Developing Dwelling Unit Equivalence (DUE) Rates Using an Activity Travel Demand Model

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DKS Associates
TRANSPORTATION SOLUTIONS
www.dksassociates.com

Development Fee Programs

Assess impacts of new developments on the transportation system & allocate mitigation costs proportional to source of impacts

Dwelling Unit Equivalent (DUE) Rates

Allocate impacts across land-use categories

- Daily or Peak-hour vehicle trip rates (ITE)
- VMT based (trip rates X trip lengths)
- Model Estimated (4-step model)
- **Model Estimated (Activity model)**

City of Roseville Traffic Mitigation Fee (TMF) Program

- Adjustment factors developed to correct for over allocation of VMT to intermediate stops on pre-existing trips

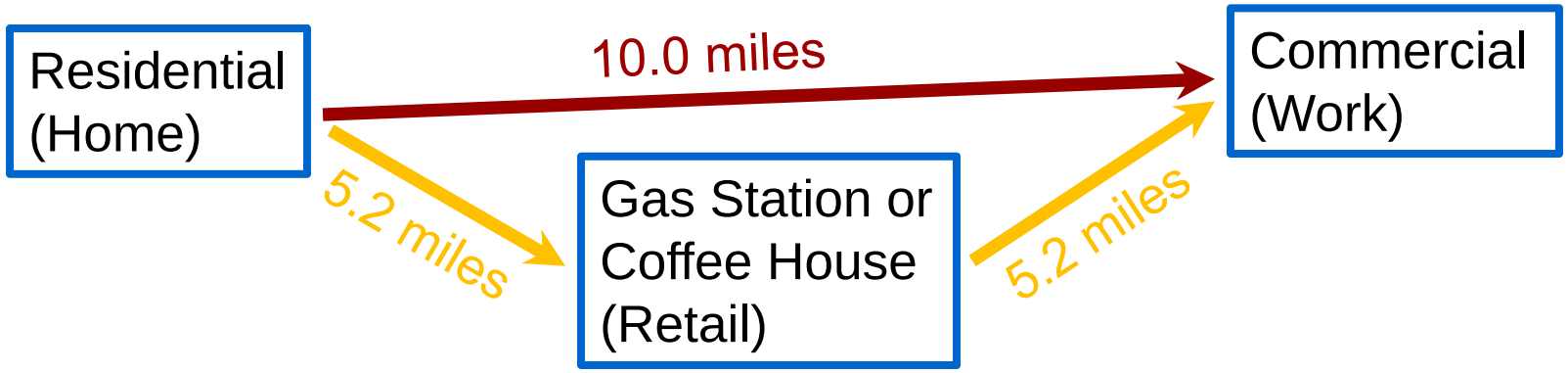
Sacramento I-5 Sub-regional Mitigation Program

- Unique DUE rates developed for each District in the fee program's study area

City of Roseville's Traffic Mitigation Fee (TMF) Program
PM Peak VMT Factors Derived from the City's Four-Step Travel Demand Model

Land Use Category	VMT Parameter Estimate	Standard Error of Estimator	t value	Pr(>|t|)	Significance
Single Family Dwelling Unit	0.993	0.030	32.601	< 2e-16	***
Multi Family Dwelling Unit	0.652	0.043	15.184	< 2e-16	***
Age Restricted Dwelling Unit	0.348	0.069	5.063	6.02E-07	***
Retail	2.102	0.051	41.012	< 2e-16	***
Mall	1.858	0.054	34.104	< 2e-16	***
Office	1.929	0.049	39.054	< 2e-16	***
Industrial	0.874	0.030	29.100	< 2e-16	***
High Tech Industrial	1.486	0.037	40.146	< 2e-16	***
Medical Offices	1.680	0.055	30.673	< 2e-16	***
Hotel	1.041	0.117	8.915	< 2e-16	***
Public Quasi-Public	1.988	0.126	15.800	< 2e-16	***
School	0.040	0.016	2.461	1.42E-02	*
Golf	1.098	0.277	3.964	8.55E-05	***
Significance Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					

VMT & DUE rates by land-use category derived from trip rates, VMT or 4-step travel models can over estimate impacts for land-use categories with high proportion of intermediate stops (e.g., retail)



Home: 1*(0.5*10.0) = 5.0 miles
Work: 1*(0.5*10.0) = 5.0 miles

Home: 1*(0.5*5.2) = 2.6 miles
Retail: 2*(0.5*5.2) = 5.2 miles
Work: 1*(0.5*5.2) = 2.6 miles

Correction factors developed using SACSIM Activity Model "tours" database

City of Roseville's Traffic Mitigation Fee (TMF) Program
Future Year Primary & Secondary Trip-end Factors from SACSIM Activity Model

Land Use Category	Probability of Stop being "Primary" (in percent)	Probability of Stop being "Secondary" (in percent)	t value	Pr(>|t|)
Single Family Dwelling Unit	88%	12%	< 2e-16	***
Multi Family Dwelling Unit	88%	12%	< 2e-16	***
Age Restricted Dwelling Unit	88%	12%	< 2e-16	***
Retail	38%	62%	< 2e-16	***
Office	59%	41%	< 2e-16	***
Industrial	62%	38%	< 2e-16	***
High Tech Industrial	62%	38%	< 2e-16	***
Medical Offices	43%	57%	< 2e-16	***
Public Quasi-Public	66%	34%	< 2e-16	***
School	96%	4%	< 2e-16	***

Significance Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

City of Roseville's Traffic Mitigation Fee (TMF) Program
Dwelling Unit Equivalent (DUE) Rate – 4-Step Model and Activity Model Corrected

Land Use Category	4-step Model Estimated DUE Rates	Activity Model Corrected DUE Rates
Single Family Dwelling Unit	**1.000**	**1.000**
Multi Family Dwelling Unit	0.614	0.657
Age Restricted Dwelling Unit	0.267	0.350
Retail	1.740	1.427
Office	1.380	1.580
Industrial	0.910	0.730
High Tech Industrial	1.000	1.240
Medical Offices	2.890	3.001
Public Quasi-Public	1.120	1.712
School	0.082	0.042

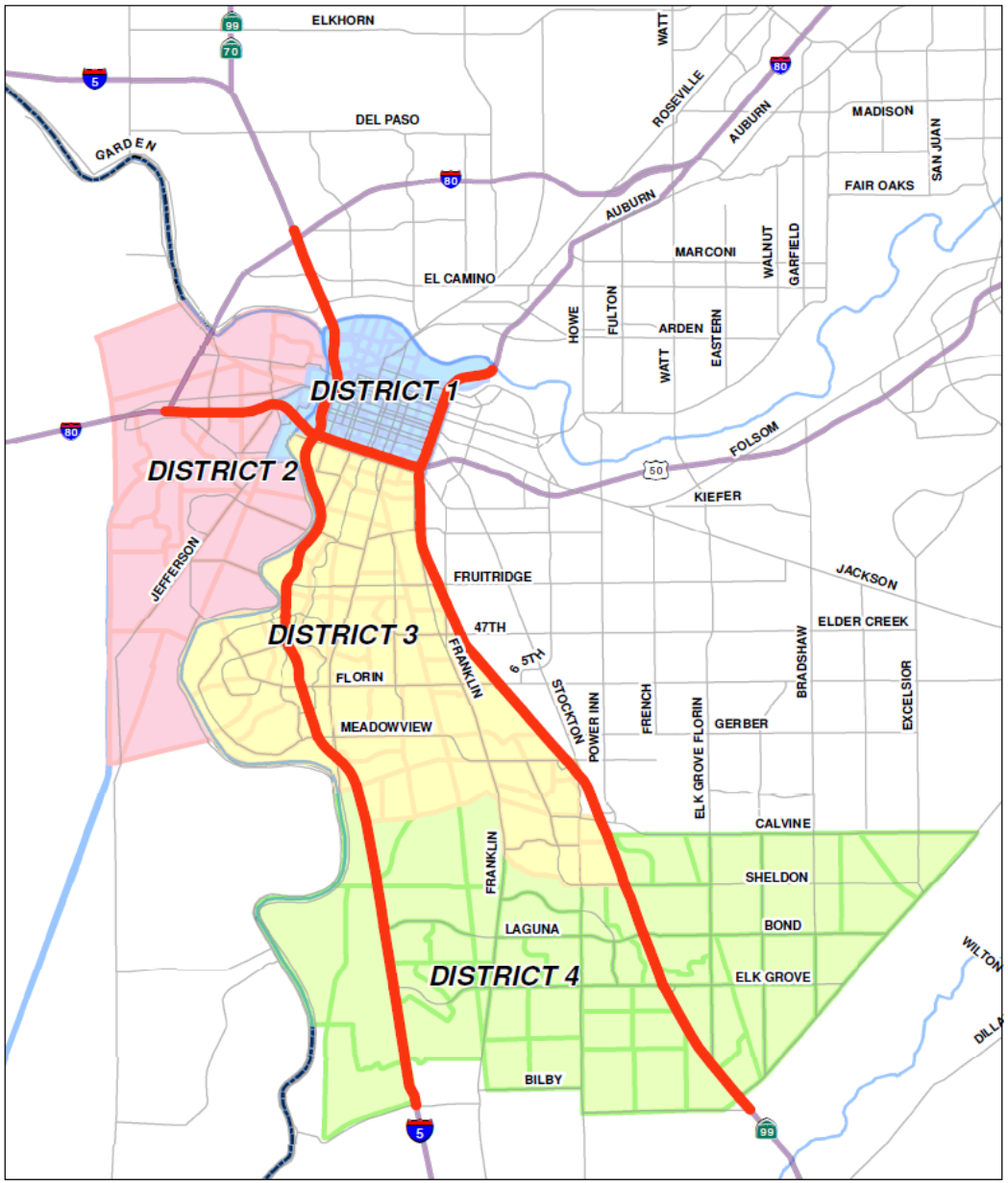
City of Roseville Traffic Mitigation Fee (TMF) Program

- Adjustment factors developed to correct for over allocation of VMT to intermediate stops on pre-existing trips

Sacramento I-5 Sub-regional Mitigation Program

- Unique DUE rates developed for each District in the fee program's study area

Sacramento I-5 Sub-regional Mitigation Program
Fee Program's Performance Area and Fee Districts



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Performance Area State Highway System

- District #1
  Sacramento's downtown area: highest density in region, jobs rich
- District #4
  City of Elk Grove: lower densities, typical suburban neighborhoods, housing rich

Sacramento I-5 Sub-regional Mitigation Program
SACSIM Estimated DUE Rates by Fee District

District		Rate per Dwelling Unit		Rate per 1,000 Square Feet		
		Single Family	Multi-Family	Retail	Office	Industrial / Other
1	Sacramento Central City & West Sac (North and Riverfront)	0.49	0.30	0.93	0.92	0.65
2	West Sacramento (Southport)	0.43	0.26	0.74	0.66	0.46
3	Land Park & South Sacramento / Pocket	0.71	0.44	0.81	0.59	0.41
4	Elk Grove	**1.00**	0.62	0.34	0.23	0.16

Sacramento I-5 Sub-regional Mitigation Program
Illustrative Cost per DUE with District 4 Single-family = $5,000

District		Cost per Dwelling Unit		Cost per 1,000 Square Feet		
		Single Family	Multi-Family	Retail	Office	Industrial / Other
1	Sacramento Central City & West Sac (North and Riverfront)	$3,439	$1,512	$4,668	$4,622	$3,235
2	West Sacramento (Southport)	$2,134	$1,323	$3,711	$3,302	$2,311
3	Land Park & South Sacramento / Pocket	$3,560	$2,207	$4,044	$2,960	$2,072
4	Elk Grove	**$5,000**	$3,100	$1,679	$1,144	$801

Activity Based Models – Viable Applications

- General Plan Updates – effects of urban form on vehicle travel (densification vs. sprawl)
- Development of Transportation Fee Programs
- Sustainable Communities & Green House Gas Reporting – California's SB 375, VMT per capita
- Transit Initiatives & FTA New Starts/Small Starts Transit Ridership Forecasting (2X for transit dependents)
- Parking, Transit & Road Pricing