Jim Mitrisin <jim.mitrisin@edcgov.us>

MCFP 9-13-16

1 message

James Sweeney <jamessweeney@comcast.net> Tue, Sep 13, 2016 at 12:06 PM
To: jim.mitrisin@edcgov.us, bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us

Comments on Item 37 9-13-16

Do not blow off the MC&FP It is still valid Measure E did not kill it!!!!

Jack

MCFP 9-13-16.docx
14K

14-0245 Public Comment Rcvd 9-13-16

Comments of James R. "Jack" Sweeney BOS item #37 9-13-16

As a member of the Board of Supervisors for the County of El Dorado for the periods of 1985 through 1992 and again from August 2003 through 2012, I realized that economic development for the central portion of this county and relief for the "South County" traffic and its impact on downtown Diamond Springs could be served by an improved connection between Pleasant Valley Road and Highway 50 at Missouri Flat Road. Many people worked very diligently to create the Missouri Flat Master Circulation and Funding Plan (MC&FP)! I am disappointed that it seems to be being discarded so willingly! This comment is based on the following from Board of Supervisors agenda item # 37 9-13-16 legistar # 14-0245 19A 10 of 19:

Diamond Springs Parkway

The MC&FP was created to help fund road capacity projects to support new commercial development in the area. The MC&FP funding mechanism is comprised of incremental sales and property taxes: 85% of new property and sales tax that would otherwise come to the County General Fund are set aside to pay for road improvements in the area. This funding mechanism was established in 2001 and currently generates approximately $900,000 per year. Measure E was approved by the voters on June 7, 2016. Policy TC-Xa 4 of Measure E states that "County tax revenues shall not be used in any way to pay for building road capacity improvements to offset traffic impacts from new development projects." MC&FP monies are a County tax revenue. Staff recommends taking a conservative approach to ensure consistency with Measure E: replace MC&FP funding currently identified for the Diamond Springs Parkway Phase 1B (CIP #72375) with Tribal Funds and/or TIM Fee funds.

The funding stream was approved by the voters as Measure J at the November 7, 2000 election. The measure garnered 38,236 votes out of 65,008, 59%. Measure E would be an Ex Post Facto law in this case! And, it only received 31,406 votes, 52%.

Measure J stated: "Shall the County be authorized to use that portion of its sales tax revenues generated by new development to pay for building road capacity improvements to offset impacts to traffic generated by non-residential development as allowed under Policy 3.2.2.5 0f Measure Y, enacted by the voters on November 3, 1998?"

The MC&FP was approved by the Board at item # 80a 12-15-98. Measure E DID NOT rescind any action of the Board or the voters in regards to the MC&FP! The use of the MC&FP funding must still be valid.

The basis for the staff position that it is invalidated should be public and I would like to have a written copy of same.

Jack!

EDC COB <edc.cob@edcgov.us>

public comment agenda 9 13 16 item 14-0245 impact fees

1 message

Henry Batsel <hbatsel@gmail.com>
To: edc.cob@edcgov.us

Tue, Sep 13, 2016 at 12:30 PM

final comments to board 9 13 16 impact fees.pdf
4933K

14-0245 Public Comment Rcvd 9-13-16

September 13, 2016

Honorable Chairman Mikulako
El Dorado County Board of Supervisors
Community Development Director Steve Pedretti

Re: Hearing on Impact fees - El Dorado County's Transportation Impact Fee Nexus Failure

Dear Chairman Mikulako,

These public comments concern the transportation impact fee (TIM) and include links to 10 years of growth spatially located on maps with charts produced by the GIS team at the county surveyor's office. Also attached are a 2002 Cal Trans manual on the preparation of impact fees, historical fair share funding documents, Sac City's nexus report (properly done), EDD inter county commute statistics, two external trip studies, and EDD's commuting estimates. These documents debunk the current model and the entire policy of excluding fair share proportional funding of transportation projects, as well as, external trip projections. We show the county has neglected the states guidelines and the Mitigation Fee Act in calculating impact fees. We believe the county exposure to liabilities to repay the collected fees to the public are extreme, and, potentially 80% of the collect fees are subject to a fraud lawsuit. An overview and explanation for our concern is below.

The growth maps are on line in the county's map library. The maps have a spread sheet at the bottom which show tallies of final permits within the zones by year for the last 10 years. At issue is the forecasting policy and consequential funding allowing for major infrastructure projects - 4 interchanges and auxiliary lanes in zones 2 & 3. The State Highway TIM fee only has projects in three zones - 2,3,and 8 which is basically a swath of land from Placerville to the Sacramento county line. Zones 2 & 3 (13.5 miles long) are between Bass Lake Road and extending east of Placerville's HWY 49. In the last 5 years, growth has virtually stopped in zones 2 & 3 with roughly 16 units per year constructed. Zone 8 (El Dorado Hills area) has over 10 times the growth as zones 2 & 3 combined. The link to the map library is below. http://edcapps.edcgov.us/maplibrary/html/ImageFiles/gi0072338g_res.pdf This link includes the latest TIM Fee Annual Reports -http://www.edcgov.us/DOT/TIMReporting.aspx.

THE GROWTH RATE IN ZONES 1-7 IS NOT THE GROWTH RATE IN ZONE 8.

However, zones 2 & 3 have the highest project costs with 4 interchanges and auxiliary lanes – substantially more than zone 8. In the last 5 years, zones 2 & 3 showed deep declines in permits from the earlier 2006-2010 period going from 605 units to 78 total units for the 5 years ending in 2015. Every transportation zone excepting zone 8 has slower growth than Lake Tahoe. In the last 5 years Zones 2 and 3 have 78 permits and Lake Tahoe had 131 final permits. El Dorado Hills Zone 8 had 995 permits in the last 5 years. In statistical analysis, the most current data is the most relevant data. No consideration is given to the decline trend in forecasting

transportation needs and indeed, to the extent that around 7,000 units are forecast in the next 20 years for these same zones 2 and 3.

Hardly any state highway mitigation is scheduled in El Dorado Hills – ED Hills zone 8 only has $22,000,000 scheduled for highway projects for the next 20 years but zones 2 & 3 have $186,000,000. Using the last 5 year permit averages to forecast, zone 8 would develop 3,980 units while zones 2 & 3 would total 312 units. We believe the data shows the disparity in fee burdens by zone and by users.

In order for the CIP to be legally defensible, the need for infrastructure must be demonstrated and the cause must be from new development not existing problems i.e. - (the Cameron Park interchange (south deck) is rated structurally deficient with low clearances) with short on and off ramps. Existing deficiencies exist at all 4 interchange projects. In 2009, a transportation study was conducted by the county indicating the Cameron Park Interchange and surrounding intersections at Coach Lane and Palmer Drive would approach Level of Service "F" by 2015. The interchange is at LOS "F" now as is Cameron Park Drive at the location. Traffic is NOW backing up on the westbound off-ramp preempting merging into the multi-purpose lanes. This is now a huge safety issue on most Friday afternoons. Safety is an existing deficiency. Impact fees may not be used to fund existing deficiencies.

The proper calculation for impact fee fair share proportions includes the deductions of external trips, existing deficiencies, and the percentage of the fair share of use (existing residents trips). The county is in error to ascribe 100% funding of capacity improvements to new development (the interpretation of Measure "Y") and exclude the impacts from existing residents – existing trips are an impact to transportation projects. The benefactors from a new interchange would primarily be existing residents. As such the cost of these projects should be borne by the users of the interchange.

Cal Trans provided instructions for preparing impact fee studies addressing fair share of use. The formula below is copied from the Cal Trans 2002 guide, GUIDE FOR THE PREPARATION OF TRAFFIC IMPACT STUDIES, and indicates the impact fees (for legal nexus considerations) **are a user based cost**. Existing development, according to the formula, does have a fair share responsibility for the Cameron Park Interchange improvements. All users are ascribed a portion in the calculation and thus new pays its fair share. Additionally, the Cal Trans guide includes cost formulas - included below this formula in the manual (attached).

EQUITABLE SHARE RESPONSIBILITY: Equation C-1
NOTE: $T_E < T_B$, see explanation for T_B below.
Where:

$$P = T/TB - TE$$

P = The equitable share for the proposed project's traffic impact.
T = The vehicle trips generated by the project during the peak hour of adjacent State highway facility in vehicles per hour, vph.

T_B = The forecasted traffic volume on an impacted State highway facility at the time of general plan build-out (e.g., 20 year model or the furthest future model date feasible), vph.

T_E = The traffic volume existing on the impacted State highway facility plus other approved projects that will generate traffic that has yet to be constructed/opened, vph.

NOTES

1. Once the equitable share responsibility and equitable cost has been established on a per trip basis, these values can be utilized for all projects on that State highway facility until the forecasted general plan build-out model is revised.
2. Truck traffic should be converted to passenger car equivalents before utilizing these equations (see the Highway Capacity Manual for converting to passenger car equivalents).

The manual also includes the legal justification for the impact fee fair share formula (page 2 Cal Trans 2guide, Exhibit "B") and fair share proportional funding formula for new developments costs.

In 2002, the county performed studies for the general plan which show the county's fair share funding for both LOCAL TIM and STATE HWY TIM fees. Existing (capacity) deficiencies for the LOCAL TIM were figured at 42% of trips and STATE HWY TIM at 52% trips (attached). These were based on future and existing trips 20 years out. The March 5, 2002 County DOT workshop handout also quantified the amounts of $162,000,000 in STATE HWY, and $83,000,000 for LOCAL TIM **existing deficiencies** (attached). It should be noted that existing deficiencies are not confined to capacity considerations – safety, grade, regulatory changes, and narrow lanes are examples of existing deficiencies.

Sometime after 2002 and before 2006, the county abandon fair share funding. In the 2006 fee program, the entire burden for all future trips is placed on new development (minus 3% for external trips). Even though the county said they funded projects with transportation grants, the current fee (2006) is based on new developments full funding of infrastructure as shown in Resolution 06-266. (The county's new draft nexus report has somewhat improved the fee calculation to include a slight increase in external trips.) However, NO deduction for existing residents trips is included in the fee calculation. Existing residents impacts should be treated the same as external impacts and existing deficiencies – because new development is only required to pay for impacts caused by new development. Existing development is a substantial 80% of all trips at 20 years out. This benefit to existing users is evidenced in the current 2006 fee program and is also carried forward in the proposed draft nexus. We request the impact fees be changed and calculated appropriately to include existing users trips per the Cal Trans GUIDE FOR THE PREPERATION OF IMPACT FEE STUDIES and not based on an interpretation of Measure "Y".

In short, just including the existing trips in the formula reduces the newly proposed impact fees by 80%. This alone is grounds for a legal challenge and possibly a fraud allowing for an 80% re-coup of fees charged under the 2006 program.

Further, growth location maps compiled by the county GIS department show that zones 2 and 3 combined only had only 78 permits in the last 5 years. In the last 10 years, under $10 million in STATE HWY TIM fees were collected. Yet, $186,000,000 in projects is included in the new draft nexus report to mitigate growth in 20 years. However, the traffic model is grossly inaccurate predicting about 7,000 residential units in 20

years for the two zones (combined by board action) or 350 new homes a year. The 7,000 forecast by consultants is not justified by permit histories, census, Department of Finance, or The Census Transportation Planning Package data (CTPP) http://download.ctpp.transportation.org/profiles_2015/transport_profiles.html .

We submit with this document a study showing external trips average from 35%-64% conflicting with the county's figures. Also, the Bay to Basin Transportation study indicates that inter-regional traffic is at 50% of HWY 50's peak hour usage. As time passes, this percentage increases because of exponential growth in surrounding counties which use HWY 50.

Measure "Y" allows our land use policy to be dictated by external trips caused by other communities using the highway and local roads – with the strong potential of shutting down all projects over time. DOT staff member Claudia Wade indicated that recently a fruit stand was turned down because of Measure "Y".

We request the board revise the draft nexus report per the Cal Trans 2002 manual, quantify the external trips and existing deficiencies and finally make it right with the citizens who have paid the fees.

Respectfully,

Bernard Carlson
Friends of El Dorado County

Henry Batsel volunteer

Henry Batsel
Friends of El Dorado County

RESIDENTIAL TRANSPORTATION IMPACT FEES - ZONES 2 & 3

PROPOSED HWY 50 RESIDENTIAL

Source – Draft CIP 4/2016

CIP Project No.	Project Name	From	To	Total Cost
GP148	Aux. Lane Eastbound	Bass Lake Rd IC	Cambridge Rd IC	8,830,500
53126	Aux. Lane Eastbound	Cambridge Rd IC	Cameron Park Dr IC	8,743,500
53127	Aux. Lane Eastbound	Cameron Park Dr IC	Ponderosa Rd IC	8,381,000
53128	Aux. Lane Westbound	Ponderosa Rd IC	Cameron Park Dr IC	8,961,000
71332,GP149	Cambridge Rd	NA	NA	8,613,000
72361	Cameron Park Dr	NA	NA	87,284,000
71333, 71338, 71339	Ponderosa Rd	NA	NA	39,417,000
71347, 71376	El Dorado Rd	NA	NA	15,636,000
	TOTAL AUX AND INTERCHANGE IMPROVEMENTS Zones 2 & 3			185,866,000

PROPOSED LOCAL ROAD IMPACT FEE ZONES 2 & 3 Source – Draft CIP 4/2016

CIP Project No.	Project Name	From	To	Total Cost
72143	Cameron Park Dr	Palmer	Hacienda Rd	1,324,000
72142	Missouri Flat Rd	China Garden Rd	State Route 49	3,920,000
72334, 72375	Diamond Springs Pkwy	Missouri Flat Rd	State Route 49	23,303,000
71375	Headington Rd Connector	El Dorado	Missouri Flat Rd	3,796,000
	TOTAL LOCAL ROAD IMPACT FEE 2 & 3			32,343,000

THERE IS INSUFFICIENT GROWTH TO FUND PROPOSED INFRASTRUCTURE IN ZONES 2 & 3. THE FIVE YEAR GROWTH AVERAGE IS 15.6 UNITS PER YEAR. THE 10 YEAR RESIDENTIAL AVERAGE IS 69 UNITS PER YEAR. (However, the county's growth projections are 350 res. units per year in zones 2 and 3.) $185,866,000 IN INFRASTRUCTURE IS PROPOSED IN HWY PROJECTS OVER THE NEXT 20 YEARS. About $7,000,000 IN STATE HWY FEES WERE COLLECTED IN THE LAST 10 YEARS IN ZONES 2 AND 3.

20 YR FORECAST USING LAST 5 YEAR RESIDENTIAL FINAL PERMIT AVERAGES

HWY 50 AND LOCAL FEE BY ZONE (except no local fee for zone 8)	**20 YR UNIT FORECAST**	20 YR STATE TIM INFRASTRUCTURE
ZONE 8 - 20 YR GROWTH	3,980 UNITS	$ 21,911,500
ZONE 2 & 3 20 YR GROWTH COMBINED BY BOARD ACTION	312 UNITS	$ 185,866,000

2011 - 2015 FINALED RESIDENTIAL BUILDING PERMITS

TIM Zone - SFR	2011	2012	2013	2014	2015	Grand Total
0	26	20	21	30	34	131
1	2	3	2		2	9
2	7	4	13	19	13	56
3	4	1	2	6	5	18
4	8	7	10	22	14	61
5	5	4	5	8	11	33
6	6	3	4	4	4	21
7	8	5	5	6	10	34
8	42	135	219	225	269	890
Grand Total	**108**	**182**	**281**	**320**	**362**	**1253**

TIM Zone - MFR	2013	2015	Grand Total
2		4	4
8	105		105
Grand Total	**105**	**4**	**109**

MFR values reflect actual Units built, not Finaled Permits.

NOTE: Lake Tahoe is TIM zone 0 with 131 permits total. Lake Tahoe has double the growth of every zone except ED Hills zone 8.

2006 - 2010 FINALED RESIDENTIAL BUILDING PERMITS

TIM Zone - SFR	2006	2007	2008	2009	2010	Grand Total
0	97	74	67	55	33	326
1	38	30	22	8	5	103
2	142	61	28	75	7	313
3	31	29	10	2	5	77
4	103	106	69	43	16	337
5	92	56	49	13	11	221
6	54	40	24	10	8	136
7	38	48	28	13	9	136
8	499	318	232	86	45	1180
Grand Total	**1094**	**762**	**529**	**305**	**139**	**2829**

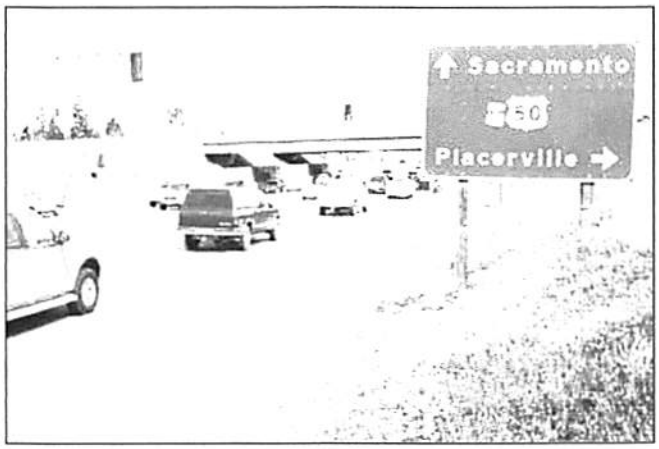
TIM Zone - MFR	2006	2007	2008	2009	Grand Total
0			5		5
2	24	14	22	155	215
3		8	2		10
8		19	36		55
Grand Total	**24**	**41**	**65**	**155**	**285**

MFR values reflect actual Units built, not Finaled Permits.

California's Oldest Newspaper - Est. 1851
Mountain Democrat

County revisits Cameron Park interchange plan

By Mike Roberts | Mother Lode News | April 04, 2010 12:26



TRAFFIC ENGINEERS are putting their heads together to come up with the best plan to alleviate congestion at the Cameron Park-Highway 50 intersection. Democrat photo by Pat Dollins

Noah Briel of El Dorado Hills likes to shop in Cameron Park and knows, at times, it gets congested. In January he was in Springfield, Mo., for work and happened to drive through the nation's first functioning "diverging diamond" interchange. He made his coworker turn their 50-foot delivery truck around and drive back through the interchange.

Seeing how efficiently it worked, and how little right of way was required on either side of the freeway, Briel immediately realized he stumbled on the perfect solution for El Dorado County's miserably tight, under-engineered Highway 50 interchanges, specifically the one at Cameron Park Drive.

Later in January he attended a county transportation workshop and told the Board of Supervisors what he'd seen. "It's brilliant," he said. "It speeds everything up, and it's much cheaper to build."

That project was watched closely by traffic engineers across the country, including El Dorado County Department of Transportation Director Jim Ware, who chaired the workshop and offered up a diverging diamond as one of several possible solutions at Cameron Park Drive and Highway 50.

Briel reported that Springfield liked its new direct diamond, built for a measly $3 million, so much they are planning four more, all at costs half of conventional designs. The second Missouri "DDI" opens in August with a price tag of $7.5 million, according to Missouri DOT spokesman Jorma Duran.

With some very expensive options on the table for a major upgrade to the Highway 50 interchange at Cameron Park Drive, Ware raised a caution flag to ensure his board and the public understand there are other options that might merit further investigation, and that the resulting project will shape the future of Cameron Park.

Ware was careful to explain that although the road engineering community is excited about the diverging diamond's possibilities, it is just one of the alternatives under consideration. Plus, it's not currently an approved Caltrans design.

The cost of the currently preferred alternative, tentatively scheduled for completion between 2013-18, jumped from $24 million to $68 million in 2009, when a traffic study showed the Cameron

Park Drive interchange and the surrounding intersections at Coach Lane and Palmer Drive approaching "Level of Service F," or gridlock, by 2015. Coach Lane is already at "LOS F" during the evening commute.

The price increase is due largely to the fact that the roadway beneath the freeway would have to be widened to eight lanes, requiring the replacement of the highway bridge over Cameron Park Drive.

The county is required to proactively address roads that approach LOS F under the terms of a settlement agreement resulting from a 2004 General Plan lawsuit.

Cameron Park Vision Committee members are quick to point out that their community must decide what it wants to be before finalizing the interchange design. The vision of a "town center" located east of Cameron Park Drive has been tossed around in recent years, but to date has not solidified. "Any new road project should support that," said Ware.

An interchange with issues

Ware's largest challenges at Cameron Park Drive are the new bridge and the gas stations on either side of the freeway that limit potential ramp realignments. The $68 million Alternative 1 price tag includes buying and relocating several such businesses. It's an expensive proposition.

Other problems include short ramps, which can result in traffic back-ups during peak hours. Sight distance on the eastbound exit prohibits a right turn on red.

The frontage roads are too close to the freeway, engineers agree. Coach Lane is a mere 200 feet away. Country Club Drive is only 100 feet from the westbound entrances.

Three alternatives were investigated as part of a 2008 DOT Project Study Report.

Alternative 1 - $68 million

The current preferred alternative pushes LOS F out past 2035. It includes widening Cameron Park Drive to eight lanes from Palmer Drive, south under the freeway to Coach Lane. The bridge structures that carry Highway 50 over Cameron Park Drive would be replaced.

Ramps would be lengthened and widened to include carpool lanes and meters. Cameron Park Drive would be widened to seven lanes between Coach Lane and Durock Road.

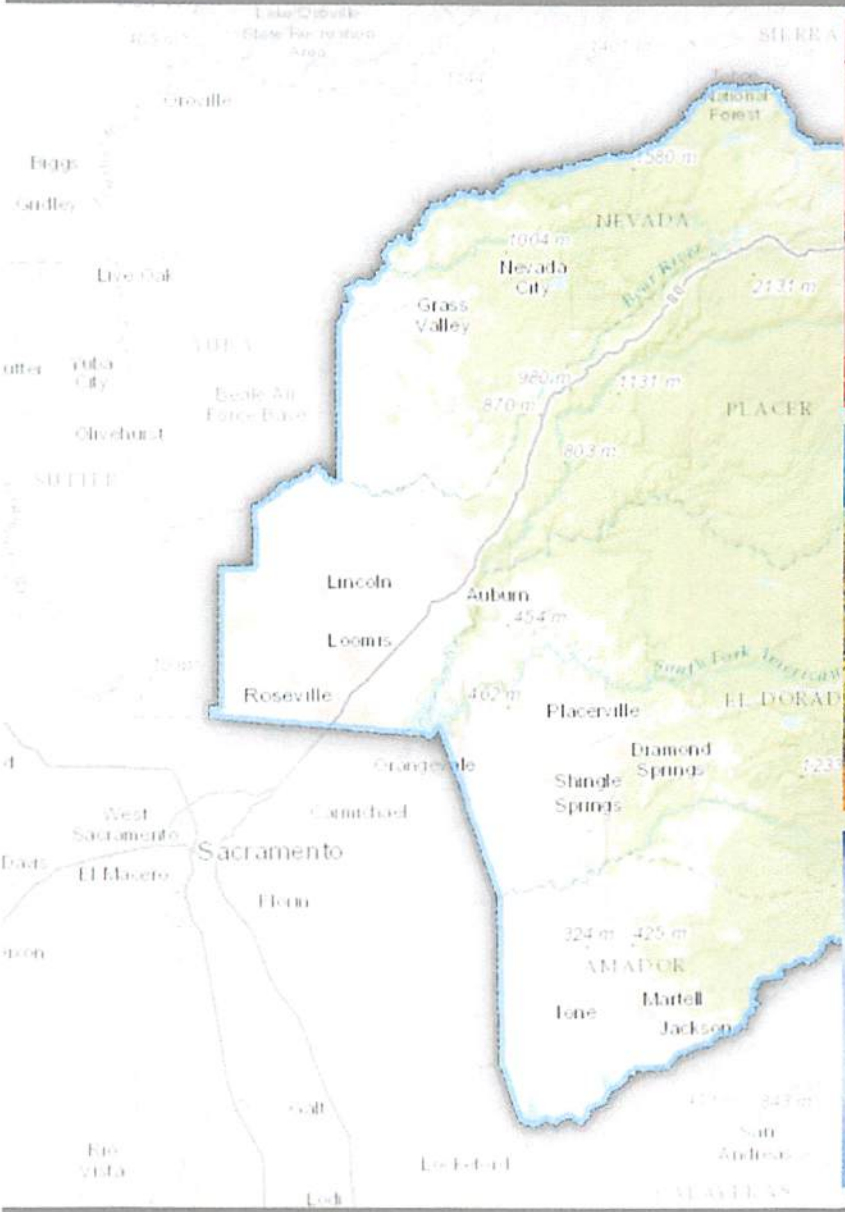
But what concerned Cameron Park business and civic leaders earlier was the barrier preventing left turns from Coach Lane onto Cameron Park Drive. Without a direct way back onto the freeway, many of the businesses south of Highway 50 could suffer.

The barrier would block the heavily used left turn from Coach Lane (between Taco Bell and Chevron) onto Cameron Park Drive. Instead, freeway-bound shoppers in the southwest quadrant of Cameron Park's commercial center - think Safeway, Burke Junction, Food 4 Less - would have to turn right on Cameron Park Drive, then make a U-turn to get back to the freeway.

Alternatively, Rodeo Road could probably be punched through to Cameron Park Drive opposite Robin Lane, south of Sizzler and Wachovia Bank.

Roughly 50 parcels could be affected, including significant impacts to up to nine current businesses

Bay to Tahoe Basin Recreation and Tourism
Travel Impact Study



October 2014

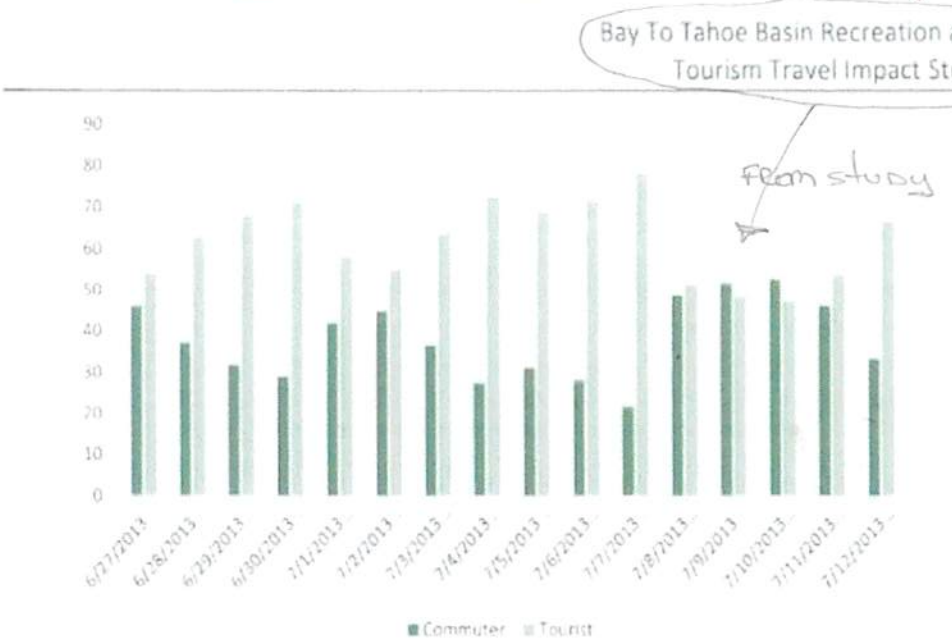
Western Slope CIP and TIM Fee Update Workshop

Board of Supervisors
Study Session
May 5, 2015

CIP & TIM FEE UPDATE
WESTERN SLOPE
INVESTING IN EL DORADO COUNTY

Traffic Analysis Methodology

- Annual Average Weekday Conditions (Tues-Thurs during Spring or Fall)
  - Published Volumes by Caltrans and US 50 PeMs Data
  - Traffic Counts on County roadways



external trips

Interregional traffic on US 50

50% weekdays

70% weekends/pk season

EXTERNALS

DOES NOT INCLUDE TRUCKS
DOES NOT INCLUDE CASINO
DOES NOT PLACERVILLE OR SLT

DOC SOURCE - NEXT PAGE

California Department of Finance

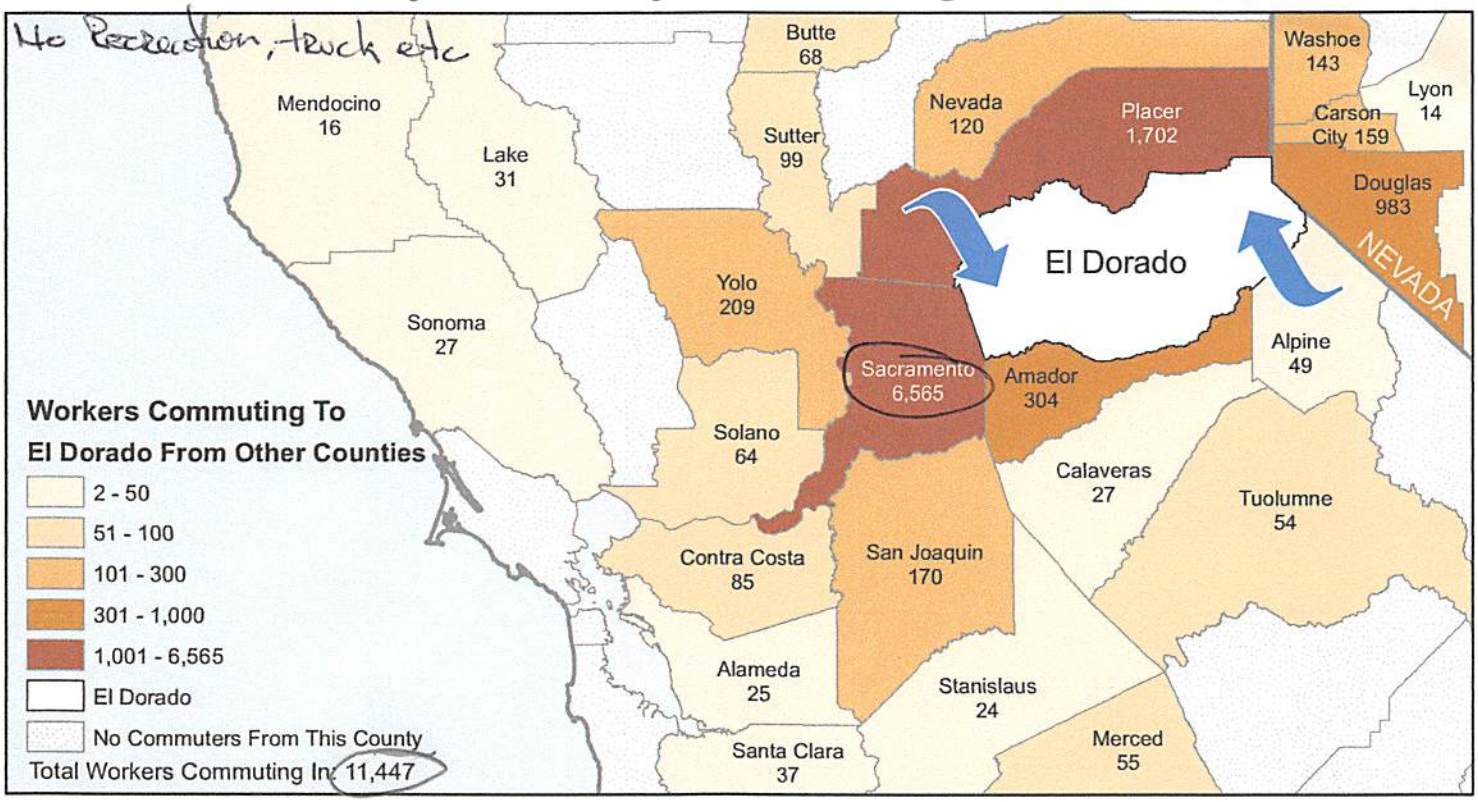
California Public K-12 Graded Enrollment Projections, 2015 Series

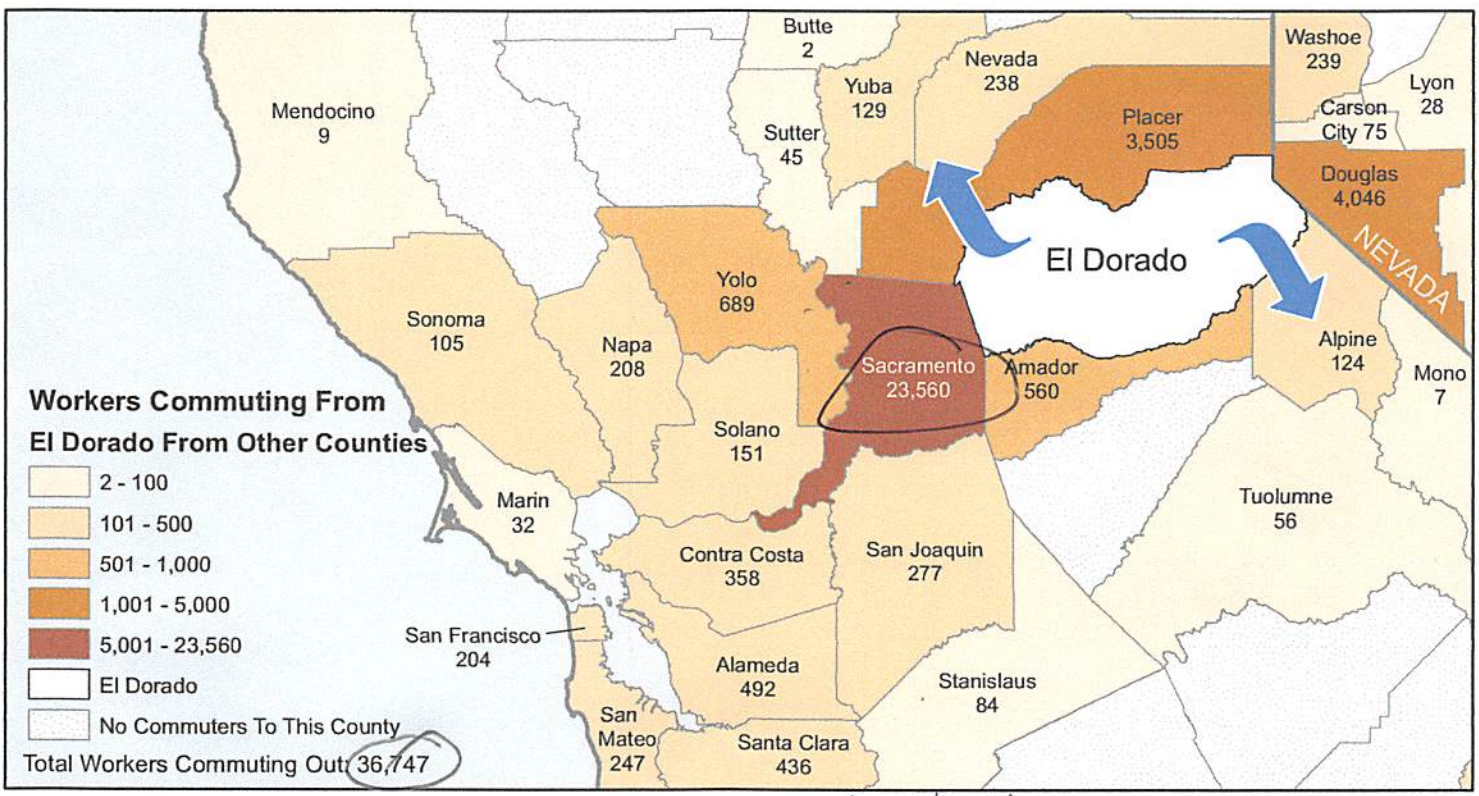
COUNTY	YEAR	Kinder	1	2	3	4	5	6	7	8	9	10	11	12	Total K-8	9 to 12	K-12
EL DORADO	1990-91	2,098	2,238	2,047	2,104	2,147	2,050	1,919	1,868	1,762	1,863	1,715	1,593	1,305	18,233	6,476	24,709
EL DORADO	1991-92	2,031	2,255	2,180	2,115	2,168	2,228	2,102	2,027	1,920	1,975	1,813	1,669	1,383	19,026	6,840	25,866
EL DORADO	1992-93	2,079	2,133	2,226	2,204	2,135	2,204	2,258	2,170	2,013	2,078	1,900	1,665	1,487	19,422	7,130	26,552
EL DORADO	1993-94	2,112	2,140	2,137	2,237	2,231	2,184	2,235	2,221	2,102	2,184	2,001	1,810	1,528	19,599	7,523	27,122
EL DORADO	1994-95	2,052	2,210	2,131	2,156	2,274	2,251	2,171	2,267	2,336	2,251	2,155	1,943	1,600	19,848	7,949	27,797
EL DORADO	1995-96	2,042	2,106	2,243	2,146	2,179	2,259	2,280	2,180	2,234	2,466	2,264	1,993	1,635	19,669	8,358	28,027
EL DORADO	1996-97	2,084	2,146	2,118	2,276	2,156	2,220	2,280	2,303	2,186	2,378	2,387	2,177	1,724	19,769	8,666	28,435
EL DORADO	1997-98	1,849	2,158	2,163	2,180	2,256	2,163	2,193	2,271	2,247	2,395	2,397	2,286	1,941	19,480	9,019	28,499
EL DORADO	1998-99	1,813	1,924	2,186	2,218	2,184	2,276	2,155	2,200	2,243	2,504	2,381	2,237	2,026	19,199	9,148	28,347
EL DORADO	1999-00	1,900	1,903	1,983	2,202	2,245	2,257	2,279	2,183	2,263	2,434	2,419	2,178	2,019	19,215	9,050	28,265
EL DORADO	2000-01	1,822	2,044	1,931	2,080	2,252	2,308	2,292	2,359	2,238	2,433	2,415	2,280	2,004	19,326	9,132	28,458
EL DORADO	2001-02	1,891	1,954	2,067	2,002	2,154	2,338	2,336	2,337	2,459	2,504	2,420	2,294	2,194	19,538	9,412	28,950
EL DORADO	2002-03	1,857	1,952	1,989	2,120	2,052	2,209	2,406	2,411	2,356	2,552	2,444	2,390	2,257	19,352	9,643	28,995
EL DORADO	2003-04	1,869	1,950	1,984	2,020	2,143	2,062	2,207	2,470	2,451	2,484	2,564	2,365	2,348	19,156	9,761	28,917
EL DORADO	2004-05	1,931	1,934	1,942	2,041	2,035	2,222	2,118	2,311	2,474	2,657	2,564	2,588	2,387	19,008	10,196	29,204
EL DORADO	2005-06	1,895	1,996	1,932	2,016	2,108	2,082	2,277	2,193	2,351	2,637	2,678	2,538	2,450	18,850	10,303	29,153
EL DORADO	2006-07	1,992	1,948	2,052	2,008	2,075	2,186	2,157	2,426	2,260	2,480	2,659	2,634	2,438	19,104	10,211	29,315
EL DORADO	2007-08	2,120	2,045	2,033	2,153	2,118	2,152	2,247	2,228	2,392	2,377	2,512	2,616	2,570	19,488	10,075	29,563
EL DORADO	2008-09	2,094	2,111	2,032	2,075	2,210	2,174	2,136	2,278	2,257	2,547	2,390	2,445	2,502	19,367	9,884	29,251
EL DORADO	2009-10	2,228	2,150	2,219	2,131	2,133	2,293	2,233	2,232	2,315	2,336	2,526	2,328	2,399	19,934	9,589	29,523
EL DORADO	2010-11	2,419	2,258	2,254	2,296	2,208	2,165	2,295	2,275	2,263	2,378	2,336	2,474	2,267	20,433	9,455	29,888
EL DORADO	2011-12	2,446	2,210	2,272	2,227	2,298	2,228	2,126	2,256	2,254	2,275	2,347	2,329	2,419	20,317	9,370	29,687
EL DORADO	2012-13	2,407	2,191	2,235	2,269	2,233	2,302	2,142	2,141	2,280	2,274	2,292	2,309	2,279	20,200	9,154	29,354
EL DORADO	2013-14	2,120	1,933	1,952	1,953	2,024	1,977	2,050	2,087	2,068	2,279	2,269	2,223	2,301	18,164	9,072	27,236
EL DORADO	2014-15	2,130	1,772	1,991	2,004	1,972	2,060	2,012	2,029	2,055	2,139	2,252	2,252	2,245	18,025	8,888	26,913
EL DORADO	2015-16	2,148	1,679	1,767	1,988	2,009	1,975	2,096	2,001	2,015	2,093	2,131	2,235	2,223	17,678	8,682	26,360
EL DORADO	2016-17	2,164	1,853	1,675	1,765	1,993	2,012	2,010	2,085	1,987	2,052	2,085	2,115	2,207	17,544	8,459	26,003
EL DORADO	2017-18	2,009	1,866	1,848	1,673	1,770	1,996	2,048	1,999	2,071	2,024	2,044	2,069	2,088	17,280	8,225	25,505
EL DORADO	2018-19	2,037	1,733	1,861	1,846	1,678	1,773	2,031	2,037	1,985	2,109	2,016	2,029	2,043	16,981	8,197	25,178
EL DORADO	2019-20	2,152	1,757	1,728	1,859	1,851	1,681	1,804	2,020	2,023	2,022	2,101	2,001	2,003	16,875	8,127	25,002
EL DORADO	2020-21	2,122	1,856	1,752	1,726	1,864	1,854	1,711	1,794	2,006	2,060	2,014	2,085	1,976	16,685	8,135	24,820
EL DORADO	2021-22	2,137	1,830	1,851	1,750	1,731	1,867	1,887	1,702	1,782	2,043	2,052	1,999	2,059	16,537	8,153	24,690
EL DORADO	2022-23	2,150	1,843	1,825	1,849	1,755	1,734	1,900	1,877	1,690	1,815	2,035	2,037	1,974	16,623	7,861	24,484
EL DORADO	2023-24	2,162	1,854	1,838	1,823	1,854	1,758	1,765	1,890	1,864	1,721	1,808	2,020	2,011	16,808	7,560	24,368
EL DORADO	2024-25	2,173	1,864	1,849	1,836	1,828	1,857	1,789	1,755	1,877	1,898	1,714	1,794	1,994	16,828	7,400	24,228

Employment Only SAC/EDC

El Dorado County to County Commuting Estimates

No Recreation, truck etc





File: T031

Total Workers That Live And Work in El Dorado: 44,974 Portion to EDC

Data Source:
Special Report of 2006 to 2010 County-to-County Commuting Flows, American Community Survey, U.S. Census Bureau, report released January 2013

Hwy 50 Sac Commuters

Cartography by:
Labor Market Information Division
California Employment Development Department
September 2015

6500/30000 = 22% of SAC 6500 = 28% of EDC 23,560 portion

EDD Employment Development Department State of California

LaborMarketInfo

GUIDE FOR THE PREPARATION

OF

TRAFFIC IMPACT STUDIES

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

December 2002

METHOD FOR CALCULATING EQUITABLE MITIGATION MEASURES

The methodology below is neither intended as, nor does it establish, a legal standard for determining equitable responsibility and cost of a project's traffic impact, the intent is to provide:

1. A starting point for early discussions to address traffic mitigation equitably.
2. A means for calculating the equitable share for mitigating traffic impacts.
3. A means for establishing rough proportionality [Dolan v. City of Tigard, 1994, 512 U.S. 374 (114 S. Ct. 2309)].

The formulas should be used when:

- A project has impacts that do not immediately warrant mitigation, but their cumulative effects are significant and will require mitigating in the future.
- A project has an immediate impact and the lead agency has assumed responsibility for addressing operational improvements

NOTE: This formula is not intended for circumstances where a project proponent will be receiving a substantial benefit from the identified mitigation measures. In these cases, (e.g., mid-block access and signalization to a shopping center) the project should take full responsibility to toward providing the necessary infrastructure.

EQUITABLE SHARE RESPONSIBILITY: **Equation C-1**

NOTE: $T_E < T_B$, see explanation for T_B below.

Conflicts with Means "Y"'s County interpretation

$$P = \frac{T}{T_B - T_E}$$

Subtract out existing trips or existing users

Where:

P = The equitable share for the proposed project's traffic impact.

T = The vehicle trips generated by the project during the peak hour of adjacent State highway facility in vehicles per hour, vph.

T_B = The forecasted traffic volume on an impacted State highway facility at the time of general plan build-out (e.g., 20 year model or the furthest future model date feasible), vph.

T_E = The traffic volume existing on the impacted State highway facility plus other approved projects that will generate traffic that has yet to be constructed/opened, vph.

EQUITABLE COST: **Equation C-2**

$$C = P\ (C_T)$$

Where:

C = The equitable cost of traffic mitigation for the proposed project, ($). (Rounded to nearest one thousand dollars)

P = The equitable share for the project being considered.

C_T = The total cost estimate for improvements necessary to mitigate the forecasted traffic demand on the impacted State highway facility in question at general plan build-out, ($).

NOTES

1. Once the equitable share responsibility and equitable cost has been established on a per trip basis, these values can be utilized for all projects on that State highway facility until the forecasted general plan build-out model is revised.
2. Truck traffic should be converted to passenger car equivalents before utilizing these equations (see the Highway Capacity Manual for converting to passenger car equivalents).

Summary of "Existing"/ "Baseline" Financing Deficit

Deferred surface treatment (approx.)	$80 million
Deferred heavy equipment replacement and reserve fund	$ 9 million
Deferred bridge replacement/ rehabilitation (approximate)	$40 million
"Existing deficiency" impact fee match – based on current programs which could change	
◆ State TIM	$162 million
◆ TIM	$ 83 million
Total	$374 million

These numbers represent the existing deficit and do not includeprojected deterioration of County roads due to insufficient annual funding.

Other Road Fund Responsibilities: Un-funded and Under-funded

- "Existing (capacity) deficiencies"
  - State Highway Traffic Impact Mitigation Fee
    - County adopted fee based upon 52% "existing deficiency"
    - This assumption may be revisited through the interim State Highway Variable Impact fee program
    - Will be considered in "final" State Highway fee developed at the end of the General Plan process
  - Traffic Impact Mitigation Fee
    - County adopted fee based upon 42% "existing deficiency"
    - Will be reconsidered during fee revision at end of General Plan process
  - El Dorado Hills/Salmon Falls Road Impact Fee requires no County "existing deficiency" share of project costs

DKS

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MEMORANDUM

DATE: August 8, 2016

TO: Lucinda Willcox, City of Sacramento

FROM: John P. Long

SUBJECT: Cost Allocation of Roadway Improvements Funded by Fee Program

---

This memorandum provides a brief summary of the methodology used to allocate the cost of roadway improvements that will be funded by the City's Transportation Development Impact Fee (TDIF) Program. The results of this analysis will be used in the Nexus Study for the TDIF Program.

Methodology

The City of Sacramento has identified a set of transportation improvements (roadway improvements as well as to new/improved facilities for bikes, transit and pedestrians) that the TDIF Program will help fund. The selected improvements are needed to help accommodate the projected growth in travel demand due to new development within the City limits, which is the TDIF "benefit area".

In addition to accommodating future development, some of the selected roadway improvements for the TDIF Program would also help some improve existing deficiencies and/or provide some mobility benefits to existing development. Therefore, the "nexus" for new development's share of the cost of roadway improvements in the TDIF Program will be based on the estimated percentage of the total future traffic volume using each roadway improvement that stems from vehicle trips generated by future development within the City. The share of the costs from "other" traffic (i.e. traffic generated by existing development or non-City growth) will need to be funded by sources other than the TDIF Program.

The "percent use" estimates are based on a future development scenario that reflects SACOG's 2036 estimated development levels in the six-county SACOG region for the 2016 Metropolitan Transportation Plan/Sustainable Community Strategy (MTP/SCS). The percent use estimates are calculated by tracking the projected number and origins/destinations of 2036 vehicle trips using the SACSIM regional travel demand model that SACOG used to prepare the 2016 MTP/SCS.

"Percent use" estimates were prepared for roadway improvement projects that the City intends to use the TDIF Program to help fund. The SACSIM model was used to estimate the number of weekday vehicle trips on each of the roadway improvement projects that fit into the following "percent use" categories:

- **Existing Uses** – vehicle trips that come from existing development within or outside the City of Sacramento
- **City Growth** – vehicle trips for future development (existing through 2036) where either end of the trip is within the City of Sacramento
- **Thru Growth** – vehicle trips from future development where neither end of trip is within the City of Sacramento

Results

Table 1 shows the cost allocation of roadway improvement projects in the TDIF Program, including the following:

- The description of each of the 20 roadway improvement projects to be funded by the TDIF Program
- The estimated percent of vehicle trips in each of the three "percent use" categories for each of the roadway improvement projects
- The estimated cost of each roadway improvement project
- The cost allocation for each roadway improvement project. The percentage of traffic generated by City Growth was multiplied by the cost of each of the roadway improvement projects to determine the amount to be funded by the TDIF Program.

The total cost of the roadway improvement projects is estimated at about $410 million. This nexus analysis determined that new development should pay about $136 million (about 33 percent of the total cost of these improvements) through the TDIF Program. The City will identify any other sources of funding for the selected roadway improvement projects

Sacramento Grid 3.0 Improvements

In addition to the 20 roadway improvements shown in Table 1, the City intends to include a portion of the cost of the Sacramento "Grid 3.0" in the TDIF Program. This plan, described in "GRID 3.0 - Planning the Future of Mobility in the Sacramento Central City" (August 2016) is the City's plan to improve the downtown grid and accommodate growth. The plan includes about $165 million in improvements to pedestrian, bicycle, transit and roadway facilities in the Sacramento Central City.

New development that occurs within the Central City will clearly use the facilities in the Grid 3.0 improvement plan. However, new development in other parts of the City will also contribute new auto, transit, bike and/or pedestrian trips to the Central City and thus should contribute a share of those costs.

DKS used the SACSIM regional travel demand model (that SACOG used to prepare the 2016 MTP/SCS) to estimate that about 10 percent of total 2036 trips that travel to/from the Central City would come from new development that occurs within portions of the City of Sacramento outside the Central City. While new development that occurs within the Central City could be allocated a higher share of the costs of the Grid 3.0 improvement plan, an allocation of 10 percent of the cost of the Grid 3.0 improvement costs Citywide is warranted.

Table 1: Cost Allocation Based on Percent Use of Roadway – City of Sacramento TDIF Program								
Facility	Project Description	Percent Use (2036)				Total Cost (2015 Dollars)	Cost Allocation	
		Existing Uses	Growth		Total		TDIF Program (City Growth)	Other
			City	Thru				
Bell Ave.	Widen: 3 lanes from Norwood Ave. to Raley Blvd.	69.0%	29.2%	1.8%	100%	$20,000,000	$5,845,408	$14,154,592
East Commerce Way	East Commerce Way from Club Center Dr. to Del Paso Rd, extend as a 6-lane facility	49.6%	50.4%	0.0%	100%	$3,787,699	$1,908,281	$1,879,418
East Commerce Way	Extend East Commerce Way from Arena Blvd. to Natomas Crossing Dr., as a 6 lane road	54.0%	46.0%	0.0%	100%	$1,251,294	$575,232	$676,062
East Commerce Way	Extend East Commerce Way from planned Natomas Crossing Drive to San Juan Rd. as a 4 lane road	62.1%	37.9%	0.0%	100%	$3,671,780	$1,391,164	$2,280,616
El Centro Rd.	New Overcrossing: El Centro Rd. overcrossing	53.3%	46.7%	0.0%	100%	$11,900,084	$5,557,815	$6,342,269
Elder Creek Rd.	Widen: 4 lanes from Florin Perkins Rd. to South Watt Ave.	66.3%	30.3%	3.3%	100%	$10,000,000	$3,033,600	$6,966,400
14th Ave Extension/ Jackson Hwy (SR 16)	Road Realignment: 4 lane Rd. from Power Inn Rd. to South Watt Ave.	69.3%	30.1%	0.6%	100%	$30,000,000	$9,024,900	$20,975,100
Lower American River Crossing	New all-modal Bridge: between downtown Sacramento and South Natomas across the Lower American River. Includes: Auto, transit, bicycle, and pedestrian facilities. Scale and features to be determined through need and purpose study anticipated to begin in 2012	77.0%	23.0%	0.0%	100%	$40,000,000	$9,205,600	$30,794,400
Main Ave.	Widen: 4 lanes from Norwood Ave. to Rio Linda Blvd.	59.7%	36.2%	4.1%	100%	$10,500,000	$3,800,265	$6,699,735
Main Ave.	Road Extension: 2 lanes from Rio Linda Blvd. to Marysville Blvd.	52.2%	43.9%	3.9%	100%	$9,000,000	$3,947,490	$5,052,510
Natomas Crossing Dr.	New Overcrossing: Natomas Crossing Dr. at I-5	60.0%	40.0%	0.0%	100%	$11,900,084	$4,761,819	$7,138,265
Power Inn Rd.	Widen: 6 lanes from Fruitridge Rd. to 14th	76.6%	20.7%	2.7%	100%	$30,000,000	$6,207,900	$23,792,100

Table 1: Cost Allocation Based on Percent Use of Roadway – City of Sacramento TDIF Program								
Facility	Project Description	Percent Use (2036)				Total Cost (2015 Dollars)	Cost Allocation	
		Existing Uses	Growth		Total		TDIF Program (City Growth)	Other
			City	Thru				
I-5 at Richards Blvd. Interchange	Richards Blvd. and I-5; reconstruct interchange	59.1%	37.5%	3.4%	100%	$89,000,000	$33,388,350	$55,611,650
W. El Camino Ave.	Widen: 6 lanes West El Camino Interchange. Includes: bike lanes at I-80 / Natomas Main Drainage Canal	77.5%	22.2%	0.4%	100%	$30,000,000	$6,654,000	$23,346,000
S. Watt Ave.	Widen: 6 lanes from Elder Creek Rd. to Fruitridge Rd.	64.5%	27.6%	7.9%	100%	$20,000,000	$5,524,200	$14,475,800
S. Watt Ave. / Elk Grove Florin Rd.	Widen: 6 lanes from Fruitridge Rd. to Kiefer Blvd.	60.7%	32.3%	7.0%	100%	$10,000,000	$3,229,100	$6,770,900
Highway 99 Meister Way Overcrossing	New Overcrossing: Meister Wy. / Hwy. 99	31.8%	68.2%	0.0%	100%	$8,195,118	$5,590,136	$2,604,982
SR 99 Elkhorn Boulevard Interchange	In Sacramento County :Expand the Elkhorn Blvd. interchange on Route 99 to accommodate the widening of Elkhorn Blvd. from 2 to 6 lanes	60.5%	24.8%	14.7%	100%	$11,085,277	$2,744,604	$8,340,673
5th and 6th Streets	Extend roadways between Railyards Blvd and Richards Blvd	32.8%	67.2%	0.0%	100%	$30,000,000	$20,158,073	$9,841,927
Riverfront Reconnection Project	Phases 2 and 3	87.5%	12.3%	0.1%	100%	$30,000,000	$3,701,440	$26,298,560
Total Roadway Improvements						$410,291,336	$136,249,376	$274,041,960

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8th International Conference on Traffic and Transportation Studies
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Forecasting External Trips in Small and Medium Cities Based on Local Economic Context

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Abstract

The external trip estimation is important but usually neglected in travel demand modeling process for small and medium urban areas. This research develops a cost-effective method to forecast external trips from an economic point of view. A concept of Employment Index (EI) by NAICS sectors was initiated to represent local economic characteristics in statewide context and approved to be significant in predicting external trips. Based on recent survey data, separate external trip models were developed by urban categories. The new models minimize data requirements and are easy to use. They appear transferable to other small and medium urban areas.

Keywords: external trip; economic; regression; travel demand model; small and medium urban areas

1. Introduction

1.1. Background

Transportation planning in small and medium sized urban areas is becoming more and more important. U.S. census shows about 52% of U.S. residents live in small cities with populations less than 50,000, and 22% live in medium urban areas with populations between 50,000 and 200,000 (U.S. Census Bureau,

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2000). As a recent survey indicated, all U.S. MPOs (population > 50,000) have planning procedures for travel demand forecasting (TRB, 2007) to obey federal law. Some states, like North Carolina, extend the planning requirement to all municipalities regardless of size. Such smaller communities have sizable external trips, which thus affect the whole transportation planning process and decision-making.

The total traffic crossing an area's cordon line is comprised of through and external trips. When both the origin and destination of a trip are outside the cordon line, the trip is termed a through trip or external-external (E-E) trip. When only one end, either origin or destination, is within the study area, the trip is termed an external trip. External trips can be classified further into external-internal (E-I) or internal-external (I-E) trips, depending on the origin of a trip outside the study area or not. External and through trips are typically split at each external station, because separate origin-destination (O-D) tables need to be developed in travel demand modelling process. Therefore, good estimate of total external trips is desired.

Two reasons motivate this research. First, the local employment types and magnitudes represent the economic characteristics which significantly impact external trips. Second, the employment data is generally readily available from online sources of U.S. census, thereby making the possible new method easy to use.

1.2. Problem statement

Historically, the most popular method for collecting external trip data is to perform a roadside intercept survey at study area's cordon. However, very few roadside surveys have been conducted in recent years, primarily because of rising costs and the concern that stopping vehicles on the highway would be perceived as an unacceptable intrusion on the motorist (Martin, et al, 1998). Compared to large urban areas, performing surveys is not as feasible in smaller communities because most such areas have few if any financial and personnel resources to conduct an expensive survey. This cost issue supports the need for a cost-effective planning procedure in small or medium urban areas.

Some areas are using traditional through trip models to indirectly predict external trips (Martin, et al, 1998). This approach has been weakened by limitations of the traditional through trip models: (1) they are only suitable to small urban areas with population less than 50,000, and (2) they require intensive classified traffic counts, especially truck traffic data, which are not always available or expensive to collect. Therefore, a simple external trip forecasting methodology with minimum data collection is desired by smaller urban areas.

2. Literature review

The effort on studying external trips has been much less intensive than for internal trips. The primary reason is very little is known outside the planning area. Modlin (1971) provided a multiple regression equation to estimate I-E and E-I trip split based on community's employment characteristics. It is the only reference directly studying external trips can be found. Although this method was not widely used it motivated an approach to analyze external trips from an economic point of view.

In current modeling practice, through trip ends are firstly estimated and then subtracted from ADT to obtain external trips at each external station. NCHRP Report 365 (Martin, et al, 1998) represents an indirect approach to estimate external trips in small communities (population < 50,000) where an external survey is not available or possible. It is the traditional method being used by some areas. This methodology apply a through trip model (Modlin, 1982) to develop the through trip matrix based on urban population, highway functional classification, ADT, percentage of trucks and route continuity, and subtract the through trip totals from ADT counts at external stations. The remainders represent the

overall control totals by station for external trips. The directional differences of external trips are usually ignored by assuming E-I trips equal I-E trips in a typical daily period. Pigman (1978) also created an empirical through trip model. However, this model has not seen widespread use due to less accuracy (Chatterjee, et al, 1989). Other methods of developing through trip tables include the gravity-model structured equations recommended by Quick Response Freight Manual (Cambridge Systematics, 1996) and an improved version proposed by Horowitz (2000). Both methods focus on through trip distribution between external station pairs and assume through trip ends are already known at each external station.

In recent years, some new research shows that external trips are strongly related to community's socioeconomic characteristics which is the key determinant of external trips. Anderson (2005, 2006) determined an interaction between small communities and nearby major cities (or highway facilities). His studies indicate that the city of interest is not an isolated island and that the economic activities in the market area surrounding a city impact through and external trip patterns. Another recent research (Han and Stone, 2008) clarifies the definition of nearby major city in through trip estimation and statistically approves the significant influence of a study area's economic context on patterns of through trips and, eventually, the external trips.

3. Data collection

3.1. External O-D survey data

In 2005, the authors contacted cities and state agencies through U.S. which were known to have recent external survey studies. In addition, the members and friends of TRB Committee ADA30 (Transportation Planning for Small and Medium-Sized Communities) were asked for data. Twenty-three agencies in five states responded and afforded their survey reports. Data cleaning eliminated study areas that are located on the U.S. border or that are large metropolitan cities. The resulting data set used for this research includes 16 different study areas in Alabama (AL), North Carolina (NC) and Texas (TX). Table 1 summarizes these communities by two urban categories: small urban areas (populations < 50,000) and medium urban areas (populations > 50,000). In this research, survey data from communities in Alabama and Texas were randomly selected for model development, and the remainders in North Carolina were used for model performance evaluation.

In each study area, a one-way (inbound or outbound) or two-way survey was conducted to capture through trip ends, external-internal (E-I) trip ends and internal-external (I-E) trip ends at each external station. Related analysis has validated that one-way surveys and two-way surveys produce consistent percents of external trips (Han and Stone, 2008). Therefore, all external trips measured as percentage of total ADT ends that enter or leave the study area can be obtained from the survey to develop a new external trip estimating methodology. As Table 1 shows, the percentage of external trip ends of the ADT at all external stations for a small community ranges between 35% and 64%. Medium-sized urban areas have larger share of external trips.

3.2. *Employment data*

Employment is the primary criterion of an area's economic profile. The employment complexion is a key factor representing the "attractive" characteristics of a study area. It directly affects external trip patterns. Furthermore, employment data is easy to obtain from the U.S. economic census for any community, so it provides a cost-effective basis for developing external trip models.

U.S. economic census organizes employment data by different sectors defined by North American Industry Classification System (NAICS) (U.S. Census Bureau, 2002). NAICS is a unique, all-new

system for classifying business establishments and was adopted in 1997 to replace the Standard Industrial Classification (SIC) system. The business data is updated every five years from national, statewide to local (county and city) levels. Table 2 lists NAICS economic sectors.

Table 1. Summary of external survey data

Urban Category	Community	Population (1)	Employment	Study Year	# of Stations	Traffic Surveyed	EI + IE Trips (%)
Small	Alexander City, AL	15,008	22,009	2004	6	Inbound	43.85
	Arab, AL	7,174	4,724	2004	4	Inbound	56.78
	Hartselle, AL	12,019	5,919	2004	4	Inbound	49.38
	Roanoke, AL	6,563	3,377	2004	4	Inbound	64.39
	Russellville, AL	8,971	6,927	2004	4	Inbound	63.61
	Troy, AL	13,935	8,609	2004	5	Inbound	55.29
	Pilot Mountain, NC	2,912	2,214	1995	7	Two-way	34.66
Medium	Goldsboro, NC	86,752	42,126	2003	32	Two-way	74.22
	Jacksonville, NC	95,179	86,270	2002	9	Two-way	80.80
	Wilmington, NC	172,322	97,410	2003	8	Outbound	92.76
	Brazos County, TX	152,415	47,375	2001	15	Two-way	83.74
	Longview, TX	256,152	86,314	2004	60	Two-way	77.34
	Midland/Ector County, TX	237,132	88,017	2002	19	Two-way	92.93
	San Angelo, TX	88,439	34,772	2004	23	Two-way	90.02
	Texarkana, TX	129,749	43,467	2003	16	Two-way	72.75
	Tyler, TX	174,706	73,898	2004	32	Two-way	81.90

(1) Population are from 2000 census, except Pilot Mountain, NC with 1995 data.

Table 2. NAICS economic sectors

NAICS Code	NAICS Economic Sectors	Symbol
11	Agriculture, Forestry, Fishing and Hunting	AFFH
21	Mining	MIN
22	Utilities	UTIL
23	Construction	CONS
31-33	Manufacturing	MANU
42	Wholesale Trade	WHOLESALE
44-45	Retail Trade	RETAIL
48-49	Transportation and Warehousing	TRANS
51	Information	INFO
52	Finance and Insurance	FINANCE
53	Real Estate and Rental and Leasing	ESTATE
54	Professional, Scientific, and Technical Services	PSTS
55	Management of Companies and Enterprises	MANA
56	Administrative and Support and Waste Management and Remediation Services	ASWMRS
61	Educational Services	EDU
62	Health Care and Social Assistance	HCSA
71	Arts, Entertainment, and Recreation	AER
72	Accommodation and Food Services	AFS
81	Other Services (except Public Administration)	OS
92	Public Administration	PA

Size (county by county) Hartselle - Attached
Source - EDD

WE USE Actual Counts which include All NAICS classifications

Each employment sector is associated with a group of external trips with a specific trip purpose. Therefore, the total external trips commuting with a study area are comprised of different trip groups with different purposes of working, shopping, entertainment, and so on. In other words, employments in different economic sectors have their own industrial characteristics and should have different contributions to external trip generation in communities. In this research, a concept of "Employment Index (EI)" was developed to represent local economic characteristics of study areas. Employment Index is defined as below.

$$EI_j = \frac{LEmp_j / \sum_j LEmp_j}{SEmpj / \sum_j SEmp_j} = \frac{\text{Local employment share of NAICS economic sector } j}{\text{Statewide employment share of NAICS economic sector } j}$$

where,

EI_j = Employment index for NAICS economic sector j in local area;
$LEmp_j$ = Number of employees for NAICS economic sector j in local area;
$SEmp_j$ = Number of employees for NAICS economic sector j in the state where the local area is.

Any study area has a set of EIs corresponding to NAICS economic sectors. Each EI is a ratio of the local-level percentage of employment to the corresponding statewide-level percentage of employment, for a specific NAICS economic sector. An EI represents a study area's relatively attractive power in the statewide context, which is caused by the magnitude of employment in the corresponding economic sector. Therefore, it is intuitively reasonable that a rational combination of explanatory EIs can summarize a community's unique economic complexion that affects external trip generation.

To be consistent with study years of external surveys as much as possible, 2002 NAICS data was used to obtain values of Employment Index in this research. Some areas only have a range of number of employees for NAICS economic sectors. Average employments were used for these situations.

4. Methodology

This research is to efficiently predict the percentage of external trips of total ADT crossing study area's cordon line. Because ADT is usually known at external stations, external trip ends can be determined given the percentage of external trips. The methodology includes the following steps: (1) Comparison of percent external trips between urban categories; (2) Regression model development by scenarios; (3) Model assumption validation; (4) Model performance evaluation.

As two urban categories exist, the model could be separate for each category or combined for both. A scenario design is conducted first. It determines if it is necessary to split data set for developing two individual models by urban categories or whether one model and one combined data set is sufficient. A multiple regression analysis was conducted to build the relationship between percent external trips in the study area and local Employment Index. A stepwise selection procedure was used to select the most significant Employment Index at a 95% confidence level. By evaluating the goodness of fit with survey data, the best model was chosen from candidate models developed under different scenarios. Then, the model assumptions are examined. Finally, the predictive power of the final model was evaluated by comparing to observed data.

5. Model development

The external survey data from six small urban areas in Alabama and six medium urban areas in Texas was used for model development.

A two-step hypothesis test procedure was firstly conducted to compare external trips, as percentage of AADT at all external stations, between small and medium urban areas: (1) test the equality of two sample variances, and (2) test the equality of two sample means. The test of sample variances results in an *F*-value of 1.11 and a *p*-value of 0.9083, which indicates the percent external trips observed in small and medium urban areas have the same variances. Assuming equal population variances, a pooled *t*-test was subsequently conducted to compare sample means. This hypothesis test produces a *t*-value of 6.13 and a *p*-value less than 0.0001, which strongly proves the percentage of external trips in medium urban areas is significantly greater than that of small urban areas. This result is consistent with the findings of previous studies (Martin, 1998; Modlin, 1982). It leads to an intuitive modeling framework of two separate models by urban categories. However, a single model based on combined data may be more appealing because of an enlarged sample size for analysis. Therefore, two scenarios were designed for the model development:

- Scenario 1 (separate models)
  - Use small urban area data for small-city model development.
  - Use medium urban area data for medium-city model development.
- Scenario 2 (single model)
  - Combine small and medium urban area data for a single model development.
  - Include a dummy variable (equal to 1 if urban population less than 50,000; equal to 0 otherwise) to distinguish urban category.

Under each scenario, significant Employment Index was selected by a stepwise selection procedure with a 95% confidence level from candidate Employment Indices of all NAICS economic sectors. Table 3 presents the model parameter estimates.

Table 3. Model estimation results

Variables	Small City Model (Scenario 1)			Medium City Model (Scenario 1)			Single Model (Scenario 2)		
	Coeff.	F-value	p-value	Coeff.	F-value	p-value	Coeff.	F-value	p-value
Constant	59.64			58.66			83.11		
Small (1)							-27.56	37.59	0.0001
MIN	12.01	19.58	0.0214						
WHOLESALE	-1.56	27.07	0.035						
ESTATE	-1.38	1168.82	0.0186						
ASWMRS	-2.16	9.41	0.0374						
AER				31.76	18.11	0.0131			
R-Square		1.00			0.82			0.79	

(1) Small is a dummy variable, 1 = small city, 0 = medium city.

6. Model explanation and selection

Under Scenario 1, the separate models show the external trip generation is statistically related to local Employment Indices. However, the modeling results indicate small and medium urban areas have different explanatory EIs. It is consistent with the fact that different industrial and socioeconomic factors impact external trips in different sized urban areas. For a small urban area, it is interesting to find the mining industry has a positive influence on external trip generation. It is reasonably true in Alabama where the model data was collected. Mining is one of the state's key industries and attract extensive flow

of workers. The magnitude of local employment on wholesale trade, real estate and rental and leasing, and administrative and support and remediation services are all more likely to decrease external trips commuting to the study area. This may be capturing commercial and residential centers widely located at the fringe areas of small cities and towns, which are key origins or destinations of daily trips. For a medium urban area, the amount of external trips is likely to be associated with increasing arts, entertainment and recreation services. This finding does not conflict with our common sense that a larger urban area usually hosts more cultural and recreational services which generates a large number of home-based other or non-home based trips.

Under Scenario 2, the single model only includes the urban category dummy variable, which implies all EIs are not significant variables after the model accounts for the significance of urban size based on the combined dataset. If the single model is used, all study areas within the same urban category would have the same estimated external trips. The expected results from the single model do not reflect the external trip patterns observed in the real world and thus are less reasonable compared to separate models in Scenario 1.

The two separate models developed under Scenario 1 obviously have better goodness-of-fit with observed data (R^2 = 1.00 for small-city model and R^2 = 0.82 for medium-city model) than the single model (R^2 = 0.79). Therefore, the separate models are considered superior to the single model and are recommended for use.

7. Model assumption validation

The two basic assumptions made for developing a multiple regression model are: (1) errors are all normally distributed, and (2) all errors have the same variance. The residuals of the recommended separate models were analyzed to confirm the model assumptions are not violated.

In this research a Q-Q plot (Johnson and Wichern, 2002) was applied to test the assumption of normality of model errors' distribution. This plot orders the data against the corresponding normal quantiles. Normality is not indicated if the points deviate from a straight line. Fig 1(a) and 1(b) show the Q-Q plots for residuals of the small-city model and medium-city model respectively. It can be observed that the points approximately lie on a straight line in both plots. The conclusion of the linear relation between the ordered residuals and the corresponding normal quantiles is also strengthen by the resulting correlation coefficients with values of 0.94 and 0.96 (a value of 1.0 represents a straight line) for small-city model and medium-city model respectively.

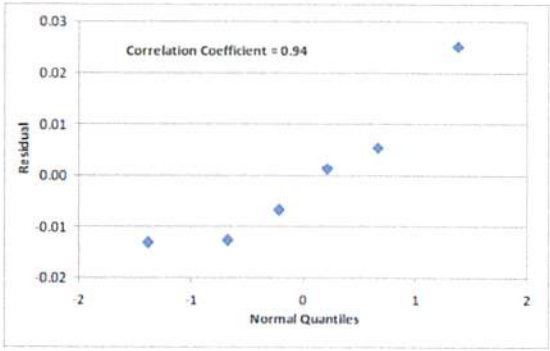

Fig 1(a). Q-Q plot of small-city model

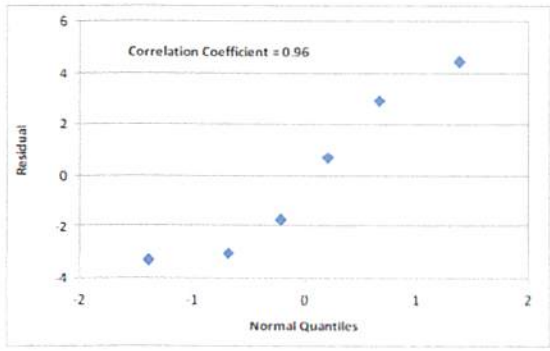

Fig 1(b). Q-Q plot of medium-city model

Figure 2(a) and 2(b) show the residual plots of small-city model and medium-city model, respectively. Both of the plots show residuals have no trends and are contained in a horizontal band. This means the residuals of each models are independently and randomly distributed with a constant variance.

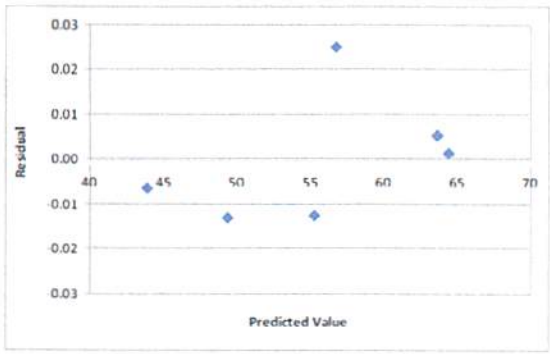

Fig 2(a). Residual plot of small-city model

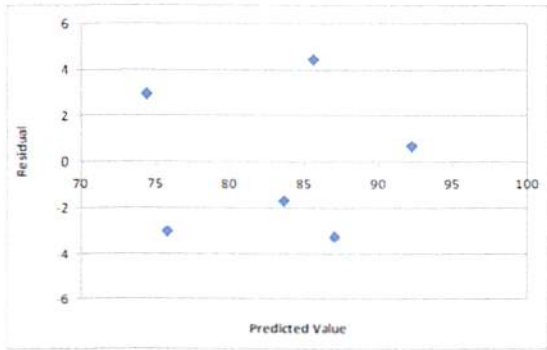

Fig 2(b). Residual plot of medium-city model

8. Model performance evaluation

One small city (Pilot Mountain) and three medium urban areas (Goldsboro, Jacksonville and Wilmington) in North Carolina were examined to evaluate the predictive power of the recommended separate models. Table 4 compares the estimates and observed results.

Table 4. Model performance evaluation

Urban Category	Case City	Model Used	Observed External Trips (%)	Predicated External Trips (%)	R-Square
Small	Pilot Mountain	Small-city Model	34.66	56.05	n/a
Medium	Goldsboro	Medium-city Model	74.22	75.34	0.67
	Jacksonville		80.8	82.93	
	Wilmington		92.76	100	

The comparisons show that the medium city model provides satisfactory estimation of percent external trips. The predicted values of all three medium-sized case urban areas are close to observations and yield an overall coefficient of determination (R^2) with a high value of 0.67. The small city model seems to produce acceptable external trip estimation for Pilot Mountain, North Carolina, although there are insufficient samples of small cities to strengthen this conclusion. As expected, the new model forecasts higher external trips in medium sized cities than that in small cities.

9. Conclusions

In this research, a concept of Employment Index by NAICS economic sectors was initiated to simulate a community's unique economic characteristics in statewide context. This factor is statistically significant in predicting external trips. Different from traditional external trip forecasting approaches, the new models only require state and local employment data that is easily obtained from U.S. economic

census. The minimal data input makes the new models extremely easy to use and cost-effective in application, compared to expensive external surveys and traditional modeling methods.

The methodology proposed by this research is applicable and transferable to other local datasets. By thoroughly performing this methodology, the resulting models are expected to be more reliable as calibrating database increases. The small-city model has a perfect fit with survey data from Alabama. It needs more data to strengthen the conclusion of the model's transferability to other small areas. The medium city model shows clear transferability to other medium cities, especially in North Carolina.

The new economy-based models may be used in two different ways for travel demand modeling:

(1) In areas where the traditional modeling method is being used, the new models can be used to calibrate the control totals of external trips and then proportionally adjust external trips at external stations.
(2) In areas where an external survey and traditional modeling method are not available or possible, the control total of external trips can be easily predicted by the new models and then assigned to each external station based on local knowledge.

The good external trip estimates by the new models can improve the whole travel demand forecasting process in smaller areas that have insufficient resources to conduct external surveys. Cities with growing fringe area and sizable inter-city traffic flows can particularly benefit from the new models while proposing and evaluating commuter routes or inter-city transit services. In areas where external surveys may be supported, transportation professionals can borrow the models to perceive a big picture of external trip patterns prior to conducting surveys. It will be helpful to select efficient sampling approaches so as to avoid overspending on an expensive data collection effort.

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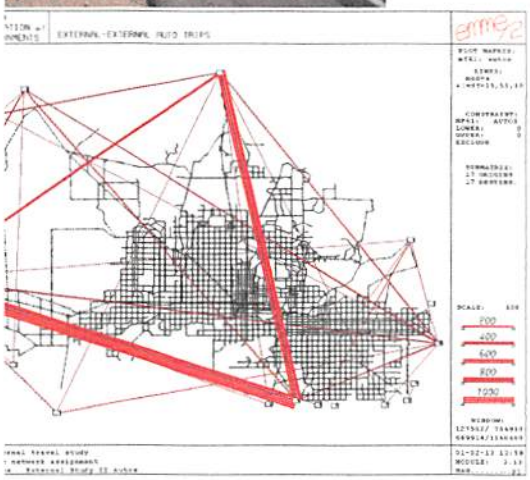
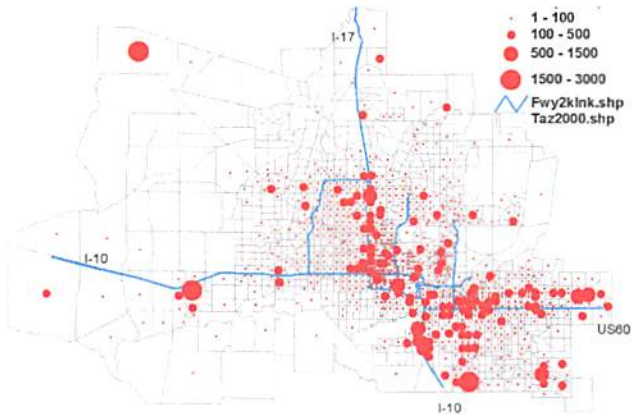
PHOENIX EXTERNAL TRAVEL SURVEY

EXECUTIVE SUMMARY





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March 5, 2001

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Phoenix External Travel Survey — Executive Summary

ion of Governments (MAG) performed
ıl Survey as part of its responsibility for
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an area. This vital tool is used for
planning and for supplying design
most major transportation projects
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ɔns included three interstate highways,
ɔur state highways, and five county
ır) traffic counts were collected at each
ns and two additional sites.

Table 1
Survey Samples

Site	Site Location	Surveyed Trips	Outbound Count	Percent of Outbound Traffic Surveyed	Inbound Count
1	SR-85 at Patterson Road	403	3,091	13.0%	2,726
2	Old U.S. 80 at Gila River	55	105	52.4%	93
3	Salome Highway east of Courthouse Road	69	155	44.5%	156
4	I-10 at 477th Avenue	647	7,264	8.9%	8,810
5	U.S. 60 at 355th Avenue	248	582	42.6%	574
6	U.S. 93 at Maricopa/Yavapai County Boundary	444	4,073	10.9%	3,740
7	I-17 at Maricopa/Yavapai County Boundary	1,003	16,513	6.1%	15,489
8	SR-87/Beeline Highway east of Bush Highway	541	3,308	16.4%	3,383
9	SR-88 south of First Water Road (counts only)	n/a	1,156	n/a	1,086
10	U.S. 60 about 3 miles southeast of Goldfield Road	961	10,357	9.3%	15,104
11	Ocotillo Road east of Meridian Road	298	1,603	18.6%	1,507
12	Rittenhouse Road at Combs Road	242	944	25.6%	928
13	Hunt Highway 1.7 miles east of Ellsworth Road	322	1,312	24.5%	1,368
14	Gilbert Road south of Hunt Highway (counts only)	n/a	1,029	n/a	1,066
15	SR-87 at SR-87/SR-587 Junction	475	5,319	8.9%	4,753
16	I-10 south of Hunt Highway	677	19,465	3.5%	19,343
17	SR-347/Maricopa Road south of Hunt Highway	464	4,741	9.8%	5,373

AVG 50%