City C05
 - Vn City Res

Search Map

Select the Place Type and adjust settings for the Place Type

Style Layer: Scenario End State

Apply

User: Uhm@scaplan.com Selected Records: 13

Clear Base Condition Selected Records: 13

Development Density GrossNet

100 % 100 % 100 %

Active Subform: City Mixed Use

46.56 83.82

Date: Error

UF PlaceTypes

- Blank
- Campus/University
- City Commercial
- City Mixed Use
- City Residential
- High Intensity Activity Center
- Industrial Focus
- Industrial/Office/Res Mixed High
- Industrial/Office/Res Mixed Low
- Institutional
- Large Lot Residential Area
- Low Intensity Retail-Centered VI/Food
- Low Density Employment Park
- Mid Intensity Activity Center
- Mixed Office and R&D
- Neighborhood Low
- Neighborhood Residential
- Office Focus
- Office/Industrial
- Parks & Open Space
- Residential Subdivision
- Retail Strip Mall Big Box
- Rural Employment
- Rural Ranchettes
- Rural Residential

UF: UrbanFootprint 1.5 rev. 2016.07.20 © 2016 Calthorpe Analytics

300 m 1000 ft

4442 0 112 4330 7097 3192 4795 0 0 95.40

Dwelling Units Single Family Attached SF Multi-Family Employees Retail Office Public Industrial Acres Developable

23

Scenario Editor Window

The Scenario Editor Window allows the user to select the Place Type. Users can also specify development and density percentage.

Edit Layer: Scenario End State

Apply

User: Uhm\m@coaq.ca.gov Selected Records: 13

Clear Base Condition Redevelopment Flag

Develop.	Density	Gross/Net
100 %	100 %	100 %

Active Built Form: City Mixed Use

	46.56	83.82
	DU/Ac	Emp/Ac

UF Placeypes

Manage Urban Built Forms

- Campus / University
- City Commercial
- City Mixed Use
- City Residential
- High Intensity Activity Center
- Industrial Focus
- Industrial/Office/Res Mixed High
- Industrial/Office/Res Mixed Low
- Institutional
- Large Lot Residential Area
- Low Intensity Retail-Centered N'Hood
- Low-Density Employment Park
- Mid Intensity Activity Center
- Mixed Office and R&D
- Neighborhood Low
- Neighborhood Residential
- Office Focus
- Office Industrial
- Parks & Open Space
- Residential Subdivision
- Retail - Strip Mall/Big Box
- Rural Employment
- Rural Ranchettes
- Rural Residential
- Suburban Mixed Residential
- Suburban Multifamily
- Town Commercial
- Town Mixed Use
- Office Focus

Buildings Building Type Placeype

Placeype: Industrial/Office/Res Mixed High

Included Building Types in Placeype

Building Type	Count	Employee	Use Pct
Suburban Multifamily App/Condo	581	0.0	6.9672545
Industrial High	109.6	8.8	7.7413938
Standard Townhome	219	6.0	8.515332
Warehouse Low	0.0	14.7	0.7741394
Streets	0.0	0.0	17.5862616
Office Park High	0.0	98.8	7.7413938
Park	0.0	0.0	3
Urban Mid-Rise Residential	172.6	33.4	16.2959271
Low-Rise Office	0.0	384.0	6.1531151
Detention/Lotuses	0.0	0.0	2
Warehouse High	0.0	64.9	6.9672545

Add a Building Type to the mix

#BCT81

Red: 251
 Green: 199
 Blue: 120

Close Save

Summary Densities (Per Acre)

Dwelling Unit Density	47.9
Single Family Large Lot	0.0
Single Family Small Lot	0.0
Attached Single Family	1.8
Multifamily Units	46.1
All Employment	45.3
Retail Employees	7.0
Office Density	33.2
Public Employees	0.0
Industrial Employees	5.1
Agriculture Employees	0.0
Military Employees	0.0

Customize Built Forms

Built Form Manager

The Built Form Manager tool allows the user to change the fundamentals of the place type.

Active Ventura County

13 Query/Selection Results

sn	acres_developable	source_id	region_lu_code	built_form_key	land_development_category	intersection_density_sqmi	acres_gross	sql_parcel	acres_parcel	z
1	7.1182	601101100460110	null	pl_low_residential	compact	220.0000	7.1182	310070.8720	4.5863	
1	10.4337	601041100460010	null	pl_low_residential	compact	220.0000	10.4337	454493.5698	6.7225	
1	2.9633	601101100460100	null	pl_low_residential	compact	220.0000	2.9633	129079.5522	1.9093	
1	4.8096	601101100460250	null	pl_low_residential	compact	220.0000	4.8096	209508.3763	3.0989	
1	5.653	601101100460240	null	pl_low_residential	compact	220.0000	5.6530	246244.8378	3.6423	

Zoom map to selection | Export as CSV

Select attributes | AND

Join: None

Results Limited to Selected Area | Clear | Query

Layers

- Analysis Results
 - Energy Demand Output
 - Public Health Output
 - Vehicle Miles Traveled Output
 - Water Demand Output
- Basemaps
 - Mapbox: Aerial Photo
 - Mapbox: Simple Streets
 - OpenStreetMap: Base Layer
- Future Scenario Layers
 - Scenario End State
 - Scenario Increment
 - Reference
 - 2016 SCAO Existing Land Use Parcels
 - Bike Lane
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 - County Boundary
 - Cpad Holdings
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 - Farmland
 - Flood Zones
 - Habitat Conservation Areas
 - High Quality Transit Areas 2012
 - High Quality Transit Corridors 2012
 - Major Transit Stops 2012
 - SCAO Transit Stops 2014
 - Scenario Planning Zones
 - Sea Level Rise
 - Slope % of Influence
 - Sub Region
 - Tier2 Tax
 - UF Base Canyons 2012
 - Vn 2040 SS
 - Vn City Com
 - Vn City Res

Add Data

UF UrbanFootprint 1.5 rev. 2016.07.20
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300 m
1000 ft

Search Map

Select a module from the drop down menu

Vehicle Miles Traveled

Vehicle Miles Traveled

Energy Module

Fiscal Module

Water Module

Public Health Module

Sample Scenario:

	Total VMT (Miles)
22.581.823	7.835.692.621
Daily	Annual
	Per Household VMT (Miles)
81	23.441
Daily	Annual
	Per Capita VMT (Miles)
27	9.333
Daily	Annual
	Per Employee VMT (Miles)
55	22.259
Daily	Annual

25

Analysis Module Panel

The Analysis Module Panel allows the user to select a module from the drop down menu, run the selected module, and view output summary metrics.



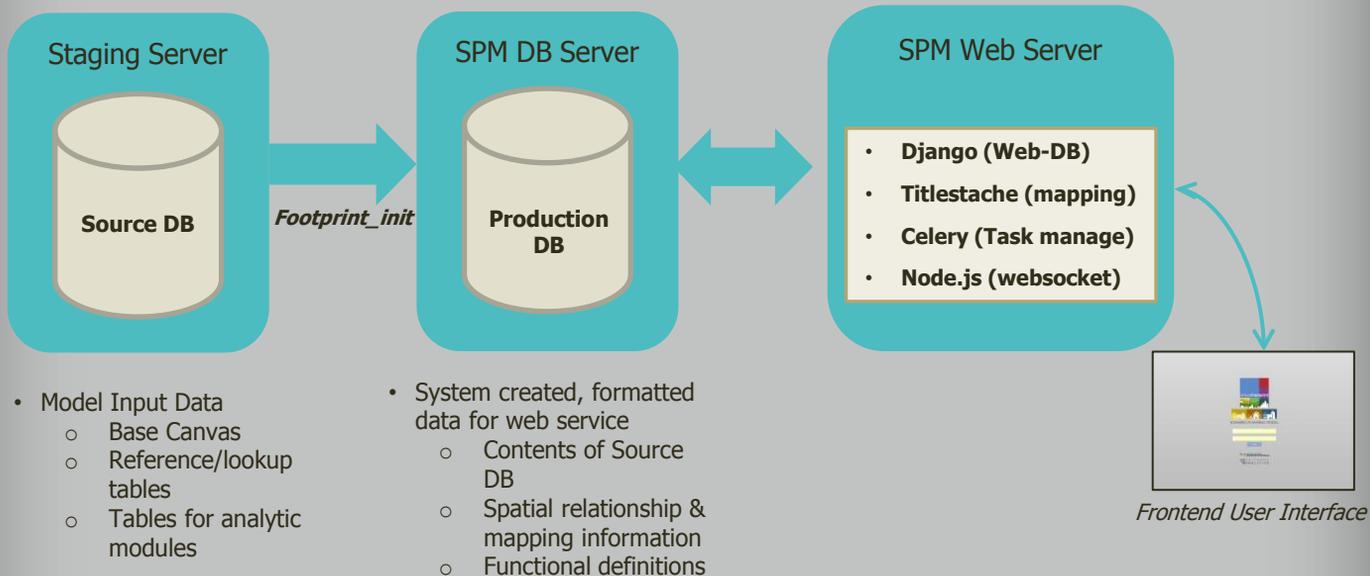
Analysis Results

Selecting layers in the 'Analysis Results' section on the Layer Management Window displays maps mapped outcomes. Users can also check out summary charts on the Top Section Menu Pane.

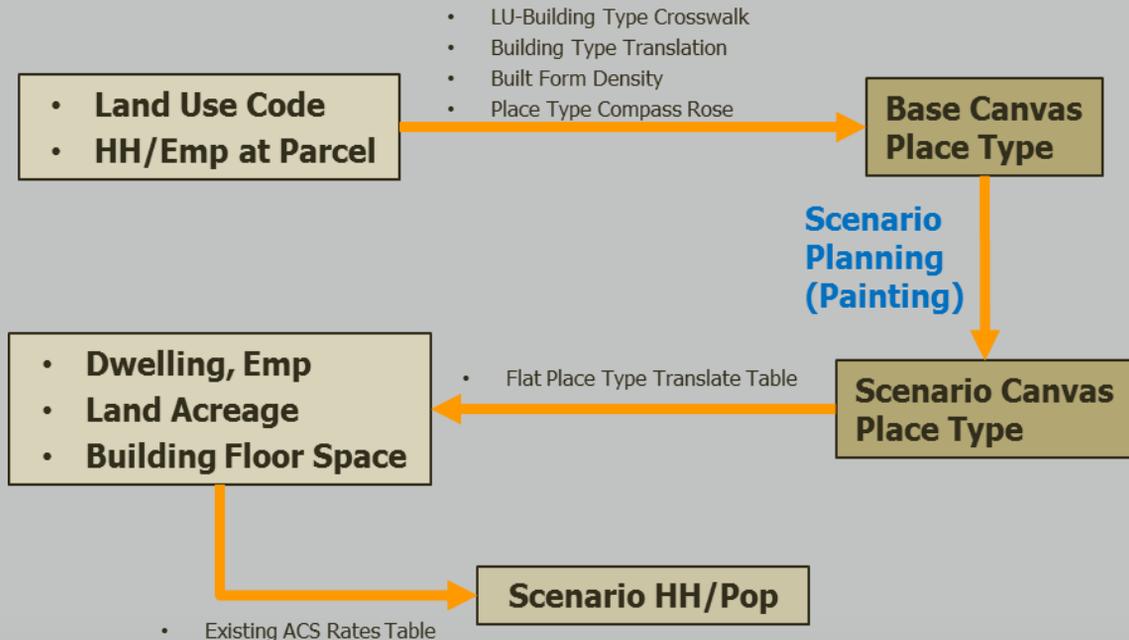
Technical Overview:

SPM Data Requirement & SCAG Regional Data Process

Backend Model Structure



SPM Scenario Development Workflow



Base Canvas



- A compiled dataset of various geographic data representing a baseline assessment of land use, demographic characteristics, and other conditions, including columns of
 - Count of household
 - Count of people
 - Count of employment by sector
 - Acreage by land use (dwelling, emp sectors)
 - Building floor spaces (dwelling, emp sectors)
 - Census driven population and demographics
- Used with ACS Rates table for detailed demographic and land use distribution.

Base Canvas Schema

Category	Data Column	Category	Data Column
Households	hh		
Population	pop		
Dwelling	du	Land by Use	acres_parcel_res acres_parcel_emp acres_parcel_mixed_use acres_parcel_no_use acres_parcel_res_detsf acres_parcel_res_detsf_sl acres_parcel_res_detsf_ll acres_parcel_res_attsf acres_parcel_res_mf acres_parcel_emp_ret acres_parcel_emp_off acres_parcel_emp_pub acres_parcel_emp_ind acres_parcel_emp_ag acres_parcel_emp_military
	du_detsf_ll		
	du_detsf_sl		
	du_attsf		
	du_mf2to4		
du_mf5p			
Employment	emp	Floor space	bldg_sqft_detsf_sl bldg_sqft_detsf_ll bldg_sqft_attsf bldg_sqft_mf bldg_sqft_retail_services bldg_sqft_restaurant bldg_sqft_accommodation bldg_sqft_arts_entertainment bldg_sqft_other_services bldg_sqft_office_services bldg_sqft_public_admin bldg_sqft_education bldg_sqft_medical_services bldg_sqft_transport_warehousing bldg_sqft_wholesale
	emp_ret		
	emp_off		
	emp_pub		
	emp_ind		
	emp_ag		
	emp_military		
	emp_retail_services		
	emp_restaurant		
	emp_accommodation		
	emp_arts_entertainment		
	emp_other_services		
	emp_office_services		
	emp_public_admin		
	emp_education		
	emp_medical_services		
	emp_manufacturing		
emp_wholesale			
emp_transport_warehousing			
emp_utilities			
emp_construction			
emp_agriculture			
emp_extraction	Place Type	Built form key	

Base Canvas Schema – cont.

Category	Column	Category	Column	
Housing Tenure	hh_own_occ_rate hh_rent_occ_rate	Age	pop_age0_4_rate pop_age5_9_rate pop_age10_14_rate pop_age15_17_rate pop_age18_19_rate pop_age20_rate pop_age21_rate pop_age22_24_rate pop_age25_29_rate pop_age30_39_rate pop_age40_49_rate pop_age50_64_rate pop_age65_up_rate pop_age16_up_rate pop_age25_up_rate pop_age_5_11_rate pop_age_12_17_rate pop_age_18_64_rate pop_avg_age5_11 pop_avg_age12_17 pop_avg_age18_64 pop_avg_age65_up	
Income	hh_inc_00_10_rate hh_inc_10_20_rate hh_inc_20_30_rate hh_inc_30_40_rate hh_inc_40_50_rate hh_inc_50_60_rate hh_inc_60_75_rate hh_inc_75_100_rate hh_inc_100_125_rate hh_inc_125_150_rate hh_inc_150_200_rate hh_inc_200p_rate			
HH Other	hh_avg_inc_rate hh_avg_veh_rate hh_with_children_under_18yr_rate			
Gender	pop_female_rate pop_male_rate			
Education	pop_hs_not_comp_rate pop_hs_diploma_rate pop_assoc_some_coll_rate pop_coll_degree_rate pop_grad_degree_rate			
Race/Ethnicity	pop_hispanic_rate pop_white_rate pop_black_rate pop_asian_rate pop_american_indian_rate pop_hawaiian_islander_rate pop_other_ethnicity_rate		Age & Disability	pop_age5_17_disability_rate pop_age5_17_ambulatory_disability_rate pop_age18_64_disability_rate pop_age18_64_ambulatory_disability_rate pop_age65up_disability_rate pop_age65up_ambulatory_disability_rate
			Work status	pop_employed_rate pop_unemployed_rate

Place Types : Scenario “Building Block”

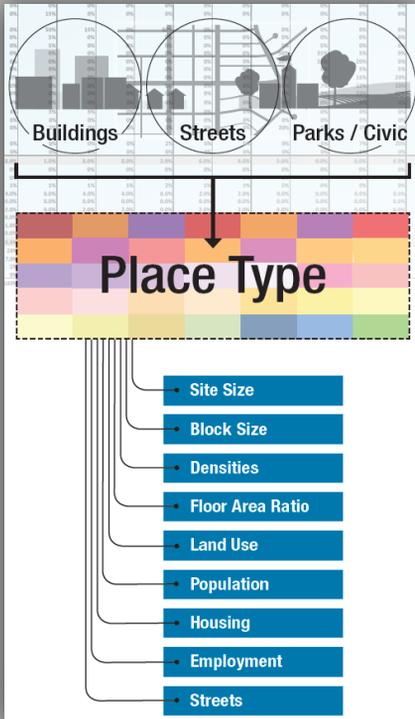
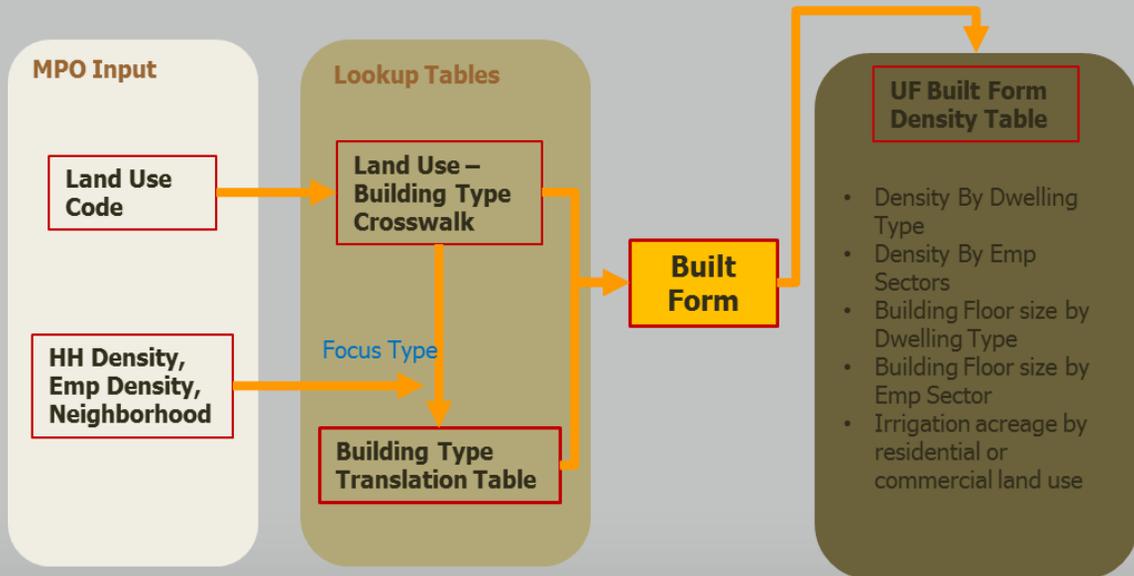


Image courtesy of Calthorpe Analytics

- Represent a full range of existing and future land development patterns
- Composed of a mix of Building Types, based on studies of real-world buildings across the nation, summarizing
 - How the buildings are used – Use and Density
 - How is the usage different by its neighborhood condition
 - Other assumptions related to the individual buildings in a Place Type (i.e., building water and energy consumption, infrastructure cost/burden, etc.)

Place Types Classification : Parcel Level

- Assign Built Form at Parcel Level and then aggregate to Place Type at Scenario Planning Zone (SPZ) level



Place Types Classification : Parcel Level (cont.)

- Examples:

LU-BT crosswalk

LU Code	LU Description	Focus Type	BuiltForm
1130	Mobile Homes and Trailer Parks		bt_mobile_home_park
1131	Trailer Parks and Mobile Home Courts, High-Density		bt_mobile_home_park
1132	Mobile Home Courts and Subdivisions, Low-Density		bt_mobile_home_park
1210	General Office Use	office_focus	
1211	Low- and Medium-Rise Major Office Use	office_focus	
1212	High-Rise Major Office Use	office_focus	
1213	Skyscrapers	office_focus	

BT Translation

Focus Type	Emp_Low	Emp_High	BuiltForm
office_focus	0	50	bt_office_park_low
	50	150	bt_office_park_high
	150	400	bt_low_rise_office
	400	1100	bt_mid_rise_office
	1100	2500	bt_high_rise_office
	2500	9999999	bt_skyscraper_office

BF Density

BuiltForm	Employment Density				Building sqft				Irrigation	
	retail	restaurant	other	office	retail	restaurant	other	office	Residential	Commercial
bt_office_park_low	0	0	0	21.6	0	0	0	10,672.2	0	614.0
bt_office_park_high	0.7	0	0.5	97.5	399.9	0	266.6	35,009.2	0	1,348.3
bt_low_rise_office	4.6	1.0	4.5	383.9	2,722.5	609.8	2,657.2	125,256.8	0	130.7
bt_mid_rise_office	9.2	0.7	7.8	892.3	5,401.4	435.6	4,617.4	247,420.8	0	522.7
bt_high_rise_office	16.0	5.3	16.4	2,135.7	9,409.0	3,092.8	9,626.8	614,457.4	0	2,613.6
bt_skyscraper_office	47.1	3.3	49.7	5,658.8	26,658.7	1,698.8	27,922.0	1,664,340.5	0	3,049.2

Place Types Classification : SPZ Level

- Place Type classification algorithm is based on a number of factors including density, mix of uses, and presence of special uses such as parks/conservation lands, schools, college/university, military.

By major land use

- pt_campus_university
- pt_institutional
- pt_military
- pt_parks_open_space

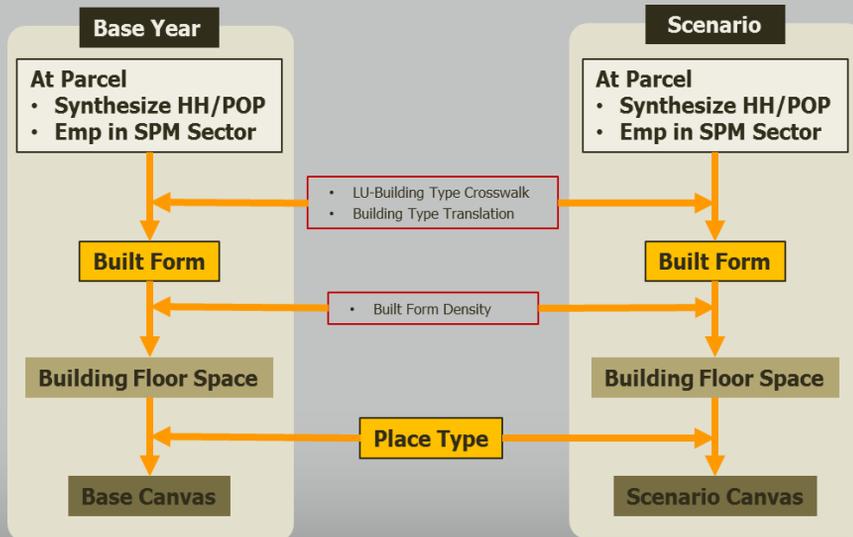


By Density of HH / Emp / Intersection

pt_city_commercial	pt_residential_subdivision
pt_city_mixed_use	pt_retail_strip_mall_big_box
pt_city_residential	pt_rural_employment
pt_high_intensity_activity_center	pt_rural_ranchettes
pt_industrial_focus	pt_rural_residential
pt_industrialofficers_mixed_high	pt_suburban_mixed_residential
pt_industrialofficers_mixed_low	pt_suburban_multifamily
pt_large_lot_residential_area	pt_town_commercial
pt_low_density_employment_park	pt_town_mixed_use
pt_low_intensity_retail_centered_nhood	pt_town_residential
pt_mid_intensity_activity_center	pt_urban_commercial
pt_mixed_office_and_rd	pt_urban_mixed_use
pt_neighborhood_low	pt_urban_residential
pt_neighborhood_residential	pt_village_commercial
pt_office_focus	pt_village_mixed_use
pt_officeindustrial	pt_village_residential

Scenario Canvas

- Can be created by translating local or regional plan into the schema of SPM Place Types or from the scratch via user interface.
- Translation of existing local or regional plan utilizes the same workflow as base canvas



Technical Overview: Ins and Outs of Analysis Modules

Fiscal Module

- Residential Buildings
 - single family detached large lot dwelling unit (> 5500 sqft/DU)
 - single family detached small lot dwelling unit (< 5500 sqft/DU)
 - single family attached dwelling unit
 - multifamily dwelling unit
- Land Development Categories
 - Urban
 - Compact
 - ✓ Compact greenfield
 - ✓ Compact refill
 - Standard
- Spatial Resolution
 - SPZ
- Temporal Resolution
 - Horizon year

Fiscal Module Data

- Time Span (horizon year – base year)
- Scenario Delta
 - Differences between horizon year canvas and base year canvas
 - Unit: square footage for residential types
 - SPZ in one of the three land development categories

Fiscal Module Coefficients

- Per Square Foot
 - Annual Fiscal Operation and Maintenance Cost
 - Revenue
 - Capital Cost
- Land Development Categories
 - Urban
 - Compact
 - ✓ Refill
 - ✓ Greenfield
 - Standard

Fiscal Module Outputs

- Residential Building Capital Cost
 - Capital cost through the entire time span
- Residential Building Revenue
 - Revenue through the entire time span
- Residential Building Operations and Maintenance Cost
 - Sum of annual operation and maintenance cost

Water Module

- Water Usage Quantification Metrics
 - Residential / Commercial buildings
 - Residential: dwelling unit
 - Commercial: employment by industry sectors
 - Indoor / Outdoor
 - Indoor: per-capita
 - Outdoor: irrigated area
- Spatial Resolution
 - SPZ
- Temporal Resolution
 - Base year & Horizon year

Water Module Data

- CA Evapotranspiration (ETo) Zone by DWR
 - 11 types of climate zone in SCAG region
 - Unit: annual inch of water per acre
 - ✓ Annual outdoor water demand
 - ✓ Residential / Commercial buildings

Water Module Data

■ Residential

- single family detached large lot dwelling unit (> 5500 sqft/DU)
- single family detached small lot dwelling unit (< 5500 sqft/DU)
- single family attached dwelling unit
- multifamily dwelling unit

■ Commercial

- retail trade
- food services (excluding accommodation)
- traveler accommodation, RV parks, rooming/boarded houses
- arts, entertainment, recreation
- other services
- information, FIRE, professional, management/admin
- public administration
- education services
- health care and social assistance
- wholesale trade
- transportation and warehousing
- manufacturing
- construction
- utilities
- agriculture, forestry, fishing, hunting
- mining
- national security, international affairs

Water Module Coefficients

- Indoor Residential Water Usage
 - Vary by residential building types
 - Unit: gallons per capita per day
 - Assumption
- Indoor Commercial Water Usage
 - Vary by industry sector
 - Unit: gallons per employee per work day
 - Estimates based on published studies
- Outdoor Residential Irrigated Area
 - Unit: sqft per dwelling unit
 - Vary by UF Building Type
 - ✓ lot size estimation
 - ✓ hardscape percentage assumption
 - ✓ irrigable percentage assumption
- Outdoor Commercial Irrigated Area
 - Unit: sqft per acre of commercial development
 - Vary by UF Building Type
 - ✓ hardscape percentage assumption
 - ✓ irrigable percentage assumption

Water Module Efficiency Policy

- Water Usage Baseline
 - Indoor Residential + Indoor Commercial + Outdoor Residential + Outdoor Commercial
- Building Stock Categorization
 - unchanged: baseline building persists to horizon year with annual turn-over rates
 - new development: horizon year building > baseline building
 - redevelopment: horizon year building < baseline building
- Efficiency Policies:
 - Vary by indoor/outdoor, residential/ commercial
 - Targets set at key horizon years: 2020, 2035, 2050
 - ✓ Annualized for intermediate years: linear
 - ✓ New construction
 - ✓ New retrofit
 - ✓ Base retrofit
 - Annual turn-over rates
 - ✓ New retrofit
 - ✓ Base retrofit
 - ✓ Base replacement

Water Module Output

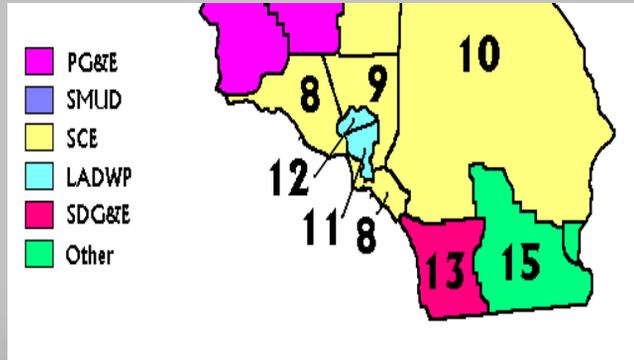
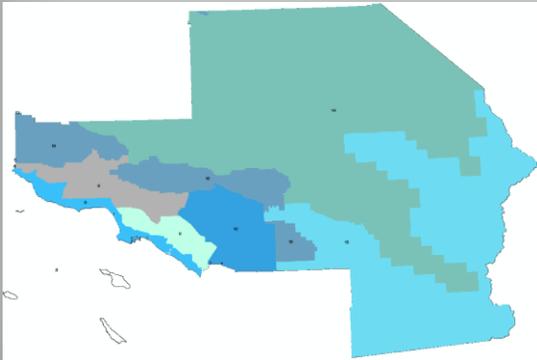
- SED
 - Population
 - Household
 - Total employment
- Water Usage
 - Total
 - Residential
 - ✓ Indoor
 - ✓ Outdoor
 - Commercial
 - ✓ Indoor
 - ✓ Outdoor
 - Annual gallons per unit
 - ✓ Residential: per capita
 - ✓ Commercial: per employee

Energy Module

- Energy Usage Quantification Metrics
 - Residential / Commercial buildings
 - ✓ Residential: dwelling unit
 - ✓ Commercial: employment by industry sectors
 - Gas / Electricity
 - ✓ Gas: US Therm to BTU
 - ✓ Electricity: Kilowatt Hour to BTU
- Spatial Resolution
 - SPZ
- Temporal Resolution
 - Base year & Horizon year

Energy Module Data

- CA Building Climate (Title24) Zone by CEC
 - 7 types of title24 zone in SCAG region
 - Residential
- CA Forecasting Climate Zone by CEC
 - 6 types of forecasting zone in SCAG region
 - Commercial



Energy Module Data

■ Residential

- single family detached large lot dwelling unit (> 5500 sqft/DU)
- single family detached small lot dwelling unit (< 5500 sqft/DU)
- single family attached dwelling unit
- multifamily dwelling unit

■ Commercial

- retail trade
- food services (excluding accommodation)
- traveler accommodation, RV parks, rooming/boarded houses
- other services
- information, FIRE, professional, management/admin
- public administration
- education services
- health care and social assistance
- wholesale trade
- transportation and warehousing

Energy Module Coefficients

- Annual Baseline Energy Consumption Rates
 - Gas and Electricity
 - Residential / Commercial
 - Climate Zone/ Forecasting Zone
 - Unit: per dwelling unit for residential; per sqft for commercial
- Estimates based on statewide surveys
 - Residential Appliance Saturation Survey (RASS): 2009
 - ✓ RASS: within dwelling unit
 - ✓ Common area proxy index: derived from CEUS
 - Commercial End Use Survey (CEUS): 2006

Energy Module Efficiency Policy

- Energy Usage Baseline
 - Residential Gas + Commercial Gas + Residential Electricity + Commercial Electricity
- Building Stock Categorization
 - unchanged: baseline building persists to horizon year with annual turn-over rates
 - new development: horizon year building > baseline building
 - redevelopment: horizon year building < baseline building
- Efficiency Policies:
 - Vary by gas / electricity, residential/ commercial
 - Targets set at key horizon years: 2020, 2035, 2050
 - ✓ Annualized for intermediate years: linear
 - ✓ New construction
 - ✓ New retrofit
 - ✓ Base retrofit
 - Annual turn-over rates
 - ✓ New retrofit
 - ✓ Base retrofit
 - ✓ Base replacement

Energy Module Output

- SED
 - Household
 - Total employment
- Energy Usage
 - Total
 - Residential
 - ✓ Gas
 - ✓ Electricity
 - Commercial
 - ✓ Gas
 - ✓ Electricity
 - Annual Million BTU per unit
 - ✓ Residential: per dwelling unit
 - ✓ Commercial: per sqft

Public Health Module

- Spatial Resolution
 - 150-meter by 150-meter grid cell (5.5 acres)
- Temporal Resolution
 - Base year & Horizon year
- Data
 - Canvas
 - Grid cell
 - ✓ Freeway & arterial length
 - ✓ Secondary road length
 - ✓ Local street length
 - ✓ Acres of park & open space
 - Census: 2009-2013 5-year ACS
 - Transit Stop Location
 - Tier2TAZ level Trip Production/Attraction by Trip Purposes

Public Health Module Data

- ACS
 - Population by Age Group
 - Population by Gender
 - Population by Ethnicity
 - Population by Education Attainment
 - Household by Income Group
 - Housing Tenure Status
 - Vehicle Ownership
- ACS Assumption
 - Population by Age Group: 5-11, 12-17, 16+
 - Population Average Age by Age Group
 - Census Tract level
 - ✓ Population (Un)employment Rate
 - ✓ Population by Age Group Disability Status
 - ✓ Population by Age Group Ambulatory Disability Status

Public Health Module Data

- Canvas

- Residential

- ✓ single family detached large lot dwelling unit (> 5500 sqft/DU)
 - ✓ single family detached small lot dwelling unit (< 5500 sqft/DU)
 - ✓ single family attached dwelling unit
 - ✓ multifamily dwelling unit

- Commercial

- ✓ retail trade
 - ✓ food services (excluding accommodation)
 - ✓ traveler accommodation, RV parks, rooming/boarding houses
 - ✓ arts, entertainment, recreation
 - ✓ other services
 - ✓ public administration
 - ✓ education services
 - ✓ health care and social assistance
 - ✓ information, FIRE, professional, management/admin

Public Health Module Outcomes

- CHTS
 - Four Age Groups
 - ✓ Adults, Seniors, Teens, Children
 - Four Income Groups
 - ✓ Low, Medium, High, All
 - Four Outcome Types
 - ✓ Auto for transportation
 - ✓ Recreational physical activity
 - ✓ Biking for transportation
 - ✓ Walking for transportation
 - Two Outcome Measures
 - ✓ Any participated activity
 - ✓ Time duration in minutes

Public Health Module Outcomes

■ CHIS

- Four Age Groups
 - ✓ Adults, Seniors, Teens, Children
- Four Income Groups
 - ✓ Low, Medium, High, All
- 14 Outcome Types
 - ✓ BMI
 - ✓ BMI percentile
 - ✓ Days per week 60+ mins of physical activity
 - ✓ Heart disease
 - ✓ High blood pressure
 - ✓ Walking for leisure
 - Any participation
 - Time duration
 - ✓ Likelihood of walking to school
 - ✓ Moderate physical activity
 - Any participation
 - Time duration
 - ✓ Obese
 - ✓ Overweight or obese
 - ✓ Poor general health
 - ✓ Walking for transportation
 - Any participation
 - Time duration
 - ✓ Type 2 diabetes
 - ✓ Vigorous physical activity
 - Any participation
 - Time duration

Travel Module

- Spatial Resolution
 - SPZ
- Temporal Resolution
 - Base year & Horizon year
- Data
 - Canvas
 - Census: 2009-2013 5-year ACS
 - Transit Stop Location
 - Tier2TAZ level Trip Production/Attraction by Trip Purposes

Travel Module Data

■ Canvas

- Household
- Population
- Intersection Density
- Acreage: residential, commercial, mixed-use
- Residential
 - ✓ single family detached large lot dwelling unit (> 5500 sqft/DU)
 - ✓ single family detached small lot dwelling unit (< 5500 sqft/DU)
 - ✓ single family attached dwelling unit
 - ✓ multifamily dwelling unit
- Commercial
 - ✓ retail trade
 - ✓ food services (excluding accommodation)
 - ✓ traveler accommodation, RV parks, rooming/boarding houses
 - ✓ arts, entertainment, recreation
 - ✓ other services
 - ✓ information, FIRE, professional, management/admin
 - ✓ public administration
 - ✓ education services
 - ✓ health care and social assistance
 - ✓ wholesale trade
 - ✓ transportation and warehousing
 - ✓ manufacturing
 - ✓ construction
 - ✓ utilities
 - ✓ agriculture, forestry, fishing, hunting
 - ✓ mining

Travel Module Data

- ACS
 - Household by Income Group
 - Population by Age Group
 - Population Employment Status
- Tier2TAZ Trip Length by Trip Purpose
 - Home-Based Work
 - Home-Based Others
 - Non-Home-Based
- Mixed-Use Development Trip Generation
 - Developed by Fehr & Peers

Travel Module Outcomes

- Trip
 - Production
 - ✓ Home-Based Work
 - ✓ Home-Based Others
 - ✓ Non-Home-Based
 - Attraction
 - ✓ Home-Based Work
 - ✓ Home-Based Others
 - ✓ Non-Home-Based
 - Internally captured trips
 - Walk / Transit
- VMT
 - Daily / Annual
 - Daily / Annual per capita / per household

SPM Next Steps

Next Steps

- SPM Availability
 - Roll out Data Management Site to all local jurisdictions to support local review/input process for the 2020 RTP/SCS
 - Make Scenario feature available to local jurisdictions
 - Extensive public outreach (training, tech support, etc.)
- Model Enhancement and Calibration

For More Information

Visit SPM website at

<http://sp.scag.ca.gov>

or contact

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