Embracing Change – Smart Growth
Development Proven to Reduce Site Traffic

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ITE Western District Meeting
June 20, 2017
San Diego, CA
Project Goal & Objectives

Goal
To produce a validated estimation method to more accurately estimate trip generation for smart growth sites in California.

Objective
Model with acceptable independent variables, transparent, comprehensible, updateable.
Caltrans Smart Growth Definition

Smart growth development characteristics

• Multiple interactive land uses, such as:
  – Workplaces
  – Restaurants
  – Stores
  – Residences
  – Entertainment

• Surroundings conveniently walkable
• Served by frequent, reliable transit
• Served by pedestrian and bicycle facilities
Data Collection Sites

LA Region

San Diego Area
Apartment & Office Data Collection Site Examples

- High-rise apartments
- Large mid-rise apartment complex
- Subway station & Bus transfer center
- BRT station
- Office buildings
Both Mid-Rise & High-Rise Apartments
Smart Growth Office Buildings
Model Database

Areas:

- Sacramento
- SF Bay Area
- LA Area
- San Diego

<table>
<thead>
<tr>
<th>Land Use</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apartment</td>
<td>39</td>
</tr>
<tr>
<td>Office</td>
<td>26</td>
</tr>
</tbody>
</table>
Principal Data Collected in SGTG Studies

Travel Characteristics

• # of persons by mode
• # of persons by direction
• Between 6:30 & 9:30 a.m. and 4 & 7 p.m.
Average Percentage of ITE Estimate

(Actual SG Vehicle Trips/ITE Suburban Vehicle Trips)

% of ITE Estimate

<table>
<thead>
<tr>
<th></th>
<th>AM</th>
<th>PM</th>
<th>AM</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apartments</td>
<td>65%</td>
<td>52%</td>
<td>49%</td>
<td>52%</td>
</tr>
<tr>
<td>Office</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Comparison of Counts to ITE Estimates

Smart Growth Apartments

Legend:
- Phase 2
- Phase 1
- Infill
Comparison of Counts to ITE Estimates
Smart Growth Office

Legend:
- Phase 2
- Phase 1
- Infill
Apartment Results

Average PM Mode Share

<table>
<thead>
<tr>
<th>Mode</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit</td>
<td>13%</td>
</tr>
<tr>
<td>Walk</td>
<td>24%</td>
</tr>
<tr>
<td>Bike</td>
<td>1%</td>
</tr>
<tr>
<td>Vehicle</td>
<td>62%</td>
</tr>
</tbody>
</table>

Weighted Average Vehicle Trip Rate

<table>
<thead>
<tr>
<th>Time</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>0.33</td>
</tr>
<tr>
<td>PM</td>
<td>0.33</td>
</tr>
</tbody>
</table>
Office Results

Average PM Mode Share

- Vehicle: 69%
- Transit: 17%
- Walk: 13%
- Bike: 1%

<table>
<thead>
<tr>
<th></th>
<th>Weighted Average Vehicle Trip Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>0.92</td>
</tr>
<tr>
<td>PM</td>
<td>0.91</td>
</tr>
</tbody>
</table>
SGTG Model

Approach:

• Rigorous evaluation of combination of variables
• LASSO regression

Resulting model:

• Vehicle Trips:
  – Separate model for AM and PM peak hour
  – By direction (enter and exit)

• Data input requirements:
  – Dwelling units or gross floor area
  – Intersection density

• Spreadsheet tool
SGTG Model

Apartment:

- AM \( Y = (0.24 \times \text{Units}) + \left(\frac{4610}{\text{Intersection Density}}\right) - 38 \)
- PM \( Y = (0.24 \times \text{Units}) + \left(\frac{3488}{\text{Intersection Density}}\right) - 31 \)

Units = total dwelling units

Office:

- AM \( Y = (0.62 \times \text{Units (1,000s)}) + \left(\frac{3311}{\text{Intersection Density}}\right) - 10 \)
- PM \( Y = (0.54 \times \text{Units (1,000s)}) + \left(\frac{4128}{\text{Intersection Density}}\right) - 7 \)

Units = total gross square feet of building floor area

\( R^2 = 0.79 \)  
ITE \( R^2 = 0.83 \)

\( R^2 = 0.85 \)  
ITE \( R^2 = 0.89 \)

\( R^2 = 0.71 \)  
ITE \( R^2 = 0.83 \)

\( R^2 = 0.69 \)  
ITE \( R^2 = 0.82 \)
Primary Application Criteria for SGTG Model

• Site size ranges:
  – Office 100K - 500K Gross Square Feet (GSF)
  – Apartments 80 - 800 Dwelling Units (DU)

• Area within ½ mile almost fully developed

• Mix of complementary land uses within ¼ mile

• No special major attractor within ½ mile

• Substantial peak hour transit service:
  – 10+ individual buses with stops within ¼ mile, or
  – 5+ individual trains with station stops within ½ mile
California Smart Growth Trip Generation Model Application Tool
January 2017
Developed by Texas A&M Transportation Institute for the California Department of Transportation

* Not recommended for sites within core central business district developments. For estimating site vehicle trip generation for free-standing individual apartment and office buildings in smart growth areas. For mixed-use developments, see footnote 1.

<table>
<thead>
<tr>
<th>Qualifiers &amp; Model Inputs</th>
<th>Please enter values below</th>
</tr>
</thead>
</table>
| ITE land use code (enter either 220, 221, or 223 for Apartment OR 710 for Office)
| Apartment - Dwelling Units (enter number between 80 - 800)
| Office - Gross Square Feet in 1,000s (enter number between 100 - 500)
| Adequate parking (on-site or conveniently walkable) to meet demand (See User Guide, Yes/No)
| Walkable surroundings on and off site (See User Guide, Yes/No)
| Transit stop(s) within ¼ mile conveniently accessible by foot from development (Yes/No)
| Moderate to high development compactness and densities within 1/4 mile (See User Guide, Yes/No)
| Well connected and conveniently walkable to adjacent land uses (Yes/No)
| No major special attractors within ¼ mile of site (See User Guide, Yes/No)
| Area within ¼ mile of site at least 80% developed and occupied (Yes/No)
| At least two interacting land uses within ¼ mile of site (Yes/No)
| Number of public intersections – excluding freeways – within ¼ mile radius of site must be between 50 - 150 for Apartments OR 40 - 250 for Office (enter number)
| Total jobs within ¼ mile of site between: 2,200 - 79,000 for Apartments OR 2,500 - 136,000 for Office (Yes/No)
| Total population within ¼ mile of site between: 3,600 - 35,000 for Apartments OR 2,900 - 42,000 for Office (Yes/No)
| Minimum of 10 PM peak hour buses stopping within ¼ mile of site OR
| Minimum of 5 PM peak hour rail transit trains stopping within ¼ mile of site (Yes/No)

Additional comments

<table>
<thead>
<tr>
<th>Project name</th>
<th>Land use description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address, city, state</td>
<td></td>
</tr>
<tr>
<td>Analyst's name, organization, date</td>
<td></td>
</tr>
<tr>
<td>Checked by, date</td>
<td></td>
</tr>
<tr>
<td>Analysis year</td>
<td></td>
</tr>
<tr>
<td>Analysis period</td>
<td>Typical Weekday Site Peak Hour between 7 and 9 AM &amp; between 4 and 6 PM</td>
</tr>
</tbody>
</table>

Identity

Comparative Analysis

<table>
<thead>
<tr>
<th>Qualifiers</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Site qualified as a smart growth development based on sites used to develop this tool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Land use</td>
<td>Apartment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Vehicle Trips (street peak hour)</td>
</tr>
<tr>
<td>Period</td>
</tr>
<tr>
<td>AM</td>
</tr>
<tr>
<td>PM</td>
</tr>
</tbody>
</table>
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Questions?

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