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(Exempt from filing fees – Gov. Code §6103)

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF SACRAMENTO

TOWN OF ATHERTON *et al*., Petitioners and Plaintiffs v. CALIFORNIA HIGH SPEED RAIL AUTHORITY, a public entity, and DOES 1-20, Respondents and Defendants	No. 34-2008-80000022 filed 8/8/08 Judge Assigned for All Purposes: HONORABLE MICHAEL P. KENNY Department: 31 PETITION FOR WRIT OF ERROR *CORAM NOBIS* Date: August 20, 2010 Time: 9:00 AM Dept. 31 Judge: Hon. Michael P. Kenny

Petitioners Town of Atherton, City of Menlo Park, California Rail Foundation, Planning and Conservation League, and Transportation Solutions Defense and Education Fund (hereinafter, "Petitioners") hereby allege as follows:

1. This petition seeks to have the Court vacate its previously-entered judgment in this case, based on newly-discovered evidence that had previously been improperly withheld from Petitioners, the public, and the Court.

2. The evidence presented with this petition indicates that the revenue and ridership modeling done under contract for the Metropolitan Transportation Commission and included in the Programmatic Environmental Impact Report/Environmental Impact Study (hereinafter "PEIR/EIS") for the Bay Area to Central Valley High-Speed Train Project (hereinafter, "Project") was obviously and fatally flawed. However this evidence, in the form of the final

model coefficients that indicated the flaws, was, up until very recently, concealed from Petitioners, from the public, and from this Court; thereby depriving Petitioners of a fair trial on the adequacy of the PEIR/EIS.

3. Further, Petitioners are informed and believe, and on that basis allege, that the evidence presented with this Petition was never presented to or considered by the Board of Directors of Respondent California High-Speed Rail Authority (hereinafter, “Respondent”) prior to its determinations to certify the Final PEIR/EIS and to approve the Pacheco Pass alignment as the chosen alignment for the Project.

4. Consequently, Petitioners ask that the Court vacate the existing judgment in this case and enter in its stead a modified judgment.

5. The currently-entered judgment and writ of mandate order the rescission of Respondent’s certification of the Final PEIR/EIS and of Respondent’s approval of the Pacheco Pass alignment with San Jose and San Francisco termini as the chosen alignment for the Project. The currently-entered judgment and writ of mandate also require reconsideration of certain matters identified in the judgment and the writ of mandate prior to Respondent certifying a revised PEIR/EIS for the Project and approving an alignment for the Project.

6. Petitioners ask that the judgment be modified to also require Respondent to address the newly discovered evidence, and the questions it raises about the adequacy of the revenue and ridership analysis included in the PEIR/EIS, prior to certifying the adequacy of the modified PEIR/EIS or approving an alignment for the Project.

BACKGROUND AND HISTORY OF THE CASE

7. This case was filed in August of 2008 to challenge decisions made by Respondent in connection with approving the Project. In particular, the case challenged the adequacy of the Final EIR/EIS for the Project in numerous respects as well as the findings made in connection with the Project approval. The case was fully briefed, based on an extensive administrative record, and heard by the Court on May 29, 2009. In August 2009, the Court issued its decision upholding some aspects of the PEIR/EIS, but finding it defective in its treatment of land use and

right-of-way impacts. The Court also found Respondent's findings defective in failing to acknowledge the significance of the Project's vibration impacts.

8. In November of 2009, the Court entered final judgment in the case in accordance with its decision. The Court also issued a peremptory writ of mandate ordering Respondent to rescind its certification of the Final PEIR/EIS and its approval of the Project, and remanding the same to Respondent for reconsideration and revision in accordance with the Court's final judgment. The Court did not, however, enjoin further project-level environmental work on the Project.

9. At present, both the time to move for reconsideration or a new trial and the time for filing an appeal of the final judgment have expired. Consequently, the case is essentially closed.

THE NEWLY-DISCOVERED EVIDENCE AND ITS SIGNIFICANCE

10. On or about February 1, 2010, after the expiration of any recourse other than this Petition, Petitioners learned of newly-discovered evidence that indicates that the ridership and revenue modeling used in the PEIR/EIS, and upon which Respondent relied in making decisions on a choice of alignment for the Project, is seriously flawed. The flaws call into question the validity of the modeling results included in the PEIR/EIS, and the soundness of the alignment decision made by Respondent in reliance on those results.

11. The newly-discovered evidence consists of information on the parameters used for the modeling that produced the ridership and revenue data included in the EIR/EIS. This evidence was not previously available to Petitioners, nor to the public. Petitioners are further informed and believe and on that basis allege that this evidence was also not available to Respondent's Board of Directors when it made its determination of the alignment for the Project.

12. The mathematical model used to estimate ridership and revenue had been prepared by Cambridge Systematics, Inc., a private consulting firm working under contract with the Metropolitan Transportation Commission ("MTC"). Cambridge Systematics prepared an initial model, which was peer-reviewed and found acceptable, and, in August 2006, it published the parameters for that model, which were included in the administrative record for this case. (AR

F004477-004554.) A true and correct copy of the “main mode choice” model parameters for the initial model, taken from the Administrative Record for this case, is attached hereto as Exhibit A.

13. Petitioners are informed and believe, and on that basis allege, that this first model, when applied to the data for the Project did not provide results that were acceptable to MTC and Respondent. Consequently, Cambridge Systematics changed the modeling parameters to produce a revised model. A true and copy of the coefficients of the revised main mode choice model, as obtained from Respondent on March 27, 2010 through a California Public Records Act Request, is attached hereto as Exhibit B.

14. Petitioners are informed and believe, and on that basis allege, that the revised model was not peer reviewed; nor was it ever published. The revised model was not included in the administrative record for this case. However, ridership and revenue results obtained using the revised model were included in the PEIR/EIS for the Project.

15. In a January 29, 2010 transmittal memo from Cambridge Systematics to Respondent, Cambridge Systematics states that it had forwarded the revised modeling parameters to MTC, but MTC “elected” not to update the published modeling report to include the revised parameters. A true and correct copy of that memo, as obtained from Respondent, is attached hereto as Exhibit C.

16. Petitioners have had the revised model evaluated by an independent consultant with expertise in transportation modeling. The consultant’s expert opinion is that the revised model contains major flaws and errors that make its results untrustworthy. A true and correct copy of the consultant’s report evaluating the revised model is attached hereto as Exhibit D.

17. Petitioners have delayed filing this petition only long enough to seek to obtain, through California Public Record Act requests, sufficient documentation from Respondent and from MTC to substantiate the allegations made in this petition.

18. Had the revised model been published during the administrative process, Petitioners and the public would have had the opportunity to evaluate the model and to point out its inadequacies to Respondent. Because the revised model was never made public, however, neither Petitioners,

nor the public, nor Respondent's Board of Directors itself was aware of the problems inherent in the revised model, nor of the untrustworthiness of the ridership and revenue figures derived using that model. As a consequence of the concealment of the final model and its flaws, Petitioners have been deprived of the opportunity to present this issue to Respondent or to the Court, making the trial of this case, and the resulting judgment, unfair.

PRAYER FOR RELIEF

WHEREFORE, Petitioners pray for relief as follows:

1. For the Court to issue its Writ of Error *Coram Nobis* vacating the final judgment in this case and reopening the proceedings to consider the newly-discovered evidence;

2. For entry of a new and modified judgment, including all of the provisions contained in the prior judgment, but, in addition, ordering that the writ of mandate issued in the case be modified to require Respondent to consider the newly-discovered evidence and its effect on the ridership and revenue figures contained in the PEIR/EIR, as well as any associated environmental impacts, prior to certifying a modified PEIR/EIS for the Project and prior to granting a program-level approval for a Project alignment.

3. For an award of costs of suit in these proceedings;

4. For an award of attorneys fees under Code of Civil Procedure §1021.5 or other applicable basis;

5. For such other and further relief as the Court may consider just and proper.

Dated: May 5, 2010

Stuart M. Flashman
Attorney for Petitioners

Exhibit A

Table 3.15 Main Mode Choice Models

	Long Trip				Short Trip					
	Business		Other		Business		Commute		Other	
Observations	2,918		8,075		326		564		852	
Final log-likelihood	-1,969		-3,933		-295		-445		-744	
Rho-squared(0)	0.389		0.31		0.175		0.281		0.205	
Rho-squared(cons)	0.163		0.155		0.123		0.159		0.117	
	Coeff.	**T-stat**	**Coeff.**	**T-stat**	**Coeff.**	**T-stat**	**Coeff.**	**T-stat**	**Coeff.**	**T-stat**
Main Mode Characteristics										
Constants										
Car (base)										
Air	-1.645	-4.7	0.6898	2.8						
Conventional rail	-0.387	-0.9	0.6149	2.6	-0.268	-0.5	4.232	2.6	-0.3847	-1.4
High-speed rail	-0.3503	-1.1	1.434	7	-1.557	-2.8	4.048	2.5	0.5041	1.7
Level of Service										
Cost ($)	-0.01626	-12.8	-0.035	-18.5	-0.109	-5.4	-0.148	-11.3	-0.109	-8.2
In-vehicle time (min)	-0.016	-11.1	-0.011	-14.2	-0.5	constrained	-0.025	constrained	-0.014	-5.2
Service headway (min)	-0.003	-3.7	-0.003	-3.5	-0.006	-2.5	-0.0023	-2.4	-0.009	-5.5
Reliability (% on time)	0.001	0.3	0.005	1.9	0.023	1.8	0.006	0.6	0.004	0.6
Implied Value of Time IVT ($/hour)	$57.71		$18.33		$27.60		$10.12		$7.93	
Ratio Frequency/IVT	0.21		0.24		0.12		0.1		0.66	
Trip Characteristics										
Travel in a Group										
Car	0.8492	4.2	1.417	9.1						
Air	-0.3375	-2.7	-0.5061	-3.7						
Household Characteristics										
Household Size										
Car	0.0704	0.9	0.225	4.9			0.655	2		
Income										
High – car					-1.211	-2.3	-1.247	-1.8		
High – air	1.018	4.5								
High – conventional rail	0.5237	1.2								
High – high-speed rail	0.9807	4.8								
Fewer Cars than Workers										
Car	-0.7696	-2.4	-0.4354	-2.8	-0.7873	-0.8	-2	-1.5		
Nesting and scaling										
Nest – air, rail, high-speed rail	0.8514	8.8	0.7426	13	0.5159	2.7	0.5892	3.4	0.6855	6.1
Access mode choice logsum	0.115	3.1	0.2134	3.8	0.4628	1.9	0.33	1.5	0.3148	3.5
Egress mode choice logsum	0.1561	3.8	0.3974	7.1	0.4628	constrained	0.33	constrained	0.3148	3.5

Exhibit B

Table 3.15. Main Mode Choice Models

Variable	Acronym	Definition	Coefficient / Constant Applied for Mode: Car	Air	Conv. Rail	High Speed Rail	Long Trip – Business / Commute: Coefficient	t-stat	Long Trip – Recreation / Other: Coefficient	t-stat	Short Trip – Business: Coefficient	t-stat	Short Trip – Commute: Coefficient	t-stat	Short Trip – Recreation / Other: Coefficient	t-stat
Level of Service Coefficients																
1	cost	Cost ($)	x	x	x	x	-0.017	-12.8	-0.035	-18.5	-0.109	Constr	-0.148	-11.3	-0.108	-8.1
2	time	In-vehicle time (minutes)	x	x	x	x	-0.018	Constr	-0.011	-14.2	-0.050	Constr	-0.025	Constr	-0.014	-5.2
3	reli	Reliability (Percent on time)	x	x	x	x	0.023	Constr	0.005	1.9	0.023	1.8	0.007	0.7	0.004	0.7
4	freq	Service headway (minutes)		x	x	x	-0.179	-191.0	-0.011	-14.7	-0.050	-18.1	-0.025	-12.7	-0.014	-8.4
5	accls	Access mode choice logsum					0.136	3.4	0.204	3.7	0.463	Constr	0.330	Constr	0.303	3.4
6	egrls	Egress mode choice logsum					0.171	3.9	0.399	7.1			0.330	Constr		
7	accls<-5	Access mode choice logsum less than -5? (0/1)														
8	egrls<-5	Egress mode choice logsum less than -5? (0/1)														
9	freq>60	Service headway greater than 60 minutes? (0/1)														
10	reli>90	Reliability greater than 90 percent? (0/1)														
Constants																
104	c-group	Traveling in a group? (0/1)	x				1.086	4.6	1.430	9.1						
105	c-nocars	Zero car household? (0/1)	x													
106	c-carslt2	Fewer than 2 cars for household size greater than 1? (0/1)	x						-0.308	-2.3	-1.114	-1.2	-1.824	-1.3	-0.728	-2.3
107	c-hhsize	Household size	x				0.182	1.2	0.296	4.4			0.877	1.7		
108	c-hiinc	High income household? (0/1)	x								-1.232	-2.3	-1.180	-1.6		
200	a-const	Mode constant		x			-10.269	Constr	-4.683	Constr						
207	a-loinc	Low income household? (0/1)		x												
208	a-hiinc	High income household? (0/1)		x			1.180	4.6								
209	a-msinc	Missing income household? (0/1) (for model estimation only)		x												
210	a-group	Traveling in a group? (0/1)		x			-0.356	-2.8	-0.505	-3.7						
211	{lax-sfo}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
212	{sfo-lax}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
213	{lax-oak}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
214	{oak-lax}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
215	{lax-sjc}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
216	{sjc-lax}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
217	{lax-sac}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
218	{sac-lax}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
221	{bur-sfo}	Airport interchange served? (0/1)		x			4.151	Constr	4.151	Constr						
222	{sfo-bur}	Airport interchange served? (0/1)		x			5.363	Constr	5.363	Constr						
223	{bur-oak}	Airport interchange served? (0/1)		x			2.032	Constr	2.032	Constr						
224	{oak-bur}	Airport interchange served? (0/1)		x			4.145	Constr	4.145	Constr						
225	{bur-sjc}	Airport interchange served? (0/1)		x			3.757	Constr	3.757	Constr						
226	{sjc-bur}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
227	{bur-sac}	Airport interchange served? (0/1)		x			5.602	Constr	5.602	Constr						
228	{sac-bur}	Airport interchange served? (0/1)		x			1.421	Constr	1.421	Constr						
231	{ont-sfo}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
232	{sfo-ont}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
233	{ont-oak}	Airport interchange served? (0/1)		x			2.233	Constr	2.233	Constr						
234	{oak-ont}	Airport interchange served? (0/1)		x			2.269	Constr	2.269	Constr						
235	{ont-sjc}	Airport interchange served? (0/1)		x			3.263	Constr	3.263	Constr						
236	{sjc-ont}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
237	{ont-sac}	Airport interchange served? (0/1)		x			5.907	Constr	5.907	Constr						
238	{sac-ont}	Airport interchange served? (0/1)		x			3.787	Constr	3.787	Constr						
241	{sna-sfo}	Airport interchange served? (0/1)		x			4.652	Constr	4.652	Constr						
242	{sfo-sna}	Airport interchange served? (0/1)		x			2.409	Constr	2.409	Constr						
243	{sna-oak}	Airport interchange served? (0/1)		x			-0.231	Constr	-0.231	Constr						
244	{oak-sna}	Airport interchange served? (0/1)		x			-2.852	Constr	-2.852	Constr						
245	{sna-sjc}	Airport interchange served? (0/1)		x			4.348	Constr	4.348	Constr						
246	{sjc-sna}	Airport interchange served? (0/1)		x			2.963	Constr	2.963	Constr						
247	{sna-sac}	Airport interchange served? (0/1)		x			3.571	Constr	3.571	Constr						
248	{sac-sna}	Airport interchange served? (0/1)		x			-1.996	Constr	-1.996	Constr						
251	{san-sfo}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
252	{sfo-san}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
253	{san-oak}	Airport interchange served? (0/1)		x			1.704	Constr	1.704	Constr						
254	{oak-san}	Airport interchange served? (0/1)		x			1.952	Constr	1.952	Constr						
255	{san-sjc}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
256	{sjc-san}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
257	{san-sac}	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Constr						
258	{sac-san}	Airport interchange served? (0/1)		x			5.686	Constr	5.686	Constr						
300	h-const	Mode constant				x	-6.757	Constr	-0.713	Constr	-7.530	Constr	-6.964	Constr	-5.685	Constr
307	h-loinc	Low income household? (0/1)				x										
308	h-hiinc	High income household? (0/1)				x	1.147	4.8								
309	h-msinc	Missing income household? (0/1) (for model estimation only)				x										
400	r-const	Mode constant			x		-4.620	Constr	1.272	Constr	-6.232	Constr	-7.126	Constr	-5.541	Constr
407	r-loinc	Low income household? (0/1)			x											
408	r-hiinc	High income household? (0/1)			x		0.613	1.4								
409	r-msinc	Missing income household? (0/1) (for model estimation only)			x											
99	Theta0099	Nesting coefficient		x	x	x	0.692	10.4	0.738	13.0	0.516	Constr	0.420	3.9	0.689	6.1
Implied Value of Time							$63.64		$18.45		$27.60		$10.12		$7.95	

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 402   tx-egr   F    5.0
 403   tx-cvr   T    .000000000000       .000000000000
 404   tx-hsr   F    2.50663100001       .690972253428
 405  tx-alone  T    .000000000000       .000000000000
 406 tx-nocars  T    .000000000000       .000000000000
 407 tx-carsltw T    .000000000000       .000000000000
 408 tx-lowinc  F   -3.00249349507       1.32958912291
 409  tx-hiinc  T    .000000000000       .000000000000
 411 tx-misinc  T    .000000000000       .000000000000
 501   tr-acc   T    .000000000000       .000000000000
```

```
 502   tr-egr   F    5.0
 503   tr-cvr   F    3.57977389677       .693714014857
 504   tr-hsr   F    .592030344982       .818772706902
 505  tr-alone  T    .000000000000       .000000000000
 506 tr-nocars  T    .000000000000       .000000000000
 507 tr-carsltw T    .000000000000       .000000000000
 508 tr-lowinc  T    .000000000000       .000000000000
 509  tr-hiinc  T    .000000000000       .000000000000
 511 tr-misinc  T    .000000000000       .000000000000
 601   wk-acc   T    .000000000000       .000000000000
 602   wk-egr   F    5.0
 603   wk-air   F   -2.07424138293       1.02594397371
  98  mlogsum   F    .279810088965       .405610752766E-01
  99   hscale   F    .516212747874       .528553007548E-01
  -1

MOD 3 Access mode choice recreation and other long
Created by ALOGIT version 4                             13:31:13 on 10 May 06
END
   1    ivt     T   -.300000000000E-01   .000000000000
   2    cost    T   -.120000000000       .000000000000
   4 aivt-pkup  F   -.313798856910E-01   .101793353277E-01
   5 adis-taxi  F   -.704952818464E-01   .187485026208E-01
  12    ovt     F   -.827508998653E-01   .325081473438E-01
  17  carused   F   -1.80683862549       .976477137525
  21  railused  F    1.72684423460       .722240563269
 101   dp-acc   F    4.3564
 102   dp-egr   T    .000000000000       .000000000000
 103   dp-cvr   T    .000000000000       .000000000000
 104   dp-hsr   T    .000000000000       .000000000000
 105  dp-alone  F   -1.92545846752       .632972060090
 106 dp-nocars  T    .000000000000       .000000000000
 107 dp-carsltw F   -1.90269161291       .684852371113
 108 dp-lowinc  F   -1.95952156219       .703611812140
 109  dp-hiinc  F    .338696215219       .239284366685
 110 dp-misinc  T    .000000000000       .000000000000
 111 dp-laxacc  F   -1.27511064593       .757110722094
 112 dp-sfoacc  F   -3.03578560200      1.15707042718
 113 dp-oakacc  T    .000000000000       .000000000000
 114 dp-sjcacc  F   -1.47916441469       .701620252954
 115 dp-sanacc  F   -1.37047675180       .588105731178
 116 dp-buracc  T    .000000000000       .000000000000
 201   rc-acc   F   -5.0
 202   rc-egr   T    .000000000000       .000000000000
 203   rc-cvr   T   -5.00000000000       .000000000000
 204   rc-hsr   T    .000000000000       .000000000000
 205  rc-alone  T    .000000000000       .000000000000
 206 rc-nocars  T    .000000000000       .000000000000
 207 rc-carsltw T    .000000000000       .000000000000
 208 rc-lowinc  T    .000000000000       .000000000000
 209  rc-hiinc  T    .000000000000       .000000000000
 211 rc-misinc  T    .000000000000       .000000000000
 301 sp-onephh  T    .000000000000       .000000000000
 302 sp-hhsize  F    .477799416072       .172660174793
 401   tx-acc   F   -2.1553
 402   tx-egr   T    .000000000000       .000000000000
 403   tx-cvr   F   -2.26500157152       .939440486777
```

```
 404   tx-hsr   F   -1.09236498390       .508844003079
 405  tx-alone  F   -.877354722961       .495376207725
 406 tx-nocars  T    .000000000000       .000000000000
 407 tx-carsltw T    .000000000000       .000000000000
 408 tx-lowinc  T    .000000000000       .000000000000
 409  tx-hiinc  F    .849368455901       .451504919317
 411 tx-misinc  T    .000000000000       .000000000000
 501   tr-acc   F   -1.9075
 502   tr-egr   T    .000000000000       .000000000000
 503   tr-cvr   T    .000000000000       .000000000000
 504   tr-hsr   T    .000000000000       .000000000000
 505  tr-alone  F    1.56892763996       .696904272796
 506 tr-nocars  F    1.43883301621       .861037658348
 507 tr-carsltw T    .000000000000       .000000000000
 508 tr-lowinc  F    .845620517281       .834361842539
 509  tr-hiinc  T    .000000000000       .000000000000
 511 tr-misinc  T    .000000000000       .000000000000
 601   wk-acc   F    4.6959
 602   wk-egr   T    .000000000000       .000000000000
 603   wk-air   F   -2.63447076165      2.53798981223
  98  mlogsum   F    .450501127562       .137096352183
  99   hscale   T    1.00000000000       .000000000000
  -1

MOD 4 Egress mode choice recreation + other long
Created by ALOGIT version 4                            13:37:43 on 10 May 06
END
   1    ivt     T   -.300000000000E-01   .000000000000
   2    cost    T   -.120000000000       .000000000000
   4 aivt-pkup  F   -.151156493326E-01   .390242466939E-02
   5 adis-taxi  F   -.519350342685E-01   .783525424872E-02
  12    ovt     T   -.600000000000E-01   .000000000000
  17  carused   T    .000000000000       .000000000000
  21  railused  F    2.96007314337       .591485559641
 101   dp-acc   T    .000000000000       .000000000000
 102   dp-egr   F   -5.4182
 103   dp-cvr   T    .000000000000       .000000000000
 104   dp-hsr   T    .000000000000       .000000000000
 105  dp-alone  T    .000000000000       .000000000000
 106 dp-nocars  T    .000000000000       .000000000000
 107 dp-carsltw T    .000000000000       .000000000000
 108 dp-lowinc  F   -1.26303857602      1.16113977585
 109  dp-hiinc  T    .000000000000       .000000000000
 110 dp-misinc  T    .000000000000       .000000000000
 111 dp-laxacc  T    .000000000000       .000000000000
 112 dp-sfoacc  T    .000000000000       .000000000000
 113 dp-oakacc  T    .000000000000       .000000000000
 114 dp-sjcacc  T    .000000000000       .000000000000
 115 dp-sanacc  T    .000000000000       .000000000000
 116 dp-buracc  T    .000000000000       .000000000000
 201   rc-acc   T    .000000000000       .000000000000
 202   rc-egr   F    1.8267
 203   rc-cvr   F   -1.17569814996       .377501714710
 204   rc-hsr   F   -.551771575522       .232062035704
 205  rc-alone  F   -2.58764320747       .544874661370
 206 rc-nocars  T    .000000000000       .000000000000
 207 rc-carsltw T    .000000000000       .000000000000
```

```
 208 rc-lowinc  F   -1.89053040331       .515692436199
 209  rc-hiinc  T    .000000000000       .000000000000
 211 rc-misinc  T    .000000000000       .000000000000
 301 sp-onephh  T    .000000000000       .000000000000
 302 sp-hhsize  T    .000000000000       .000000000000
 401   tx-acc   T    .000000000000       .000000000000
 402   tx-egr   F    1.0547
 403   tx-cvr   T    .000000000000       .000000000000
 404   tx-hsr   T    .000000000000       .000000000000
 405  tx-alone  F   -2.76752965896       .596391644531
 406 tx-nocars  T    .000000000000       .000000000000
 407 tx-carsltw T    .000000000000       .000000000000
 408 tx-lowinc  F   -1.03751565300       .443286685529
 409  tx-hiinc  T    .000000000000       .000000000000
 411 tx-misinc  T    .000000000000       .000000000000
 501   tr-acc   T    .000000000000       .000000000000
 502   tr-egr   F    -3.6551
 503   tr-cvr   F    1.82969819985       .658298335194
 504   tr-hsr   F    1.03189768519       .555818058795
 505  tr-alone  T    .000000000000       .000000000000
 506 tr-nocars  T    .000000000000       .000000000000
 507 tr-carsltw T    .000000000000       .000000000000
 508 tr-lowinc  F    1.21613504556       .635389422694
 509  tr-hiinc  T    .000000000000       .000000000000
 511 tr-misinc  T    .000000000000       .000000000000
 601   wk-acc   T    .000000000000       .000000000000
 602   wk-egr   F    3.0764
 603   wk-air   T    .000000000000       .000000000000
  98  mlogsum   F    .469642820360       .879056935410E-01
  99   hscale   T    1.00000000000       .000000000000
  -1

MOD 5 Access mode choice business short
Created by ALOGIT version 4                            15:01:03 on 10 May 06
END
   1    ivt     T   -.400000000000E-01   .000000000000
   2    cost    T   -.500000000000E-01   .000000000000
   4 aivt-pkup  T    .000000000000       .000000000000
   5 adis-taxi  F   -.405195357464E-01   .539403427696E-01
  12    ovt     F   -.100380457206       .352121424419E-01
  17  carused   F   -1.46924971795       1.33671612122
  21  railused  F    3.31250730404       1.21455853095
 101   dp-acc   F    4.1656
 102   dp-egr   T    .000000000000       .000000000000
 103   dp-cvr   T    .000000000000       .000000000000
 104   dp-hsr   T    .000000000000       .000000000000
 105  dp-alone  T    .000000000000       .000000000000
 106 dp-nocars  T    .000000000000       .000000000000
 107 dp-carsltw T    .000000000000       .000000000000
 108 dp-lowinc  F   -2.01683665843       1.64535826482
 109  dp-hiinc  T    .000000000000       .000000000000
 110 dp-misinc  T    .000000000000       .000000000000
 111 dp-laxacc  T    .000000000000       .000000000000
 112 dp-sfoacc  T    .000000000000       .000000000000
 113 dp-oakacc  T    .000000000000       .000000000000
 114 dp-sjcacc  T    .000000000000       .000000000000
 115 dp-sanacc  T    .000000000000       .000000000000
```

```
 116 dp-buracc  T    .000000000000       .000000000000
 201   rc-acc   T    .000000000000       .000000000000
 202   rc-egr   T    .000000000000       .000000000000
 203   rc-cvr   T    .000000000000       .000000000000
 204   rc-hsr   T    .000000000000       .000000000000
 205  rc-alone  T    .000000000000       .000000000000
 206 rc-nocars  T    .000000000000       .000000000000
 207 rc-carsltw T    .000000000000       .000000000000
 208 rc-lowinc  T    .000000000000       .000000000000
 209  rc-hiinc  T    .000000000000       .000000000000
 211 rc-misinc  T    .000000000000       .000000000000
 301 sp-onephh  T    .000000000000       .000000000000
 302 sp-hhsize  T    .000000000000       .000000000000
 401   tx-acc   F   -1.6820
 402   tx-egr   T    .000000000000       .000000000000
 403   tx-cvr   T    .000000000000       .000000000000
 404   tx-hsr   T    .000000000000       .000000000000
 405  tx-alone  T    .000000000000       .000000000000
 406 tx-nocars  T    .000000000000       .000000000000
 407 tx-carsltw T    .000000000000       .000000000000
 408 tx-lowinc  T    .000000000000       .000000000000
 409  tx-hiinc  T    .000000000000       .000000000000
 411 tx-misinc  T    .000000000000       .000000000000
 501   tr-acc   F    5.0
 502   tr-egr   T    .000000000000       .000000000000
 503   tr-cvr   T    .000000000000       .000000000000
 504   tr-hsr   T    .000000000000       .000000000000
 505  tr-alone  T    .000000000000       .000000000000
 506 tr-nocars  T    .000000000000       .000000000000
 507 tr-carsltw T    .000000000000       .000000000000
 508 tr-lowinc  T    .000000000000       .000000000000
 509  tr-hiinc  T    .000000000000       .000000000000
 511 tr-misinc  T    .000000000000       .000000000000
 601   wk-acc   F    5.0
 602   wk-egr   T    .000000000000       .000000000000
 603   wk-air   T    .000000000000       .000000000000
  98  mlogsum   F    .569888918836       .132629115917
  99   hscale   T    1.00000000000       .000000000000
  -1

MOD 6 Egress mode choice business short
Created by ALOGIT version 4                            15:00:43 on 10 May 06
END
   1    ivt     T   -.400000000000E-01   .000000000000
   2    cost    T   -.500000000000E-01   .000000000000
   4 aivt-pkup  T    .000000000000       .000000000000
   5 adis-taxi  F   -.230230313333       .736820960204E-01
  12    ovt     F   -.116873699485       .380972318152E-01
  17  carused   F   -5.11827086334       1.19872552992
  21  railused  T    .000000000000       .000000000000
 101   dp-acc   T    .000000000000       .000000000000
 102   dp-egr   F    -0.6350
 103   dp-cvr   T    .000000000000       .000000000000
 104   dp-hsr   T    .000000000000       .000000000000
 105  dp-alone  T    .000000000000       .000000000000
 106 dp-nocars  T    .000000000000       .000000000000
 107 dp-carsltw T    .000000000000       .000000000000
```

```
 108 dp-lowinc  T    .000000000000      .000000000000
 109  dp-hiinc  T    .000000000000      .000000000000
 110 dp-misinc  T    .000000000000      .000000000000
 111 dp-laxacc  T    .000000000000      .000000000000
 112 dp-sfoacc  T    .000000000000      .000000000000
 113 dp-oakacc  T    .000000000000      .000000000000
 114 dp-sjcacc  T    .000000000000      .000000000000
 115 dp-sanacc  T    .000000000000      .000000000000
 116 dp-buracc  T    .000000000000      .000000000000
 201   rc-acc   T    .000000000000      .000000000000
 202   rc-egr   F   -0.9882
 203   rc-cvr   T    .000000000000      .000000000000
 204   rc-hsr   T    .000000000000      .000000000000
 205  rc-alone  T    .000000000000      .000000000000
 206 rc-nocars  T    .000000000000      .000000000000
 207 rc-carsltw T    .000000000000      .000000000000
 208 rc-lowinc  T    .000000000000      .000000000000
 209  rc-hiinc  T    .000000000000      .000000000000
 211 rc-misinc  T    .000000000000      .000000000000
 301 sp-onephh  T    .000000000000      .000000000000
 302 sp-hhsize  T    .000000000000      .000000000000
 401   tx-acc   T    .000000000000      .000000000000
 402   tx-egr   F    4.6531
 403   tx-cvr   T    .000000000000      .000000000000
 404   tx-hsr   T    .000000000000      .000000000000
 405  tx-alone  T    .000000000000      .000000000000
 406 tx-nocars  T    .000000000000      .000000000000
 407 tx-carsltw T    .000000000000      .000000000000
 408 tx-lowinc  T    .000000000000      .000000000000
 409  tx-hiinc  T    .000000000000      .000000000000
 411 tx-misinc  T    .000000000000      .000000000000
 501   tr-acc   T    .000000000000      .000000000000
 502   tr-egr   F    5.0
 503   tr-cvr   T    .000000000000      .000000000000
 504   tr-hsr   T    .000000000000      .000000000000
 505  tr-alone  T    .000000000000      .000000000000
 506 tr-nocars  T    .000000000000      .000000000000
 507 tr-carsltw T    .000000000000      .000000000000
 508 tr-lowinc  T    .000000000000      .000000000000
 509  tr-hiinc  T    .000000000000      .000000000000
 511 tr-misinc  T    .000000000000      .000000000000
 601   wk-acc   T    .000000000000      .000000000000
 602   wk-egr   F    5.0
 603   wk-air   T    .000000000000      .000000000000
  98  mlogsum   F    .648868928583      .226624398975
  99   hscale   F    .411961327207      .136506752214
  -1

MOD 7 Access mode choice commute short
Created by ALOGIT version 4                             14:55:14 on 10 May 06
END
   1    ivt     T   -.300000000000E-01   .000000000000
   2    cost    T   -.100000000000       .000000000000
   4 aivt-pkup  T    .000000000000       .000000000000
   5 adis-taxi  T    .000000000000       .000000000000
  12    ovt     T   -.600000000000E-01   .000000000000
  17  carused   T    .000000000000       .000000000000
```

21	railused	T	.000000000000	.000000000000
101	dp-acc	F	5.0	
102	dp-egr	T	.000000000000	.000000000000
103	dp-cvr	T	.000000000000	.000000000000
104	dp-hsr	T	.000000000000	.000000000000
105	dp-alone	T	.000000000000	.000000000000
106	dp-nocars	T	.000000000000	.000000000000
107	dp-carsltw	F	-3.77498125249	2.03663164916
108	dp-lowinc	T	.000000000000	.000000000000
109	dp-hiinc	T	.000000000000	.000000000000
110	dp-misinc	T	.000000000000	.000000000000
111	dp-laxacc	T	.000000000000	.000000000000
112	dp-sfoacc	T	.000000000000	.000000000000
113	dp-oakacc	T	.000000000000	.000000000000
114	dp-sjcacc	T	.000000000000	.000000000000
115	dp-sanacc	T	.000000000000	.000000000000
116	dp-buracc	T	.000000000000	.000000000000
201	rc-acc	T	.000000000000	.000000000000
202	rc-egr	T	.000000000000	.000000000000
203	rc-cvr	T	.000000000000	.000000000000
204	rc-hsr	T	.000000000000	.000000000000
205	rc-alone	T	.000000000000	.000000000000
206	rc-nocars	T	.000000000000	.000000000000
207	rc-carsltw	T	.000000000000	.000000000000
208	rc-lowinc	T	.000000000000	.000000000000
209	rc-hiinc	T	.000000000000	.000000000000
211	rc-misinc	T	.000000000000	.000000000000
301	sp-onephh	T	.000000000000	.000000000000
302	sp-hhsize	F	.671625012285	.490887498077
401	tx-acc	F	-4.1039	
402	tx-egr	T	.000000000000	.000000000000
403	tx-cvr	T	.000000000000	.000000000000
404	tx-hsr	T	.000000000000	.000000000000
405	tx-alone	T	.000000000000	.000000000000
406	tx-nocars	T	.000000000000	.000000000000
407	tx-carsltw	T	.000000000000	.000000000000
408	tx-lowinc	T	.000000000000	.000000000000
409	tx-hiinc	T	.000000000000	.000000000000
411	tx-misinc	T	.000000000000	.000000000000
501	tr-acc	F	5.0	
502	tr-egr	T	.000000000000	.000000000000
503	tr-cvr	T	.000000000000	.000000000000
504	tr-hsr	T	.000000000000	.000000000000
505	tr-alone	T	.000000000000	.000000000000
506	tr-nocars	T	.000000000000	.000000000000
507	tr-carsltw	T	.000000000000	.000000000000
508	tr-lowinc	T	.000000000000	.000000000000
509	tr-hiinc	T	.000000000000	.000000000000
511	tr-misinc	T	.000000000000	.000000000000
601	wk-acc	F	5.7962	
602	wk-egr	T	.000000000000	.000000000000
603	wk-air	T	.000000000000	.000000000000
98	mlogsum	F	.457768710032	.224554798686
99	hscale	T	1.00000000000	.000000000000
-1				

MOD 8 Egress mode choice commute short

```
Created by ALOGIT version 4                               15:01:58 on 10 May 06
END
   1    ivt     T   -.300000000000E-01   .000000000000
   2    cost    T   -.100000000000       .000000000000
   4 aivt-pkup  T    .000000000000       .000000000000
   5 adis-taxi  T    .000000000000       .000000000000
  12    ovt     T   -.750000000000E-01   .000000000000
  17  carused   F   -4.46616828189       .724189280874
  21  railused  T    .000000000000       .000000000000
 101   dp-acc   T    .000000000000       .000000000000
 102   dp-egr   F    -0.7228
 103   dp-cvr   T    .000000000000       .000000000000
 104   dp-hsr   T    .000000000000       .000000000000
 105  dp-alone  T    .000000000000       .000000000000
 106 dp-nocars  T    .000000000000       .000000000000
 107 dp-carsltw T    .000000000000       .000000000000
 108 dp-lowinc  T    .000000000000       .000000000000
 109  dp-hiinc  T    .000000000000       .000000000000
 110 dp-misinc  T    .000000000000       .000000000000
 111 dp-laxacc  T    .000000000000       .000000000000
 112 dp-sfoacc  T    .000000000000       .000000000000
 113 dp-oakacc  T    .000000000000       .000000000000
 114 dp-sjcacc  T    .000000000000       .000000000000
 115 dp-sanacc  T    .000000000000       .000000000000
 116 dp-buracc  T    .000000000000       .000000000000
 201   rc-acc   T    .000000000000       .000000000000
 202   rc-egr   F    -5.0
 203   rc-cvr   T    .000000000000       .000000000000
 204   rc-hsr   T    .000000000000       .000000000000
 205  rc-alone  T    .000000000000       .000000000000
 206 rc-nocars  T    .000000000000       .000000000000
 207 rc-carsltw T    .000000000000       .000000000000
 208 rc-lowinc  T    .000000000000       .000000000000
 209  rc-hiinc  T    .000000000000       .000000000000
 211 rc-misinc  T    .000000000000       .000000000000
 301 sp-onephh  T    .000000000000       .000000000000
 302 sp-hhsize  T    .000000000000       .000000000000
 401   tx-acc   T    .000000000000       .000000000000
 402   tx-egr   F    -1.4252
 403   tx-cvr   T    .000000000000       .000000000000
 404   tx-hsr   T    .000000000000       .000000000000
 405  tx-alone  T    .000000000000       .000000000000
 406 tx-nocars  T    .000000000000       .000000000000
 407 tx-carsltw T    .000000000000       .000000000000
 408 tx-lowinc  T    .000000000000       .000000000000
 409  tx-hiinc  T    .000000000000       .000000000000
 411 tx-misinc  T    .000000000000       .000000000000
 501   tr-acc   T    .000000000000       .000000000000
 502   tr-egr   F    5.0
 503   tr-cvr   T    .000000000000       .000000000000
 504   tr-hsr   T    .000000000000       .000000000000
 505  tr-alone  T    .000000000000       .000000000000
 506 tr-nocars  T    .000000000000       .000000000000
 507 tr-carsltw T    .000000000000       .000000000000
 508 tr-lowinc  T    .000000000000       .000000000000
 509  tr-hiinc  F   -.581051985992       .513330767318
 511 tr-misinc  T    .000000000000       .000000000000
```

```
 601   wk-acc   T    .000000000000       .000000000000
 602   wk-egr   F    5.0
 603   wk-air   T    .000000000000       .000000000000
  98  mlogsum   F    .487229998693       .185096889919
  99   hscale   F    .334088456985       .642247791983E-01
  -1

MOD 9 Access mode choice recreation and other short
Created by ALOGIT version 4                          14:58:44 on 10 May 06
END
   1    ivt     T   -.250000000000E-01   .000000000000
   2    cost    T   -.100000000000       .000000000000
   4 aivt-pkup  F   -.251192757143E-02   .371504147959E-02
   5 adis-taxi  F   -.142035080189E-01   .584568514644E-02
  12    ovt     F   -.607239951669E-01   .247132864676E-01
  17  carused   F   -3.34548147004       .917827531618
  21  railused  F    3.27132495097      .770923303593
 101   dp-acc   F    3.2323
 102   dp-egr   T    .000000000000       .000000000000
 103   dp-cvr   T    .000000000000       .000000000000
 104   dp-hsr   T    .000000000000       .000000000000
 105  dp-alone  T    .000000000000       .000000000000
 106 dp-nocars  T    .000000000000       .000000000000
 107 dp-carsltw F   -1.16604713627       .368478532513
 108 dp-lowinc  F   -.493452080846       .304057166465
 109  dp-hiinc  T    .000000000000       .000000000000
 110 dp-misinc  T    .000000000000       .000000000000
 111 dp-laxacc  T    .000000000000       .000000000000
 112 dp-sfoacc  T    .000000000000       .000000000000
 113 dp-oakacc  T    .000000000000       .000000000000
 114 dp-sjcacc  T    .000000000000       .000000000000
 115 dp-sanacc  T    .000000000000       .000000000000
 116 dp-buracc  T    .000000000000       .000000000000
 201   rc-acc   T    .000000000000       .000000000000
 202   rc-egr   T    .000000000000       .000000000000
 203   rc-cvr   T    .000000000000       .000000000000
 204   rc-hsr   T    .000000000000       .000000000000
 205  rc-alone  T    .000000000000       .000000000000
 206 rc-nocars  T    .000000000000       .000000000000
 207 rc-carsltw T    .000000000000       .000000000000
 208 rc-lowinc  T    .000000000000       .000000000000
 209  rc-hiinc  T    .000000000000       .000000000000
 211 rc-misinc  T    .000000000000       .000000000000
 301 sp-onephh  T    .000000000000       .000000000000
 302 sp-hhsize  F    .272511953433       .104638117998
 401   tx-acc   F    -0.0244
 402   tx-egr   T    .000000000000       .000000000000
 403   tx-cvr   T    .000000000000       .000000000000
 404   tx-hsr   T    .000000000000       .000000000000
 405  tx-alone  T    .000000000000       .000000000000
 406 tx-nocars  T    .000000000000       .000000000000
 407 tx-carsltw T    .000000000000       .000000000000
 408 tx-lowinc  T    .000000000000       .000000000000
 409  tx-hiinc  T    .000000000000       .000000000000
 411 tx-misinc  T    .000000000000       .000000000000
 501   tr-acc   F    1.0523
 502   tr-egr   T    .000000000000       .000000000000
```

```
 503   tr-cvr   T    .000000000000       .000000000000
 504   tr-hsr   T    .000000000000       .000000000000
 505  tr-alone  T    .000000000000       .000000000000
 506 tr-nocars  T    .000000000000       .000000000000
 507 tr-carsltw F    1.98491174550       .778240603488
 508 tr-lowinc  T    .000000000000       .000000000000
 509  tr-hiinc  T    .000000077100000       .000000000000
 511 tr-misinc  T    .000000000000       .000000000000
 601   wk-acc   F    1.3905
 602   wk-egr   T    .000000000000       .000000000000
 603   wk-air   T    .000000000000       .000000000000
  98  mlogsum   T    1.00000000000       .000000000000
  99   hscale   T    1.00000000000       .000000000000
  -1

MOD 10 Egress mode choice recreation and other - short
Created by ALOGIT version 4                               15:03:14 on 10 May 06
END
   1    ivt     T   -.250000000000E-01   .000000000000
   2    cost    T   -.100000000000       .000000000000
   4 aivt-pkup  T    .000000000000       .000000000000
   5 adis-taxi  F   -.964482275564E-01   .274008767809E-01
  12    ovt     T   -.500000000000E-01   .000000000000
  17  carused   T    .000000000000       .000000000000
  21  railused  F    2.56990937673       .736067340946
 101   dp-acc   T    .000000000000       .000000000000
 102   dp-egr   F   5.0
 103   dp-cvr   T    .000000000000       .000000000000
 104   dp-hsr   T    .000000000000       .000000000000
 105  dp-alone  T    .000000000000       .000000000000
 106 dp-nocars  T    .000000000000       .000000000000
 107 dp-carsltw T    .000000000000       .000000000000
 108 dp-lowinc  T    .000000000000       .000000000000
 109  dp-hiinc  T    .000000000000       .000000000000
 110 dp-misinc  T    .000000000000       .000000000000
 111 dp-laxacc  T    .000000000000       .000000000000
 112 dp-sfoacc  T    .000000000000       .000000000000
 113 dp-oakacc  T    .000000000000       .000000000000
 114 dp-sjcacc  T    .000000000000       .000000000000
 115 dp-sanacc  T    .000000000000       .000000000000
 116 dp-buracc  T    .000000000000       .000000000000
 201   rc-acc   T    .000000000000       .000000000000
 202   rc-egr   F   5.0
 203   rc-cvr   T    .000000000000       .000000000000
 204   rc-hsr   T    .000000000000       .000000000000
 205  rc-alone  T    .000000000000       .000000000000
 206 rc-nocars  T    .000000000000       .000000000000
 207 rc-carsltw T    .000000000000       .000000000000
 208 rc-lowinc  T    .000000000000       .000000000000
 209  rc-hiinc  T    .000000000000       .000000000000
 211 rc-misinc  T    .000000000000       .000000000000
 301 sp-onephh  T    .000000000000       .000000000000
 302 sp-hhsize  T    .000000000000       .000000000000
 401   tx-acc   T    .000000000000       .000000000000
 402   tx-egr   F    5.0
 403   tx-cvr   T    .000000000000       .000000000000
 404   tx-hsr   T    .000000000000       .000000000000
```

```
 405  tx-alone  T    .000000000000       .000000000000
 406 tx-nocars  T    .000000000000       .000000000000
 407 tx-carsltw T    .000000000000       .000000000000
 408 tx-lowinc  T    .000000000000       .000000000000
 409  tx-hiinc  F    1.49896386093       .527938915965
 411 tx-misinc  T    .000000000000       .000000000000
 501   tr-acc   T    .000000000000       .000000000000
 502   tr-egr   F    5.0
 503   tr-cvr   T    .000000000000       .000000000000
 504   tr-hsr   T    .000000000000       .000000000000
 505  tr-alone  T    .000000000000       .000000000000
 506 tr-nocars  T    .000000000000       .000000000000
 507 tr-carsltw T    .000000000000       .000000000000
 508 tr-lowinc  F    1.94778217762       .878655565158
 509  tr-hiinc  T    .000000000000       .000000000000
 511 tr-misinc  T    .000000000000       .000000000000
 601   wk-acc   T    .000000000000       .000000000000
 602   wk-egr   F    5.0
 603   wk-air   T    .000000000000       .000000000000
  98  mlogsum   F    .757854532209       .184830978387
  99   hscale   F    .609707206123       .127649074403
  -1

MOD 11  Main Mode Choice - Business and Commmute Long
Created by ALOGIT version 4                            12:48:51 on 27 Jul 06
END
   1    cost    F   -.169125816481E-01   .132092778127E-02
   2    time    F   -.179398934294E-01
   3    reli    T    .230000000000E-01   .000000000000
   4    freq    F   -0.179398934294E-01   .939330857274E-03
   5   accls    F    .136225404947       .395524126716E-01
   6   egrls    F    .170684110264       .437944012964E-01
   7  accls<-5  T    .000000000000       .000000000000
   8  egrls<-5  T    .000000000000       .000000000000
   9  freq>60   T    .000000000000       .000000000000
  10  reli>90   T    .000000000000       .000000000000
 104  c-group   F    1.08578247142       .236187719233
 105  c-nocars  T    .000000000000       .000000000000
 106 c-carslt2  T    .000000000000       .000000000000
 107  c-hhsize  F    .182477992677       .148486559831
 200  a-const   F   -10.2689
 207  a-loinc   T    .000000000000       .000000000000
 208  a-hiinc   F    1.17993018929       .255950269247
 209  a-msinc   T    .000000000000       .000000000000
 210  a-group   F   -.355619639411       .126817245228
  211 {lax-sfo}        5.0
  212 {sfo-lax}        5.0
  213 {lax-oak}        5.0
  214 {oak-lax}        5.0
  215 {lax-sjc}        5.0
  216 {sjc-lax}        5.0
  217 {lax-sac}        5.0
  218 {sac-lax}        5.0
  221 {bur-sfo}        4.15072520436814
  222 {sfo-bur}        5.36281442393504
  223 {bur-oak}        2.03201572731104
  224 {oak-bur}        4.14476509244301
```

```
  225 {bur-sjc}          3.75706173305878
  226 {sjc-bur}          5.0
  227 {bur-sac}          5.60156977111601
  228 {sac-bur}          1.42104660563145
  231 {ont-sfo}          5.0
  232 {sfo-ont}          5.0
  233 {ont-oak}          2.23349440850832
  234 {oak-ont}          2.26919125574209
  235 {ont-sjc}          3.26290399154547
  236 {sjc-ont}          5.0
  237 {ont-sac}          5.90736665045338
  238 {sac-ont}          3.78720498366305
  241 {sna-sfo}          4.65231270011812
  242 {sfo-sna}          2.4090372458046
  243 {sna-oak}          -0.230896084465091
  244 {oak-sna}          -2.85176655896499
  245 {sna-sjc}          4.34849653334348
  246 {sjc-sna}          2.96278833669688
  247 {sna-sac}          3.57105510199639
  248 {sac-sna}          -1.99647855488629
  251 {san-sfo}          5.0
  252 {sfo-san}          5.0
  253 {san-oak}          1.70371109455288
  254 {oak-san}          1.95176783374581
  255 {san-sjc}          5.0
  256 {sjc-san}          5.0
  257 {san-sac}          5.0
  258 {sac-san}          5.68645827296802
 300  h-const   F   -6.7570
 307  h-loinc   T    .000000000000       .000000000000
 308  h-hiinc   F    1.14736055123       .237668533798
 309  h-msinc   T    .000000000000       .000000000000
 400  r-const   F   -4.6197
 407  r-loinc   T    .000000000000       .000000000000
 408  r-hiinc   F    .612826383162       .443604244551
 409  r-msinc   T    .000000000000       .000000000000
  99 Theta0099  F    .692234654570       .668596912482E-01
  -1

MOD 12  Main mode choice recreation and other - long
Created by ALOGIT version 4                            12:39:38 on 27 Jul 06
END
   1    cost    F   -.346448190426E-01   .187280762959E-02
   2    time    F   -.106514832329E-01   .749202499680E-03
   3    reli    F    .496248119642E-02   .254935961031E-02
   4    freq    F   -.106514832329E-01   .726152555101E-03
   5   accls    F    .204331414285       .556873680225E-01
   6   egrls    F    .398716794278       .562408794235E-01
   7  accls<-5  T    .000000000000       .000000000000
   8  egrls<-5  T    .000000000000       .000000000000
   9  freq>60   T    .000000000000       .000000000000
  10  reli>90   T    .000000000000       .000000000000
 104  c-group   F    1.43048682130       .157631255678
 105  c-nocars  T    .000000000000       .000000000000
 106 c-carslt2  F   -.307517864955       .135422897487
 107  c-hhsize  F    .296266699244       .680947551096E-01
 200  a-const   F   -4.6833
```

```
 207  a-loinc   T    .000000000000       .000000000000
 208  a-hiinc   T    .000000000000       .000000000000
 209  a-msinc   T    .000000000000       .000000000000
 210  a-group   F   -.504718914311       .136653209093
  211 {lax-sfo}          5.0
  212 {sfo-lax}          5.0
  213 {lax-oak}          5.0
  214 {oak-lax}          5.0
  215 {lax-sjc}          5.0
  216 {sjc-lax}          5.0
  217 {lax-sac}          5.0
  218 {sac-lax}          5.0
  221 {bur-sfo}          4.15072520436814
  222 {sfo-bur}          5.36281442393504
  223 {bur-oak}          2.03201572731104
  224 {oak-bur}          4.14476509244301
  225 {bur-sjc}          3.75706173305878
  226 {sjc-bur}          5.0
  227 {bur-sac}          5.60156977111601
  228 {sac-bur}          1.42104660563145
  231 {ont-sfo}          5.0
  232 {sfo-ont}          5.0
  233 {ont-oak}          2.23349440850832
  234 {oak-ont}          2.26919125574209
  235 {ont-sjc}          3.26290399154547
  236 {sjc-ont}          5.0
  237 {ont-sac}          5.90736665045338
  238 {sac-ont}          3.78720498366305
  241 {sna-sfo}          4.65231270011812
  242 {sfo-sna}          2.4090372458046
  243 {sna-oak}          -0.230896084465091
  244 {oak-sna}          -2.85176655896499
  245 {sna-sjc}          4.34849653334348
  246 {sjc-sna}          2.96278833669688
  247 {sna-sac}          3.57105510199639
  248 {sac-sna}          -1.99647855488629
  251 {san-sfo}          5.0
  252 {sfo-san}          5.0
  253 {san-oak}          1.70371109455288
  254 {oak-san}          1.95176783374581
  255 {san-sjc}          5.0
  256 {sjc-san}          5.0
  257 {san-sac}          5.0
  258 {sac-san}          5.68645827296802
 300  h-const   F    -0.7132
 307  h-loinc   T    .000000000000       .000000000000
 308  h-hiinc   T    .000000000000       .000000000000
 309  h-msinc   T    .000000000000       .000000000000
 400  r-const   F    1.2723
 407  r-loinc   T    .000000000000       .000000000000
 408  r-hiinc   T    .000000000000       .000000000000
 409  r-msinc   T    .000000000000       .000000000000
  99 Theta0099  F    .738466393025       .567279230094E-01
  -1
```

```
END
   1    cost    T   -.108700000000       .000000000000
   2    time    T   -.500000000000E-01   .000000000000
   3    reli    F    .229975345758E-01   .126915968338E-01
   4    freq    F   -.500000000000E-01  .276774209788E-02
   5   accls    T    .462800000000       .000000000000
   7  accls<-5  T    .000000000000       .000000000000
   8  egrls<-5  T    .000000000000       .000000000000
   9  freq>60   T    .000000000000       .000000000000
  10  reli>90   T    .000000000000       .000000000000
 104  c-group   T    .000000000000       .000000000000
 105  c-nocars  T    .000000000000       .000000000000
 106 c-carslt2  F   -1.11398591591       .916249922014
 107  c-hhsize  T    .000000000000       .000000000000
 108  c-hiinc   F   -1.23168425539       .536765671049
 200  a-const   T    0                   .000000000000
 207  a-loinc   T    .000000000000       .000000000000
 208  a-hiinc   T    .000000000000       .000000000000
 209  a-msinc   T    .000000000000       .000000000000
 210  a-group   T    .000000000000       .000000000000
 300  h-const   F   -7.5296
 307  h-loinc   T    .000000000000       .000000000000
 308  h-hiinc   T    .000000000000       .000000000000
 309  h-msinc   T    .000000000000       .000000000000
 400  r-const   F   -6.2316
 407  r-loinc   T    .000000000000       .000000000000
 408  r-hiinc   T    .000000000000       .000000000000
 409  r-msinc   T    .000000000000       .000000000000
  99  mlogsum   T    .515900000000       .000000000000
  -1

MOD 14  Main mode choice commute short
Created by ALOGIT version 4                            12:43:42 on 27 Jul 06
END
   1    cost    F   -.148190602715       .131557273513E-01
   2    time    T   -.250000000000E-01   .000000000000
   3    reli    F    .692058060115E-02   .101357616313E-01
   4    freq    F   -.250000000000E-01   .196490562614E-02
   5   accls    T    .330000000000       .000000000000
   6   egrls    T    .330000000000       .000000000000
   7  accls<-5  T    .000000000000       .000000000000
   8  egrls<-5  T    .000000000000       .000000000000
   9  freq>60   T    .000000000000       .000000000000
  10  reli>90   T    .000000000000       .000000000000
 104  c-group   T    .000000000000       .000000000000
 105  c-nocars  T    .000000000000       .000000000000
 106 c-carslt2  F   -1.82370282052       1.35252862612
 107  c-hhsize  F    .876836226297       .517116866912
 108  c-hiinc   F   -1.18007873626       .722746899106
 200  a-const   T    0
 207  a-loinc   T    .000000000000       .000000000000
 208  a-hiinc   T    .000000000000       .000000000000
 209  a-msinc   T    .000000000000       .000000000000
 210  a-group   T    .000000000000       .000000000000
 300  h-const   F    -6.9635
 307  h-loinc   T    .000000000000       .000000000000
 308  h-hiinc   T    .000000000000       .000000000000
```

```
 309  h-msinc   T    .000000000000       .000000000000
 400  r-const   F   -7.1260
 407  r-loinc   T    .000000000000       .000000000000
 408  r-hiinc   T    .000000000000       .000000000000
 409  r-msinc   T    .000000000000       .000000000000
  99 Theta0099  F    .420155852798       .108412101629
  -1

MOD 15  Main mode choice recreation and other short
END
   1    cost    F   -.108338072179       .133265392065E-01
   2    time    F   -.143482826674E-01   .278070509870E-02
   3    reli    F    .436807998947E-02   .663308216492E-02
   4    freq    F   -.143482826674E-01   .171510286720E-02
   5   accls    F    .302875459841       .886544464080E-01
   7  accls<-5  T    .000000000000       .000000000000
   8  egrls<-5  T    .000000000000       .000000000000
   9  freq>60   T    .000000000000       .000000000000
  10  reli>90   T    .000000000000       .000000000000
 104  c-group   T    .000000000000       .000000000000
 105  c-nocars  T    .000000000000       .000000000000
 106 c-carslt2  F   -.727909776896       .316766314921
 107  c-hhsize  T    .000000000000       .000000000000
 200  a-const   T    0
 207  a-loinc   T    .000000000000       .000000000000
 208  a-hiinc   T    .000000000000       .000000000000
 209  a-msinc   T    .000000000000       .000000000000
 210  a-group   T    .000000000000       .000000000000
 300  h-const   F    -5.6853
 307  h-loinc   T    .000000000000       .000000000000
 308  h-hiinc   T    .000000000000       .000000000000
 309  h-msinc   T    .000000000000       .000000000000
 400  r-const   F   -5.5412
 407  r-loinc   T    .000000000000       .000000000000
 408  r-hiinc   T    .000000000000       .000000000000
 409  r-msinc   T    .000000000000       .000000000000
  99 Theta0099  F    .688524458541       .113485613730
  -1

MOD      16      MTC-HSR COMMUTE+  BUSINESS-LONG Model
Created by ALOGIT version 4                            21:38:17 on  2 Aug 06
END
   1  mlogsum   T    .053400000000       .000000000000
   2  distance  F   -.239152774584E-01   .280361297712E-02
   3  distsqu   F    .697999009335E-04   .785479395475E-05
   4  distcub   F   -.522655425792E-07   .657249396945E-08
   6   durban   F    .723960029700       .108286956182
   7   drural   F    .222021179810       .108853880835
   8   urburb   F   -.977828461117E-02   .148771271554
   9   subsub   F   -.185441669706       .121761902690
  10   rurrur   F   -.111537122938       .151976080733
  41 AMBAG          -0.2418
  42 CC          -0.2546
  43 FN          -1.7279
  44 FM          -0.6854
  45 Kern          0.4764
  46 Merced          -0.8552
```

```
  47 SSJ          -0.1435
  48 SACOG          0
  49 SANDAG          -5.0724
  50 SJ          -0.1083
  51 Stan          -1.0433
  52 WSN          -0.1343
  53 MTC          -0.6781
  54 MTC          0.2262
  55 MTC          0.1486
  56 MTC          -0.8474
  57 MTC          -0.6874
  58 MTC          -0.7104
  59 MTC          0.8002
  60 SCAG          -1.8101
  61 SCAG          -2.9451
  62 SCAG          0.0963
  63 SCAG          -4.4162
  64 SCAG          -3.8305
  65 SCAG          -3.0011
  71 mtcscag          -1.1226
  72 mtcsandag          1.1415
  73 sacogscag          -1.7357
  74 sacogsand          0.3684
  75 scagmtc          -1.1226
  76 scagsacog          -1.7357
  77 sandagmtc          1.1415
  78 sandagsac          0.3684
  79 mtcsacog          0.77
  80 sacogmtc          0.77
  81 scagsandag          5.4033
  82 sandagscag          5.4033
   0   L_S_M    T    1.00000000000       .000000000000
 101  loincret  F    1.06072479268       .512920452549
 102  loincsvc  F    .546793921886       .372657293834
 103  mdincret  F    2.23188071822       .451473625295
 104  mdincsvc  F    .829331973673       .449373637680
 105  hiincret  F    1.99300897450       .353044567410
 106  hiincsvc  F    .926117109361       .336472123072
 107  msincret  F    12.9905793043       230.973931968
 108  msincsvc  F    12.3427816999       230.973338465
  -1

MOD      17      MTC-HSR Recreatio n+Other LONG Model
Created by ALOGIT version 4                            22:23:50 on  2 Aug 06
END
   1  mlogsum   T    .053400000000
   2  distance  F   -.306076104746E-01   .262542631716E-02
   3  distsqu   F    .864978730176E-04   .803787284904E-05
   4  distcub   F   -.701570934659E-07   .739311402532E-08
   6   durban   F    .809717689013       .856089130955E-01
   7   drural   F    .607129381143       .891644979760E-01
   8   urburb   F   -.963866897682E-01   .120757908789
   9   subsub   F   -.291527859901E-01   .101506354168
  10   rurrur   F   -.357590898832E-01   .117754324605
  41 AMBAG          0.1833
  42 CC          1.3342
  43 FN          -0.839
```

```
  44 FM          -0.1504
  45 Kern          0.5223
  46 Merced          -0.0942
  47 SSJ          0.5465
  48 SACOG          0
  49 SANDAG          -4.3954
  50 SJ          -0.3754
  51 Stan          -1.426
  52 WSN          0.407
  53 MTC          5
  54 MTC          5
  55 MTC          5
  56 MTC          5
  57 MTC          5
  58 MTC          5
  59 MTC          5
  60 SCAG          5
  61 SCAG          5
  62 SCAG          5
  63 SCAG          5
  64 SCAG          5
  65 SCAG          5
  71 mtcscag          -6.4
  72 mtcsandag          3.6322
  73 sacogscag          -1.2741
  74 sacogsand          8
  75 scagmtc          -6.4
  76 scagsacog          -1.2741
  77 sandagmtc          3.6322
  78 sandagsac          8
  79 mtcsacog          0.5322
  80 sacogmtc          0.5322
  81 scagsandag          8.0982
  82 sandagscag          8.0982
   0   L_S_M    T    1.00000000000       .000000000000
 101  loincret  F   -.410012673898E-01   .334286902455
 102  loincsvc  F   -1.25005087263       .344538882859
 103  mdincret  F   -.162726763894       .455793285576
 104  mdincsvc  F   -.985011054130       .299787523565
 105  hiincret  F    .325559876968       .408801283294
 106  hiincsvc  F   -.933121103768       .394550598184
 107  msincret  F   -6.85144317306      125.477475560
 108  msincsvc  F   -.835940647681       .591174063590
  -1

MOD      18      MTC-HSR BUSINE    SS-SHORT Model
Created by ALOGIT version 4                            19:36:11 on  2 Aug 06
END
   1  mlogsum   T    .331900000000
   2  distance  F   -.129873769130       .355595659630E-01
   3  distsqu   F    .155084741916E-02   .686368097435E-03
   4  distcub   F   -.666312870653E-05   .403752064709E-05
   6   durban   F    .760347994599       .199639604795
   7   drural   F    .356764222605E-01   .197811689858
   8   urburb   F   -.498668784739       .304954080235
   9   subsub   F    .252874157067       .226353359864
  10   rurrur   F   -.504559271327       .273681769279
```

```
  41 AMBAG          -0.2445
  42 CC          -2.5528
  43 FN          4.2944
  44 FM          -0.4407
  45 Kern          0.2741
  46 Merced          -1.4348
  47 SSJ          -0.0078
  48 SACOG          0
  49 SANDAG          -3.1823
  50 SJ          0.5557
  51 Stan          0.2438
  52 WSN          1.634
  53 MTC          -0.2746
  54 MTC          0.2653
  55 MTC          0.1175
  56 MTC          -0.1086
  57 MTC          -0.0096
  58 MTC          -0.2444
  59 MTC          -0.2181
  60 SCAG          -2.2261
  61 SCAG          -3.6169
  62 SCAG          -3.1387
  63 SCAG          -3.7639
  64 SCAG          -2.2261
  65 SCAG          -3.0721
  71 mtcscag          0
  72 mtcsandag          0
  73 sacogscag          0
  74 sacogsand          0
  75 scagmtc          0
  76 scagsacog          0
  77 sandagmtc          0
  78 sandagsac          0
  79 mtcsacog          2.7003
  80 sacogmtc          2.7003
  81 scagsandag          -1.0785
  82 sandagscag          -1.0785
   0   L_S_M    T    1.00000000000       .000000000000
 101  loincret  F    .378325421872E-01   1.07422036575
 102  loincsvc  F    1.22842097867       .593165990483
 103  mdincret  F    .717944266087       .611459238036
 104  mdincsvc  F   -.566541871349E-01   .498542988158
 105  hiincret  F    3.14606659225       1.00314004276
 106  hiincsvc  F    1.00167530617       1.12599614208
 107  msincret  F    .566831901188       .876521533572
 108  msincsvc  F   -1.59225991550       2.23327517263
  -1

MOD      19      MTC-HSR COMMUTE   -SHORT Model
Created by ALOGIT version 4                            19:59:06 on  2 Aug 06
END
   1  mlogsum   T    .331900000000       .000000000000
   2  distance  F   -.129755997516       .214219521772E-01
   3  distsqu   F    .115482230443E-02   .424146306759E-03
   4  distcub   F   -.452088533779E-05   .255500551787E-05
   6   durban   F    .872129579645       .117928342461
   7   drural   F    .126061922760       .116750598636
```

```
   8   urburb   F   -.186988780833E-01   .157914396272
   9   subsub   F   -.552548432712E-01   .137397611024
  10   rurrur   F   -.754841730120E-01   .163476772108
  41 AMBAG          -5.7298
  42 CC          -11.1363
  43 FN          0.8053
  44 FM          -7.2717
  45 Kern          -12.241
  46 Merced          -7.2677
  47 SSJ          -2.1527
  48 SACOG          0
  49 SANDAG          -13.23
  50 SJ          0.4741
  51 Stan          -0.3516
  52 WSN          0.3857
  53 MTC          0.8163
  54 MTC          1.2544
  55 MTC          1.1294
  56 MTC          0.4466
  57 MTC          0.961
  58 MTC          0.3245
  59 MTC          1.4534
  60 SCAG          -9.2739
  61 SCAG          -10.9905
  62 SCAG          -1.8747
  63 SCAG          -9.9196
  64 SCAG          -9.2739
  65 SCAG          -9.4051
  71 mtcscag          0
  72 mtcsandag          0
  73 sacogscag          0
  74 sacogsand          0
  75 scagmtc          0
  76 scagsacog          0
  77 sandagmtc          0
  78 sandagsac          0
  79 mtcsacog          -0.467
  80 sacogmtc          -0.467
  81 scagsandag          0.0954
  82 sandagscag          0.0954
   0   L_S_M    T    1.00000000000       .000000000000
 101  loincret  F    2.28451428621       .625263262355
 102  loincsvc  F    1.10624736614       .666628947111
 103  mdincret  F    1.16170285945       .285429919781
 104  mdincsvc  F    .574175665517E-01   .328101031440
 105  hiincret  F    2.32788980001       .380825584419
 106  hiincsvc  F    1.11411134938       .378849179693
 107  msincret  F    .810615143918       .637804472386
 108  msincsvc  F   -.249426113013       .710547194453
  -1

MOD      20      MTC-HSR Recreatio n Short Model
Created by ALOGIT version 4                              0:11:56 on  3 Aug 06
END
   1  mlogsum   T    .331900000000
   2  distance  F   -.166492532483       .210911895899E-01
   3  distsqu   F    .139115624921E-02   .425132887262E-03
```

```
   4  distcub   F   -.296773488444E-05   .256292290724E-05
   6   durban   F    .501733157889       .132927557377
   7   drural   F    .814392313815E-01   .136381052343
   8   urburb   F   -.141880986240       .193953496211
   9   subsub   F    .506474896286E-01   .156431620686
  10   rurrur   F    .335685453547       .177181104767
  41 AMBAG          5.3663
  42 CC          -4.1681
  43 FN          11.1214
  44 FM          2.2259
  45 Kern          -5.4572
  46 Merced          2.3322
  47 SSJ          3.9379
  48 SACOG          0
  49 SANDAG          -3.5181
  50 SJ          4.4123
  51 Stan          4.8938
  52 WSN          5.2839
  53 MTC          1.6012
  54 MTC          2.2944
  55 MTC          2.8305
  56 MTC          0.8779
  57 MTC          1.2878
  58 MTC          2.2959
  59 MTC          1.5247
  60 SCAG          4.2654
  61 SCAG          2.9308
  62 SCAG          -1.2074
  63 SCAG          2.438
  64 SCAG          3.2743
  65 SCAG          3.6632
  71 mtcscag          0
  72 mtcsandag          0
  73 sacogscag          0
  74 sacogsand          0
  75 scagmtc          0
  76 scagsacog          0
  77 sandagmtc          0
  78 sandagsac          0
  79 mtcsacog          7.1403
  80 sacogmtc          7.1403
  81 scagsandag          0.7464
  82 sandagscag          0.7464
   0   L_S_M    T    1.00000000000       .000000000000
 101  loincret  F    .148659149297       .464041690024
 102  loincsvc  F   -2.67441258642      2.56996789270
 103  mdincret  F   -.108406199158       .501007176257
 104  mdincsvc  F   -.716011746674       .365391456857
 105  hiincret  F   -.156641815377       .693039517018
 106  hiincsvc  F   -1.77750320733      1.28838579938
 107  msincret  F    .629920159408       .775644559000
 108  msincsvc  F   -1.16736268719      1.46182420772
  -1

MOD      21      MTC-HSR Other-    SHORT Model
Created by ALOGIT version 4                            20:53:02 on  2 Aug 06
END
```

1	mlogsum	T	.331900000000	
2	distance	F	-.103767836189	.257576301680E-01
3	distsqu	F	.605742784407E-03	.537203973246E-03
4	distcub	F	-.112726281244E-05	.336109431038E-05
6	durban	F	.419350150545	.181804706982
7	drural	F	.189737005047	.171157560980
8	urburb	F	.456563282445	.237353113018
9	subsub	F	-.156767898187E-01	.197638493232
10	rurrur	F	.244676475524	.235484242367
41	AMBAG		6.909	
42	CC		-0.4686	
43	FN		15.8674	
44	FM		4.798	
45	Kern		-0.5856	
46	Merced		2.3068	
47	SSJ		3.9476	
48	SACOG		0	
49	SANDAG		-2.1712	
50	SJ		4.9147	
51	Stan		4.1515	
52	WSN		4.6007	
53	MTC		2.1743	
54	MTC		2.3108	
55	MTC		1.166	
56	MTC		1.1404	
57	MTC		1.5877	
58	MTC		2.0104	
59	MTC		2.3977	
60	SCAG		4.5493	
61	SCAG		2.6648	
62	SCAG		-2.2575	
63	SCAG		2.4556	
64	SCAG		4.4368	
65	SCAG		3.7485	
71	mtcscag		0	
72	mtcsandag		0	
73	sacogscag		0	
74	sacogsand		0	
75	scagmtc		0	
76	scagsacog		0	
77	sandagmtc		0	
78	sandagsac		0	
79	mtcsacog		10.3682	
80	sacogmtc		10.3682	
81	scagsandag		-2.3621	
82	sandagscag		-2.3621	
0	L_S_M	T	1.00000000000	.000000000000
101	loincret	F	-10.1952434281	221.405278980
102	loincsvc	F	-1.47816978613	.625747863995
103	mdincret	F	-11.1121079903	295.098041441
104	mdincsvc	F	-.987043321777	.445548796678
105	hiincret	F	1.00689082382	.546458325371
106	hiincsvc	F	-1.00223949436	1.18725455571
107	msincret	F	.285848345950	.811108026364
108	msincsvc	F	-11.5372859484	224.665203404
-1				

```
MOD 22   Business Trips - Long (PERS)
Created by ALOGIT version 4                               13:16:51 on 27 Jul 06
END
   1   regacc   F   -.217014327221
   2  slogsum   T    .000000000000       .000000000000
   3  llogsum   F   .123149717245
   4  hhsizen   T    .000000000000       .000000000000
   5   onephh   T    .000000000000       .000000000000
   6  threephh  T    .000000000000       .000000000000
   7   medinc   F    .526640496134       .347793049078
   8  highinc   F    1.13868756858       .374704786584
   9  missinc   F    .954736717590       .412344781620
  10   nocars   T    .000000000000       .000000000000
  11  carsltw   F   -.412116808341       .393581369684
  12  wkrspps   F    .537110885157       .290214739629
  13   sacog    F    0.2342
  14   sandag   F   -0.1735
  15    mtc     F   -0.6830
  16   nowkrs   F   -2.09842377476       .614992742601
  17    scag    F   -0.2735
  21   const1   F   -4.6107
  22   const2   F   -5.2468
  -1

MOD 23 Commute Trips - Long (PERS)
Created by ALOGIT version 4                               13:17:36 on 27 Jul 06
END
   1   regacc   F   -.217014327221
   2  slogsum   T    .000000000000       .000000000000
   3  llogsum   F    .123149717245
   4  hhsizen   T    .000000000000       .000000000000
   5   onephh   T    .000000000000       .000000000000
   6  threephh  T    .000000000000       .000000000000
   7   medinc   F    .188124881671       .232435424189
   8  highinc   F    .291022037242       .259121254790
   9  missinc   F    .340036808289       .296655761602
  10   nocars   T    .000000000000       .000000000000
  11  carsltw   F   -.457438897375       .279556614405
  12  wkrspps   F    1.27409936346       .219693649671
  13   sacog    F    0.0107
  14   sandag   F   -0.3420
  15    mtc     F   -1.4211
  16   nowkrs   F   -2.66762574523       .726804770209
  17    scag    F   -0.9481
  21   const1   F   -2.6735
  22   const2   F   -4.1097
  -1

MOD 24 Recreation Trips - Long (PERS)
Created by ALOGIT version 4                               13:18:22 on 27 Jul 06
END
   1   regacc   F   -.217014327221
   2  slogsum   T    .000000000000       .000000000000
   3  llogsum   F    .123149717245
   4  hhsizen   T    .000000000000       .000000000000
   5   onephh   T    .000000000000       .000000000000
   6  threephh  F   -.482254230855       .123297035914
```

```
   7   medinc   T    .000000000000       .000000000000
   8  highinc   F   -.246365017856       .183581399099
   9  missinc   F    .282129533695       .218818600058
  10   nocars   T    .000000000000       .000000000000
  11  carsltw   F   -.921776485690       .383961737815
  12  wkrspps   T    .000000000000       .000000000000
  13   sacog    F    1.8073
  14   sandag   F    1.2857
  15    mtc     F    3.0022
  16   nowkrs   T    .000000000000       .000000000000
  17    scag    F    1.5707
  21   const1   F   -4.5175
  22   const2   F   -6.0809
  -1

MOD 25  Other Trips - Long (PERS)
ONE             1     -0.4049      0.6533     -0.62    0.5354
Created by ALOGIT version 4                             13:19:01 on 27 Jul 06
END
   1   regacc   F   -.217014327221
   2  slogsum   T    .000000000000       .000000000000
   3  llogsum   F    .123149717245
   4  hhsizen   T    .000000000000       .000000000000
   5   onephh   F   -.423606544905       .214765600563
   6  threephh  F   -.378471999830       .137078841487
   7   medinc   T    .000000000000       .000000000000
   8  highinc   F    .393078900615       .189833611395
   9  missinc   F    .157909987582       .241105005674
  10   nocars   T    .000000000000       .000000000000
  11  carsltw   F   -.915245734022       .416235795176
  12  wkrspps   T    .000000000000       .000000000000
  13   sacog    F   4.0798
  14   sandag   F    3.6853
  15    mtc     F   4.6764
  16   nowkrs   F    .371828622702       .151786990932
  17    scag    F   3.8985
  21   const1   F   -8.5096
  22   const2   F   -9.8395
  -1

MOD 26   Business Trips - Short
Created by ALOGIT version 4                             13:19:44 on 27 Jul 06
END
   1   regacc   F   -.176327969323
   2  slogsum   F    .262277530903
   3  llogsum   T    .000000000000       .000000000000
   4  hhsizen   T    .000000000000       .000000000000
   5   onephh   T    .000000000000       .000000000000
   6  threephh  T    .000000000000       .000000000000
   7   medinc   F    .331110968281       .265728631569
   8  highinc   F    .835109937368       .271035746713
   9  missinc   F    .445653821523       .320794044311
  10   nocars   T    .000000000000       .000000000000
  11  carsltw   F   -.947084080843       .387854839899
  12  wkrspps   F    1.15263231354       .231815741949
  13   sacog    F   -0.6531
  14   sandag   F   -0.1212
```

```
  15    mtc     F   -0.8982
  16   nowkrs   F   -.862697929971       .350275969474
  17    scag    F   -2.0018
  21   const1   F   -4.6139
  22   const2   F   -5.1815
  -1

MOD 27   Commute Trips - Short
Created by ALOGIT version 4                          13:20:25 on 27 Jul 06
END
   1   regacc   F   -.176327969323
   2  slogsum   F    .262277530903
   3  llogsum   T    .000000000000       .000000000000
   4  hhsizen   T    .000000000000       .000000000000
   5   onephh   T    .000000000000       .000000000000
   6  threephh  T    .000000000000       .000000000000
   7   medinc   F    1.04466952845       .174902551190
   8  highinc   F    1.52282830294       .176623480143
   9  missinc   F    .696045362768       .205088261024
  10   nocars   T    .000000000000       .000000000000
  11  carsltw   F   -.225134908225       .142513005938
  12  wkrspps   F    1.56981123955       .120607981146
  13   sacog    F   -0.8159
  14   sandag   F   -1.6731
  15    mtc     F   -2.2157
  16   nowkrs   F   -2.16265342523       .366206369970
  17    scag    F   -2.4058
  21   const1   F   -3.0623
  22   const2   F   -3.8896
  -1

MOD 28   Recreation Trips - Short
Created by ALOGIT version 4                          13:21:06 on 27 Jul 06
END
   1   regacc   F   -.176327969323
   2  slogsum   F   .262277530903
   3  llogsum   T    .000000000000       .000000000000
   4  hhsizen   F   -.135622998278      .389184624154E-01
   5   onephh   F   -.401364354013       .156656580976
   6  threephh  T    .000000000000       .000000000000
   7   medinc   F    .355448576214       .140956481711
   8  highinc   F    .432335064578       .154688342337
   9  missinc   F    .137250753592       .174400182523
  10   nocars   F   -1.26955586328       .509615501185
  11  carsltw   T    .000000000000       .000000000000
  12  wkrspps   T    .000000000000       .000000000000
  13   sacog    F    -2.3649
  14   sandag   F    -1.7673
  15    mtc     F    -1.8337
  16   nowkrs   F    -.493343018632       .102968895583
  17    scag    F    -0.8794
  21   const1   F    -2.9583
  22   const2   F    -3.8642
  -1
MOD 29   Other Trips - Short
Created by ALOGIT version 4                          13:21:44 on 27 Jul 06
END
```

1	regacc	F	-.176327969323	
2	slogsum	F	.262277530903	
3	llogsum	T	.000000000000	.000000000000
4	hhsizen	T	.000000000000	.000000000000
5	onephh	T	.000000000000	.000000000000
6	threephh	T	.000000000000	.000000000000
7	medinc	T	.000000000000	.000000000000
8	highinc	T	.000000000000	.000000000000
9	missinc	T	.000000000000	.000000000000
10	nocars	F	-.735953989716	.451474100358
11	carsltw	T	.000000000000	.000000000000
12	wkrspps	T	.000000000000	.000000000000
13	sacog	F	-3.1808	
14	sandag	F	-1.1565	
15	mtc	F	-3.3057	
16	nowkrs	T	.000000000000	.000000000000
17	scag	F	-0.4670	
21	const1	F	-3.7979	
22	const2	F	-4.5752	
-1				

Exhibit C

Transportation leadership you can trust.

Memorandum

TO: Nick Brand

FROM: George Mazur

DATE: January 29, 2010

RE: Final Coefficients and Constants in HSR Ridership & Revenue Model

---

The seven (7) attached tables provide the final coefficients and constants in the high-speed rail (HSR) ridership and revenue model, which was developed by Cambridge Systematics under contract to the Metropolitan Transportation Commission (MTC). These tables supersede information presented in the Task 5a report (*Interregional Model System Development*), dated August 2006.

The Task 5a report listed the model coefficients and constants as they existed after the preliminary estimation and calibration effort. As is normally the case, additional calibration and validation efforts led to changes in model structure, variables, and the values of coefficients and constants. These changes continued until the model structure was finalized in April 2007. There have been no changes to these model elements since April 2007. The client, MTC, elected not to update the Task 5a report nor to include the final coefficients and constants in the final project report.

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Oakland, CA 94607
tel 510 873 8700 www.camsys.com fax 510 873 8701

Exhibit D

Memorandum

To: David Schonbrunn, TRANSDEF
From: Norm Marshall
Subject: California High-speed Rail Model Coefficients Review
Date: April 26, 2010

I have reviewed the "final coefficients and constants in the HSR Ridership & Revenue Model" attached to the memorandum from George Mazur of Cambridge Systematics to Nick Brand dated January 29, 2010, plus March 2010 memos from Mazur and from the California High-Speed Rail Authority, and Bay Area/California High-Speed Rail Ridership and Revenue Study reports from the period 2005-2007.

As described in the March 2010 memo from the California High-Speed Rail Authority, a travel demand model was used to develop ridership and revenue forecasts:

> A travel demand model is a tool for making predictions about people's travel patterns. A model consists of a series of mathematical equations that produce forecasts of the number, origin and destination, travel mode, and travel route for trips as a function of variables such as population and employment, travel time and cost, fuel costs, rail and airline schedules, and a number of other variables. The mathematical equations in the model include coefficients and constants that describe the importance of each input variable in a traveler's decisions regarding the number of trips, destination, travel mode, and travel route. Typically, the mathematical equations, including the constants and coefficients, reside in computer software files that are used to apply the model. In applying the model, assumed values for the variables are input to the model, and the computer software applies the mathematical equations to these assumed values in order to make travel predictions. In the following [comments], the word "model" specifically refers to the mathematical equations, including the coefficients and constants, and does not include the assumed values that are input to the model.[1]

Based on my expertise and experience as documented in the attached C.V., I find:

1) The model coefficients used in developing the ridership and revenue forecasts are different than those disclosed to the public during the 2007 environmental review period.

2) The final frequency (headway) coefficients used in developing the ridership and revenue forecasts are invalid.

3) The use of these invalid frequency (headway) coefficients biases the alternatives analyses in favor of the Pacheco Alignment (P1) as compared to the Altamont alignment (A1).

4) Mode-specific constants were misrepresented during the public review process.

5) The mode-specific constants in the final model that were used to forecast ridership and revenue are invalid.

I provide support for these findings in the sections below.

[1] Memorandum from George Mazur to Mehdi Morshed, Executive Director of the California High-Speed Rail Authority regarding "tHigh-Speed Rail Ridership and Revenue Model, p. 1, March 3, 2010.

High-speed Rail Model Misrepresented to Public during the Environmental Review Process

The California High-Speed Rail ridership and revenue forecasts are derived directly from a set of computer models. Information about these models was presented to the public in a series of project publications published between 2005 and 2007.[2] In 2010, it was disclosed that the final project reports misrepresented the model that was used to develop the ridership and revenue forecasts. Many model coefficients were different between the published model and the model that was applied, but I focus on two set of coefficients that are particularly significant – 1) coefficients related to train service frequency, and 2) mode-specific constants that capture any bias between the attractiveness of different travel modes (auto, high-speed rail, conventional rail and air) that is not captured in other model variables.

An important attribute of high-speed rail service is the frequency of service. If all other things are equal, higher frequency (trains more often) will attract higher ridership. The critical modeling question is: how much higher ridership? Answering this question was a focus of the survey and model development process. When urban transit service is frequent, e.g. every 10 minutes, modelers assume that travelers will arrive randomly without attention to the schedule. With 10-minute frequency, also referred to as a 10-minute headway, modelers assume an average wait time of one half the headway, or 5 minutes. With less frequent scheduled service, and particularly with service where advance ticket purchase is likely or even required (including air travel), travelers do not arrive randomly between departures. The summary of the second (and final) peer review meeting in June 2006 states:

> Frequency is included in the mode choice models directly rather than the traditional wait times, calculated as half the headway, because frequency has a different impact on interregional travel than it does on urban travel. Wait times were estimated separately based [on] direction from the peer review panel:[3]

As a result, the magnitude of the frequency effect was estimated from an extensive traveler survey. In March 2010, the California High-Speed Rail Authority reiterated the importance of the survey work, stating:

> Model development was supported by new transportation survey data and existing data from regional transportation agencies, the census, and other sources. The new survey effort included over 10,000 "stated-preference choice exercises" that allow the resulting model to predict travel demand for the new high-speed rail travel option. All aspects of this survey effort, including the sampling plan, followed state-of-the-practice guidelines and were vetted through peer review. The new transportation surveys are discussed in High-Speed Rail Study Survey Documentation (December 2005).[4]

---

[2] I have reviewed several of these reports including: *Findings from Second Peer Review Panel Meeting: Final Report* (July 2006), *Interregional Model System Development: Final Report* (August 2006), *Statewide Model Validation Final Report* (July 2007), *Ridership and Revenue Forecasts: Final Report* (July 2007), and *Findings from First [sic] Peer Review Panel Meeting* (actually third peer review report with no meeting, September 2007).

[3] Cambridge Systematics, Inc. with Mark Bradley Research and consulting and SYSTRA Consulting, Inc. Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study: *Findings from Second Peer Review Panel Meeting: Final Report*, p. 4-14, July 2006.

[4] Morshed 2010, p. 2.

The frequency (headway) coefficients estimated from the survey data indicate that:

> "The value of frequency (headway) is significant for all segments, but is only about 20 percent as large as the in-vehicle time coefficient." (Final model development report [also called "Task 5a report"], August 2006).[5]

This same exact sentence is replicated in the project final report and in a recent peer-reviewed journal article about the modeling.

> "The value of frequency (headway) is significant for all segments, but is only about 20 percent as large as the in-vehicle time coefficient." (Final project report, July 2007)[6]

> "The value of frequency (headway) is significant for all segments, but is only about 20 percent as large as the in-vehicle time coefficient." (Peer-reviewed journal article published in March 2010)[7]

This 20 percent value is reasonable. It implies that adding an additional one hour between train departures will have the same effect on ridership as increasing the travel time on the train by 12 minutes. The question as to what values are reasonable will be discussed in greater depth in the "High-Speed Rail Model Coefficients are Invalid" section below.

Details in the August 2006 final model report provide detailed model coefficients, and indicate for long distance trips, the ratio of the frequency coefficient to the in-vehicle time coefficient is 0.21 for work trips and 0.24 for other trips. (Table 3-15, p. 3-37) These numbers are a more precise presentation of the information provided in the July 2007 project final report as "about 20 percent."

The first instance where any information was provided to the public that was different than "about 20 percent" was in a January 29, 2010 memo.[8] Attached to this memo were model coefficients that were very different from those presented earlier, and also inconsistent with the model description in the July 2007 final project report. The January 2010 information does not state so explicitly, but it can be inferred that instead of basing the frequency coefficients on the survey data, it instead was assumed that the ratio between frequency and in-vehicle time was 100%, or about 5 times as much as indicated by the survey data.[9] The memo also states that: "The client, MTC, elected not to update the Task 5a report nor to include the final coefficients and constants in the final project report."

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[5] Cambridge Systematics, Inc. with Mark Bradley Research and Consulting, Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study: *Interregional Model System Development: Final Report*, p. 3-36, August 2006.

[6] Cambridge Systematics, Inc. with Corey, Canapary & Glanis, Mark Bradley Research and Consulting, HLB Decision Economics, Inc., SYSTRA Consulting, Inc., and Citilabs. Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study: Final Report, p. 5-7, July 2007.

[7] Outwater, Maren, Kevin Tierney, Mark Bradley, Elizabeth Sall, Arun Duppam and Vamsee Modugula. "California Statewide Model for High-Speed Rail", p. 74, Journal of Choice Modelling, March 2010, 3(1) pp. 58-83.

[8] Memo, George Mazur of Cambridge Systematics to Nick Brand re "Final Coefficients and Constants in HSR Ridership and Revenue Model, January 29, 2010

[9] The coefficients attached to the January 29, 2010 Mazur memo included one case where the ratio was 1000%, but the California High-Speed Rail Authority later indicated that was a typographical error.

In the March 2010 California High-Speed Rail Authority memo cited earlier, Morshed makes an unsupported assertion that the information was somehow available to the public earlier.

> While the final constants and coefficients had not been compiled into summary table format prior to the January 29, 2010 memorandum, the information contained in the tables has been publicly available in a different form since 2007.

One can only speculate as to what is intended by this statement, but it appears to be a reference to the model itself; i.e. if the public suspected that the model was inconsistent with the published reports, that the model could have been requested and examined. Even in this scenario, discovering the discrepancies would have been a significant undertaking for the public. As the California High-Speed Rail Authority itself stated when transmitting the January 2010 memo and correct coefficients:

> "… this material as presented did not previously exist and significant amounts of sub-consultant staff time went into preparing it."[10]

In reality, the correct model information simply was not available to the public until 2010. There clearly was ample time within the environmental review process to properly disclose the model information. The March 2010 California High-Speed Rail Authority memo states that there were no changes to model coefficients after February 7, 2007.[11] Nevertheless, the July 2007 project final report restates the 20 percent ratio. There also are no mentions of any coefficient changes in the September 2007 third peer review report.[12] This suggests that even the peer reviewers were not informed about the changes. Table 1 summarizes the entire chronology.

[10] Morshed 2010, p. 2-3.

[11] Morshed 2010, p. 2

[12] Cambridge Systematics, Inc.. Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study: *Findings from First [sic] Peer Review Panel Meeting*, September 2007.

Table 1: Chronology of Disclosure of Frequency Coefficient Information

Date	Document	Frequency/in-vehicle time ratio info
July 2006	2nd Peer Review meeting report	Estimate frequency coefficient rather than using half the headway
August 2006	Interregional Model System Development Final Report	"about 20 percent as large as the in-vehicle time coefficient" and ratios of 0.21 for long work trips and 0.24 for long other trips
February 2007	Morshed 2010, p. 2	Date when Cambridge Systematics and California High-speed Rail Authority state that coefficients were finalized
July 2007	Overall Final Report	"about 20 percent as large as the in-vehicle time coefficient"
September 2007	3rd Peer Review report (no meeting)	No mention of issue
March 2008	Journal article submitted	Presumably includes text and table numbers same as in March 2010 published version
December 2008	Journal article revisions submitted	Presumably includes text and table numbers same as in March 2010 published version
January 29, 2010	Cambridge Systematics memo	Discloses coefficients showing headway/in-vehicle time ratios of 1.0 and 10.0
March 2010	Journal article published	"about 20 percent as large as the in-vehicle time coefficient" and table with 0.21 and 0.24
March 3, 2010	Cambridge Systematics memo	Highlights typographical error in January 29 memo
March 3, 2010	California High-speed Rail Authority memo	States that "procedures, coefficients, and constants have remained unchanged since February 7, 2007"

Prior to 2010, the mathematical underpinnings of the HSR ridership and revenue forecasts were never disclosed to the public or to regulatory authorities, creating the false presumption that the previously documented coefficients and constants had been used to develop the forecasts.

High-speed Rail Model Coefficients are Invalid

As discussed above, the report from the second peer review meeting described estimating the frequency coefficients from the survey data, independent of headway/wait time. This June 2006 meeting was attended by nine peer review members:

- Ayalew Adamu (California Department of Transportation (Caltrans) Headquarters);
- Jean-Pierre Arduin (independent consultant);
- Chris Brittle (independent consultant representing MTC);
- Billy Charlton (San Francisco County Transportation Authority (SFCTA));
- Kostas Goulias (University of California at Santa Barbara);
- Keith Killough (Southern California Association of Governments (SCAG));
- Frank Koppelman (Northwestern University);
- Chausie Chu (Los Angeles County Metropolitan Transportation Authority (Metro)); and
- Kazem Oryani (URS Corporation).[13]

Especially notable in this group is Frank Koppelman who is a leading expert in mode choice modeling from stated preference data. Koppelman and Bhat have authored a guide to model estimation from which two short excerpts are reprinted below. The first excerpt discusses the use of ratios in model testing.

> The ratio of the estimated travel time and travel cost parameters provides an estimate of the value of time implied by the model; this can serve as another important informal test for evaluating the reasonableness of the model… Similar ratios may be used to assess the reasonableness of the relative magnitudes of other pairs of parameters. These include out of vehicle time relative to in vehicle time, travel time reliability (if available) relative to average travel time, etc.[14]

The focus on the ratio between frequency (headway) and in-vehicle time is a typical use of this type of reasonableness testing. If the ratio is reasonable, this adds confidence concerning the validity of the model. The second excerpt discusses “constraining” coefficients.

> Two approaches are commonly taken to identify a specification which is not statistically rejected by other models and has good behavioral relationships among variables. The first is to examine a range of different specifications in an attempt to find one which is both behaviorally sound and statistically supported. The other is to constrain the relationships between or among parameter values to ratios which we are considered reasonable. The formulation of these constraints is based on the judgment and prior empirical experience of the analyst. Therefore, the use of such constraints imposes a responsibility on the analyst to provide a sound basis for his/her decision. The advice of other more experienced analysts is often enlisted to expand and/or support these judgments.[15]

[13] Cambridge Systematics et. al. July 2007, p. ES1 – ES2.

[14] Koppelman, Frank S. and Chandra Bhat. A Self Instructing Course in Mode Choice Modeling: Multinomial and Nested Logit Models, p. 78-79. Prepared for U.S. Department of Transportation, Federal Transit Administration 2006.

[15] Koppelman and Bhat 2006, p. 112.

In the original model, the estimated frequency (headway) coefficients were all highly statistically significant[16], so lack of statistical fit was not a basis for constraining the coefficients. Nevertheless, in the final California High-Speed Rail model, the frequency (headway) coefficients were constrained to 100 percent of the in-vehicle time coefficient. This implies that the effect of an additional hour between train departures on ridership is just as great as an additional hour on the train. This is contrary to common sense, and if true, would cancel out much of the rationale of high-speed train service. Instead, it likely would be cheaper just to add more frequent conventional train service. If the survey data resulted in this 100 percent ratio, it would be necessary to give it some credence, but as discussed above, the survey data indicate the ratio to be about 20 percent, or one fifth as great. As in the Koppelman and Bhat excerpt, constraining a coefficient rather than estimating it " imposes a responsibility on the analyst to provide a sound basis for his/her decision." No such "sound basis" has been provided anywhere, even to this day.

In the journal article published in 2010, a sentence was added that did not appear in an earlier draft or in similar paragraphs in earlier project reports. After the sentence about the 20 percent ratio, it states:

> This coefficient was constrained to match in-vehicle time based on comments from the peer review panel.[17] (p. 74)

This statement cannot be reconciled with the timeline presented in Table 1. The second peer review meeting was in June 2006, and no such comments are included there. There were no further peer review meetings. Only three of the nine who attended the June 2006 meeting participated in email communications summarized in the third peer review report, and Koppelman was not one of those who participated. The third peer review report contains nothing concerning this issue.

To summarize this section:

1) The final model includes an assumption that the time between trains is just as important as the time on the train in determining ridership.

2) There is no documentation for this assumption and no basis provided for it.

3) The assumption is contrary to the empirical results obtained from a large survey conducted at great cost for this project.

4) The assumption violates both common modeling practice and common sense.

5) The technical authors continued to publish the original coefficients in a refereed journal article[18] after the model had been changed.

6) The final coefficients used in developing the ridership and revenue forecasts are invalid.

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[16] Cambridge Systematics, Inc. with Mark Bradley Research and Consulting, August 2006, Table 3-15, p. 3-37.

[17] Outwater et. al. 2010, p. 74.

[18] Outwater et. al. 2010, p. 75, Table 5 and Footnote 3.

Invalid High-Speed Rail Model Coefficients Biased Comparison of Alternatives

The Altamont alternative (A1) was modeled with trains divided between San Jose and San Francisco destinations. Therefore, this alternative has lower frequency (higher headways) on the northern end than the Pacheco alternative (P1). The ridership and revenue study identified this factor as a primary cause for the lower ridership forecast for the Altamont Alternative as compared to the Pacheco alternative.

> The annual boardings forecast for the Altamont and Pacheco baseline HST alternatives are presented in Table 2.1. Overall the Pacheco alternative (P1) has higher projected ridership with over 93 million expected annual boardings compared to 87.9 million for the Altamont alternative (A1). The preference of the P1 alternative is most pronounced in the Bay Area and Southern California due to quicker travel times between these two regions. The Altamont alternative suffers from the division of service between San Jose and San Francisco termini once trains enter the Bay Area. The split effectively doubles the average train headways into and out of the Bay Area for individual stations resulting in decreased ridership. The Altamont Alternative produces more boardings in the Sacramento and Stockton area due to shorter travel time to the Bay Area compared to the Pacheco Alternative.[19]

As discussed above, the frequency (headway) effect in the final model is five times as great as indicated by the survey data or in the model information presented to the public during the environmental review process. This results in underestimated ridership for the Altamont alternative (A1) relative to the Pacheco alternative (P1). These biased ridership and revenue numbers contributed to the selection of the P1 alternative over the A1 alternative.

Mode-Specific Constants Were Misrepresented during the Public Review Process

The mode choice model determines how passengers travel based on the relative attractiveness of each alternative mode: auto, conventional rail, high-speed rail and air travel. Ideally, all of the differences between modes can be expressed as a function of service attributes including travel time and travel cost. In practice, there always are some residual effects between modes that are not captured in the service attributes. These residual effects are incorporated into the model as mode-specific constants. It is preferable that the constants do not dominate the model. This can be tested by dividing the mode-specific constant by the in-vehicle time coefficient to calculate an equivalent number of minutes. For example, if a mode-specific constant is 60 times the in-vehicle time coefficient (in minutes), it is equivalent to one hour of additional in-vehicle time (abbreviated as IVT equiv.).

[19] Cambridge Systematics, Inc.. Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study: *Ridership and Revenue Forecasts: Final Report*, p. 2-1 -2.2, July 2007.

There are three sets of published mode-specific constants for the California high-speed rail modeling: 1) model development constants (August 2006), 2) validation report constants (July 2007) and 3) the final constants disclosed in January, 2010.

Table 2 presents the mode-specific constants given in the model development report for long commute/business and long recreation/other trips. Table 3 presents the mode-specific constants given in the *Statewide Model Validation* report for these same trip categories. Both tables convert these numbers into the equivalent number of travel minutes. Although there are no firm rules, the magnitude of the Table 3 constants in IVT equivalent minutes appear high relative to that which is desirable, and there is a danger that they may be dominating the service characteristics effects. The magnitude in IVT equivalent minutes is much high in Table 3 than in Table 2. For example, in the case of high speed rail for long-distance business trips, the model penalty relative to auto changed from 22 minutes in model development to 326 minutes in the Model Validation report.

Table 2: Mode-Specific Constants for Long Trips Reported in Model Development Report[20]

	Business/Commute		Recreation/Other	
	constant	IVT equiv. (min.)	constant	IVT equiv. (min.)
Auto (constant 0 by convention)	0	0	0	0
Air	-1.645	103	0.6898	-63
Conventional Rail	-0.387	24	0.6149	-56
High-Speed Rail	-0.3503	22	1.434	-130
Note: in-vehicle time coefficient (minutes)		-0.016		-0.011

Table 3: Mode-Specific Constants for Long Trips Reported in Validation Report[21]

	Business/Commute		Recreation/Other	
	constant	IVT equiv. (min.)	constant	IVT equiv. (min.)
Auto (constant 0 by convention)	0	0	0	0
Air	-7.5062	417	-3.0858	281
Conventional Rail	-3.9738	221	1.6557	-151
High-Speed Rail	-5.8600	326	-0.1807	16
Note: in-vehicle time coefficient (minutes)		-0.018		-0.011

[20] Cambridge Systematics, Inc. with Mark Bradley Research and Consulting, August 2006, Table 3-15, p. 3-37.

[21] Cambridge Systematics, Inc. and Mark Bradley Research and Consulting, August 2006, Table 3.15 p. 3-37.

The final set of mode-specific coefficients for long trips disclosed in January 2010 shown below in Table 4 are very different from those in the July 2007 *Statewide Model Validation* report. According to the California High-Speed Rail Authority, there were no changes to model coefficients and constants after February 2007.[22] Therefore there is no justification for the discrepancy between the validation report and the final coefficients. Note the dramatic changes in the IVT equivalents for the air constants, while the rail alternatives changed only slightly. Also, there were significant changes in the Recreation/Other column for High-Speed Rail.

Table 4: Mode-Specific Constants for Long Trips Disclosed in January 2010[23]

	Business/Commute		Recreation/Other	
	constant	IVT equiv. (min.)	constant	IVT equiv. (min.)
Auto (constant 0 by convention)	0	0	0	0
Air				
High income most* air travel	-4.089	227	0.317	-29
Low income most* air travel	-5.269	293	0.317	-29
Conventional Rail				
High income	-4.007	223	2.010	-183
Low income	-4.620	257	1.272	-116
High-Speed Rail				
High income	-5.610	312	-0.713	65
Low income	-6.757	375	-0.713	65
Note: in-vehicle time coefficient (minutes)		-0.018		-0.011
*99% of modeled air travel uses these or higher mode-specific constants				

[22] Morshed 2010, p. 2.

[23] Mazur 2010.

Unlike the constants in Tables 2 and 3, the constants in Table 4 are different for low-income and high-income travelers. These differences are relatively small. However, there also are larger underlying differences that are too complicated to be illustrated in Table 4. These involve 48 different "dummy variable" adjustment factors for airport pairs (Figure 1).

Figure 1: Airport-to-Airport Dummy Variables in Final Model Coefficients[24]

Table 3.15. Main Mode Choice Models

			Coefficient / Constant Applied for Mode				Long Trip Business / Commute		Long Trip Recreation / Other	
Variable	Acronym	Definition	Car	Air	Conv. Rail	High Speed Rail	Coefficient	t-stat	Coefficient	t-stat
Level of Service Coefficients										
1	cost	Cost ($)	x	x	x	x	-0.017	-12.8	-0.035	-18.5
2	time	In-vehicle time (minutes)	x	x	x	x	-0.018	Constr	-0.011	-14.2
3	reli	Reliability (Percent on time)	x	x	x	x	0.023	Constr	0.005	1.9
4	freq	Service headway (minutes)		x	x	x	-0.179	-191.0	-0.011	-14.7
5	accls	Access mode choice logsum					0.136	3.4	0.204	3.7
6	egrls	Egress mode choice logsum					0.171	3.9	0.399	7.1
7	accls<-5	Access mode choice logsum less than -5? (0/1)								
8	egrls<-5	Egress mode choice logsum less than -5? (0/1)								
9	freq>60	Service headway greater than 60 minutes? (0/1)								
10	reli>90	Reliability greater than 90 percent? (0/1)								
Constants										
104	c-group	Traveling in a group? (0/1)	x				1.086	4.6	1.430	9.1
105	c-nocars	Zero car household? (0/1)	x							
106	c-carslt2	Fewer than 2 cars for household size greater than 1? (0/1)	x						-0.308	-2.3
107	c-hhsize	Household size	x				0.182	1.2	0.296	4.4
108	c-hiinc	High income household? (0/1)	x							
200	a-const	Mode constant		x			-10.269	Constr	-4.683	Constr
207	a-loinc	Low income household? (0/1)		x						
208	a-hiinc	High income household? (0/1)		x			1.180	4.6		
209	a-msinc	Missing income household? (0/1) (for model estimation only)		x						
210	a-group	Traveling in a group? (0/1)		x			-0.356	-2.8	-0.505	-3.7
211	(lax-sfo)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
212	(sfo-lax)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
213	(lax-oak)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
214	(oak-lax)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
215	(lax-sjc)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
216	(sjc-lax)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
217	(lax-sac)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
218	(sac-lax)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
221	(bur-sfo)	Airport interchange served? (0/1)		x			4.151	Constr	4.151	Const
222	(sfo-bur)	Airport interchange served? (0/1)		x			5.363	Constr	5.363	Const
223	(bur-oak)	Airport interchange served? (0/1)		x			2.032	Constr	2.032	Const
224	(oak-bur)	Airport interchange served? (0/1)		x			4.145	Constr	4.145	Const
225	(bur-sjc)	Airport interchange served? (0/1)		x			3.757	Constr	3.757	Const
226	(sjc-bur)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
227	(bur-sac)	Airport interchange served? (0/1)		x			5.602	Constr	5.602	Const
228	(sac-bur)	Airport interchange served? (0/1)		x			1.421	Constr	1.421	Const
231	(ont-sfo)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
232	(sfo-ont)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
233	(ont-oak)	Airport interchange served? (0/1)		x			2.233	Constr	2.233	Const
234	(oak-ont)	Airport interchange served? (0/1)		x			2.269	Constr	2.269	Const
235	(ont-sjc)	Airport interchange served? (0/1)		x			3.263	Constr	3.263	Const
236	(sjc-ont)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
237	(ont-sac)	Airport interchange served? (0/1)		x			5.907	Constr	5.907	Const
238	(sac-ont)	Airport interchange served? (0/1)		x			3.787	Constr	3.787	Const
241	(sna-sfo)	Airport interchange served? (0/1)		x			4.652	Constr	4.652	Const
242	(sfo-sna)	Airport interchange served? (0/1)		x			2.409	Constr	2.409	Const
243	(sna-oak)	Airport interchange served? (0/1)		x			-0.231	Constr	-0.231	Const
244	(oak-sna)	Airport interchange served? (0/1)		x			-2.852	Constr	-2.852	Const
245	(sna-sjc)	Airport interchange served? (0/1)		x			4.348	Constr	4.348	Const
246	(sjc-sna)	Airport interchange served? (0/1)		x			2.963	Constr	2.963	Const
247	(sna-sac)	Airport interchange served? (0/1)		x			3.571	Constr	3.571	Const
248	(sac-sna)	Airport interchange served? (0/1)		x			-1.996	Constr	-1.996	Const
251	(san-sfo)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
252	(sfo-san)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
253	(san-oak)	Airport interchange served? (0/1)		x			1.704	Constr	1.704	Const
254	(oak-san)	Airport interchange served? (0/1)		x			1.952	Constr	1.952	Const
255	(san-sjc)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
256	(sjc-san)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
257	(san-sac)	Airport interchange served? (0/1)		x			5.000	Constr	5.000	Const
258	(sac-san)	Airport interchange served? (0/1)		x			5.686	Constr	5.686	Const

[24] Mazur 2010.

For the less popular air markets, the dummy variable structure suppresses the air share of travel to very small numbers. [25] The inclusion of these widely-variable "fudge factors" calls model validity into question as the model should handle both long and short trips without these adjustments. Would unknown adjustments be needed to match high-speed rail shares?

The *Statewide Model Validation* report states that the model is able to match observed air boardings closely: "The three largest markets match boardings with observed boardings within +/- 2 percent and the overall total air trips match observed boardings within +/- 1 percent."[26] Serious questions are raised about this statement given the revelation that the final mode-specific constants do not match those reported in this report, and that the final mode-specific constants include airport-to-airport adjustment factors. The use of such factors would make achieving a good model fit a trivial exercise, and therefore such a statement would not engender the level of confidence that it otherwise would. Questions include:

- Were the mode-specific constants in the *Statewide Model Validation* report used to produce the base year travel estimates in the *Statewide Model Validation* report?
- If the reported constants were used and were validated, why were they later changed?
- Have the final model constants been validated?
- If the final constants reported in January 2010 were used in the validation effort, then why weren't they reported accurately and why wasn't the use of airport-to-airport adjustment factors disclosed in 2007?

No matter what the answers to these questions are, it is clear that the model constants were not properly disclosed to the public during the environmental review process.

Final Mode-Specific Constants Are Invalid for Forecasting

The final mode-specific constants in Table 4 show high-speed rail as less attractive than either air or conventional rail for both business and non-business travel. Furthermore, the differences are large. For business travelers, the preference for air over high-speed rail is equivalent to 83-85 minutes of travel[27] (depending on income). More inexplicably, the preference for conventional rail over high-speed rail is equivalent to 89-119 minutes. For non-business travelers the preference for air over high-speed rail is 94 minutes, and the preference for conventional rail over high-speed rail is 180-248 minutes. If all three non-auto modes are available (air, conventional rail and high-speed rail), and service characteristics are identical (in-vehicle time, out-of-vehicle time, cost, frequency, etc.), high-speed rail will have the smallest mode share of the three modes modeled.

These numbers make absolutely no sense and cannot be justified by the model development process. The original mode-specific constants (Table 2) showed no such bias against high-speed rail. In the constants estimated from the stated preference data, high-speed rail is <u>more</u> attractive than either conventional rail

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[25] The final model includes a high negative base constant for air that is partially offset by large positive constants for the most popular air markets. These factors vary widely, but the net airport-to-airport air constants in the final model (after adding the base constant to the airport-to-airport dummy) are equal to or higher than the values shown in Table 4 for 99 percent of the modeled air boardings (for all major long distance airport pairs). Most of these interchanges include a dummy adjustment of + 5.0

[26] Cambridge Systematics, Inc. with Mark Bradley Research and Consulting, July 2007, p. 6-3.

[27] Subtract one IVT equivalent from another to see the preference.

or air travel. Compared to conventional rail, the preference for high-speed rail is equivalent to 3 minutes for business travelers and 74 minutes for non-business travelers. Compared to air, the preferences are equivalent to 72 minutes (business) and 67 minutes (non-business).

It is common to adjust mode-specific constants to make models better match base ridership data. Therefore, it was appropriate to adjust the constants for air and conventional rail to match observed mode shares. If those adjustments were significant, it would also have been necessary to adjust the high-speed rail constants as well, but these adjustments need to be consistent across modes. There is no justification for switching high-speed rail from being the most attractive non-auto mode to being the least attractive. It is especially absurd that high-speed rail could be modeled as less attractive than conventional rail if service characteristics were identical. The final model constants are invalid for forecasting.

Conclusions

The California high-speed rail ridership and revenue forecasts used in the selection of a preferred alignment were based on modeling that was misrepresented and that was invalid. Specifically:

1) The model coefficients used in developing the ridership and revenue forecasts are different than those disclosed to the public during the environmental review period.

2) The final frequency (headway) coefficients used in developing the ridership and revenue forecasts are invalid.

3) The use of these invalid frequency (headway) coefficients biases the alternatives analyses in favor of the Pacheco Alignment (P1) as compared to the Altamont alignment (A1).

4) Mode-specific constants were misrepresented during the public review process.

5) The mode-specific constants in the final model that were used to forecast ridership and revenue are invalid.

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Norm Marshall helped found Smart Mobility, Inc. in 2001. Prior to this, he was at Resource Systems Group, Inc. for 14 years where he developed a national practice in travel demand modeling. He specializes in analyzing the relationships between the built environment and travel behavior, and doing planning that coordinates multi-modal transportation with land use and community needs.

Regional Land Use/Transportation Scenario Planning

Chicago Metropolis Plan and Chicago Metropolis Freight Plan (6-county region)— developed alternative transportation scenarios, made enhancements in the regional travel demand model, and used the enhanced model to evaluate alternative scenarios including development of alternative regional transit concepts. Developed multi-class assignment model and used it to analyze freight alternatives including congestion pricing and other peak shifting strategies. Chicago Metropolis 2020 was awarded the Daniel Burnham Award for regional planning in 2004 by the American Planning Association, based in part on this work.

Envision Central Texas Vision (5-countyregion)—implemented many enhancements in regional model including multiple time periods, feedback from congestion to trip distribution and mode choice, new life style trip production rates, auto availability model sensitive to urban design variables, non-motorized trip model sensitive to urban design variables, and mode choice model sensitive to urban design variables and with higher values of time (more accurate for "choice" riders). Analyzed set land use/transportation scenarios including developing transit concepts to match the different land use scenarios.

Mid-Ohio Regional Planning Commission Regional Growth Strategy (7-county Columbus region)—developed alternative future land use scenarios and calculated performance measures for use in a large public regional visioning project.

Baltimore Vision 2030—working with the Baltimore Metropolitan Council and the Baltimore Regional Partnership, increased regional travel demand model's sensitivity to land use and transportation infrastructure. Enhanced model was used to test alternative land use and transportation scenarios including different levels of public transit.

Chittenden County (2060 Land use and Transportation Vision Burlington Vermont region) – leading extensive public visioning project as part of MPO's long-range transportation plan update.

Burlington (Vermont) Transportation Plan – Leading team developing Transportation Plan focused on supporting increased population and employment without increases in traffic by focusing investments and policies on transit, walking, biking and Transportation Demand Management.

Transit Planning

Regional Transportation Authority (Chicago) and Chicago Metropolis 2020 – evaluating alternative 2020 and 2030 system-wide transit scenarios including deterioration and enhance/expand under alternative land use and energy pricing assumptions in support of initiatives for increased public funding.

Capital Metropolitan Transportation Authority (Austin, TX) Transit Vision – analyzed the regional effects of implementing the transit vision in concert with an aggressive transit-oriented development plan developed by Calthorpe Associates. Transit vision includes commuter rail and BRT.

Bus Rapid Transit for Northern Virginia HOT Lanes (Breakthrough Technologies, Inc and Environmental Defense.) – analyzed alternative Bus Rapid Transit (BRT) strategies for proposed privately-developing High Occupancy Toll lanes on I-95 and I-495 (Capital Beltway) including different service alternatives (point-to-point services, trunk lines intersecting connecting routes at in-line stations, and hybrid).

Central Ohio Transportation Authority (Columbus) – analyzed the regional effects of implementing a rail vision plan on transit-oriented development potential and possible regional benefits that would result.

Essex (VT) Commuter Rail Environmental Assessment (Vermont Agency of Transportation and Chittenden County Metropolitan Planning Organization)—estimated transit ridership for commuter rail and enhanced bus scenarios, as well as traffic volumes.

Georgia Intercity Rail Plan (Georgia DOT)—developed statewide travel demand model for the Georgia Department of Transportation including auto, air, bus and rail modes. Work included estimating travel demand and mode split models, and building the Departments ARC/INFO database for a model running with a GIS user interface.

Roadway Corridor Planning

Hudson River Crossing Study (Capital District Transportation Committee and NYSDOT) – Analyzing long term capacity needs for Hudson River bridges which a special focus on the I-90 Patroon Island Bridge where a microsimulation VISSIM model was developed and applied.

State Routes 5 & 92 Scoping Phase (NYSDOT) —evaluated TSM, TDM, transit and highway widening alternatives for the New York State Department of Transportation using local and national data, and a linkage between a regional network model and a detailed subarea CORSIM model.

Twin Cities Minnesota Area and Corridor Studies (MinnDOT)—improved regional demand model to better match observed traffic volumes, particularly in suburban growth areas. Applied enhanced model in a series of subarea and corridor studies.

Developing Regional Transportation Model

Pease Area Transportation and Air Quality Planning (New Hampshire DOT)—developed an integrated land use allocation, transportation, and air quality model for a three-county New Hampshire and Maine seacoast region that covers two New Hampshire MPOs, the Seacoast MPO and the Salem-Plaistow MPO.

Syracuse Intermodal Model (Syracuse Metropolitan Transportation Council)—developed custom trip generation, trip distribution, and mode split models for the Syracuse Metropolitan Transportation Council. All of the new models were developed on a person-trip basis, with the trip distribution model and mode split models based on one estimated logit model formulation.

Portland Area Comprehensive Travel Study (Portland Area Comprehensive Transportation Study)—Travel Demand Model Upgrade—enhanced the Portland Maine regional model (TRIPS software). Estimated person-based trip generation and distribution, and a mode split model including drive alone, shared ride, bus, and walk/bike modes.

Chittenden County ISTEA Planning (Chittenden County Metropolitan Planning Organization)—developed a land use allocation model and a set of performance measures for Chittenden County (Burlington) Vermont for use in transportation planning studies required by the Intermodal Surface Transportation Efficiency Act (ISTEA).

Research

Obesity and the Built Environment (National Institutes of Health and Robert Wood Johnston Foundation) – Working with the Dartmouth Medical School to study the influence of local land use on middle school students in Vermont and New Hampshire, with a focus on physical activity and obesity.

The Future of Transportation Modeling (New Jersey DOT)—Member of Advisory Board on project for State of New Jersey researching trends and directions and making recommendations for future practice.

Trip Generation Characteristics of Multi-Use Development (Florida DOT)—estimated internal vehicle trips, internal pedestrian trips, and trip-making characteristics of residents at large multi-use developments in Fort Lauderdale, Florida.

Improved Transportation Models for the Future—assisted Sandia National Laboratories in developing a prototype model of the future linking ARC/INFO to the EMME/2 Albuquerque model and adding a land use allocation model and auto ownership model including alternative vehicle types.

Critiques

C-470 (Denver region) – Reviewed express toll lane proposal for Douglas County, Colorado and prepared reports on operations, safety, finances, and alternatives.

Intercounty Connector (Maryland) – Reviewed proposed toll road and modeled alternatives with different combinations of roadway capacity, transit capacity (both on and off Intercounty Connector) and pricing.

Foothills South Toll Road (Orange County, CA) – Reviewed modeling of proposed toll road.

I-93 Widening (New Hampshire) – Reviewed Environment Impact Statement and modeling, with a particular focus on induced travel and secondary impacts, and also a detailed look at transit potential in the corridor.

Stillwater Bridge – Participated in 4-person expert panel assembled by Minnesota DOT to review modeling of proposed replacement bridge in Stillwater, with special attention to land use, induced travel, pricing, and transit use.

Ohio River Bridges Projects– Reviewed Environmental Impact Statement for proposed new freeway bridge east of Louisville Kentucky for River Fields, a local land trust and historic preservation not-for-profit organization.

PUBLICATIONS AND PRESENTATIONS (partial list)

Understanding the Transportation Models and Asking the Right Questions. Lead presenter on national Webinar put on by the Surface Policy Planning Partnership (STTP) and the Center for Neighborhood Technologies (CNT) with partial funding by the Federal Transit Administration, 2007.

Sketch Transit Modeling Based on 2000 Census Data with Brian Grady. Presented at the Annual Meeting of the Transportation Research Board, Washington DC, January 2006, and *Transportation Research Record*, No. 1986, "Transit Management, Maintenance, Technology and Planning", p. 182-189, 2006.

Travel Demand Modeling for Regional Visioning and Scenario Analysis with Brian Grady. Presented at the Annual Meeting of the Transportation Research Board, Washington DC, January 2005, and *Transportation Research Record*, No. 1921, "Travel Demand 2005", p. 55-63, 2006.

Chicago Metropolis 2020: the Business Community Develops an Integrated Land Use/Transportation Plan with Brian Grady, Frank Beal and John Fregonese, presented at the Transportation Research Board's Conference on Planning Applications, Baton Rouge LA, April 2003.

Chicago Metropolis 2020: the Business Community Develops an Integrated Land Use/Transportation Plan with Lucinda Gibson, P.E., Frank Beal and John Fregonese, presented at the Institute of Transportation Engineers Technical Conference on Transportation's Role in Successful Communities, Fort Lauderdale FL, March 2003.

Evidence of Induced Travel with Bill Cowart, presented in association with the Ninth Session of the Commission on Sustainable Development, United Nations, New York City, April 2001.

Induced Demand at the Metropolitan Level – Regulatory Disputes in Conformity Determinations and Environmental Impact Statement Approvals, Transportation Research Forum, Annapolis MD, November 2000.

Evidence of Induced Demand in the Texas Transportation Institute's Urban Roadway Congestion Study Data Set, Transportation Research Board Annual Meeting, Washington DC: January 2000.

Subarea Modeling with a Regional Model and CORSIM" with K. Kaliski, presented at Seventh National Transportation Research Board Conference on the Application of Transportation Planning Methods, Boston MA, May 1999.

New Distribution and Mode Choice Models for Chicago with K. Ballard, Transportation Research Board Annual Meeting, Washington DC: January 1998.

"Land Use Allocation Modeling in Uni-Centric and Multi-Centric Regions" with S. Lawe, Transportation Research Board Annual Meeting, Washington DC: January 1996.

Multimodal Statewide Travel Demand Modeling Within a GIS with S. Lawe, Transportation Research Board Annual Meeting, Washington DC: January 1996.

Linking a GIS and a Statewide Transportation Planning Model, with L. Barbour and Judith LaFavor, Urban and Regional Information Systems Association (URISA) Annual Conference, San Antonio, TX, July 1995.

Land Use, Transportation, and Air Quality Models Linked With ARC/INFO. with C. Hanley, C. Blewitt, and M. Lewis, Urban and Regional Information Systems Association (URISA) Annual Conference,: San Antonio, TX, July 1995.

Forecasting Land Use Changes for Transportation Alternative with S. Lawe, Fifth National Conference on the Application of Transportation Planning Methods, Seattle WA, April 1995.

Forecasting Land Use Changes for Transportation Alternatives, with S. Lawe, Fifth National Conference on the Application of Transportation Planning Methods (Transportation Research Board),: Seattle WA, April 1995.

Integrated Transportation, Land Use, and Air Quality Modeling Environment with C. Hanley and M. Lewis Fifth National Conference on the Application of Transportation Planning Methods (Transportation Research Board), Seattle WA, April 1995.

MEMBERSHIPS/AFFILIATIONS

Member, Institute of Transportation Engineers
Individual Affiliate, Transportation Research Board
Member, American Planning Association
Member, Congress for the New Urbanism