Description of SACOG Scenario Testing For SB375 Greenhouse Gas Reduction Target Setting

Introduction

SACOG tested seven policy scenario options, in concert with other large MPO's around the state involved in GHG target setting for SB375. This work was done to inform SACOG, other MPO's, the Regional Targets Advisory Committee, and CARB regarding the GHG reduction potential of various scenario options. This information was presented to SACOG's Transportation Committee, along with a proposed range for GHG reduction targets, and released for public comment on May 6, 2010. This document provides more details on the content of scenarios, analysis approach, and results.

Description of Scenario Options

The most basic scenario is the adopted Metropolitan Transportation Plan or MTP ("A Creative New Vision for Transportation in the Sacramento Region", adopted in 2008). The adopted MTP was the first long range transportation plan which the region developed after the Blueprint process was complete. Six other test scenarios were tested, each of which expands or enhances implementation of various policies over-and-above the adopted MTP. The policies are organized into one of four "bundles", as follows:

- Land use measures
- Transportation system development
- Transportation system and demand management
- Transportation pricing

Scenario 1 is the currently adopted MTP. The adopted MTP is largely, but not completely, consistent with the Blueprint land use vision adopted in 2004. The amount of transit service is increased by almost 80% from 2005, on a service-hours-per-capita basis. System and demand management is expanded marginally from current deployment levels, after accounting for population growth. No transportation pricing policies are included in the MTP.

Each of the policy bundles, with the exception of pricing, is represented to some degree in the MTP. The scenario options for this analysis are conceptually defined as enhanced implementation of these policy bundles, compared to the levels included in

the current MTP. Scenarios 2 through 5 each focus on expanding/enhancing one policy bundle, in addition to currently planned investments.

- *Scenario Option 2 (Land Use Enhancement)* is more consistent with the Blueprint's distribution of new residential housing stock. The growth share for single family large lot units is about 30% (compared to 37% for the MTP), and the combined small-lot-single-family and attached unit share is 68% (compared to 60% for the MTP. Residential units in Transit Priority Areas accounted for 46% of the growth (compared to 29% for the MTP).
- *Scenario Option 3 (Transit Enhancement)* expands investment in transit compared to the MTP. As mentioned above, the adopted MTP would significantly expand transit by 2035, compared to 2005 levels; this scenario increases transit service by another 15 percent, with service expansion focused on the most productive transit corridors.
- *Scenario Option 4 (System and Demand Management Enhancements)* expands the planned investments in transportation systems and demand management in the adopted plan. The adopted MTP includes some expansion of the current employer-based programs (primarily marketing, education, and coordination), and growth of the region's ITS and incident management to account for population growth. Scenario 4 would expand the investment in employer-based programs to include more direct incentives for non-single-occupant vehicle commuting (e.g. transit passes, non-motorized subsidies, etc.), and provide more resources for ITS and incident management. Additionally, this scenario would provide some level of public subsidy to establish car-sharing programs in at least 2 communities or employment centers where market demand alone is unlikely to support a private car-sharing venture.
- *Scenario Option 5 (Pricing)* would add significant new transportation pricing policies to the adopted MTP. Four policies are included: congestion pricing for the regions major freeways, with tolls ranging from $0.10 to $0.25 per mile; a general VMT-based charge of $0.01 to $0.03 per mile; policy-based increases to off-street parking charges at employment centers; and additional subsidies to transit fares, to reduce out-of-pocket costs for using transit.

Scenario options 6 and 7 look at combining the policy bundles:

- *Scenario Option 6* would combine Options 2, 3, and 4; no pricing policies are included.
- *Scenario Option 7* would combine Options 2, 3, 4 and 5.

Table 1 provides a summary comparison of the seven scenario options.

Each scenario option is based on enhanced, coordinated implementation of the policy bundles, without explicit reference to cost or actual implementation feasibility, so this testing focused on the benefits which could be reasonably expected from implementation of the policies.

Table 1. Land Use & Transportation Characteristics of Scenario Options

Scenario Option	Year	Land Use Characteristics	Transportation Characteristics
Base year	2005	33% of residential use in compact range, overall density is 5.7 per acre. 47% of dwellings residents are in Transit Priority Areas.	4% of freeways are HOV lanes, 19% of transit service is high frequency. TSM/TDM deployment is moderate. No car sharing or pricing programs.
1: Adopted MTP2035	2020	Compact residential is 54% of growth. Overall residential density +9%. 34% of residential growth is in Transit Priority Areas.	The HOV lane miles per capita more than doubles compared to 2005, and transit service is +22%. TSM/TDM increases with population. No car sharing or pricing.
	2035	Compact residential is 61% of growth. 36% of residential growth is in Transit Priority Areas.	Continued modest increase in HOV lanes, and transit service is +79% compared to 2005 per capita service. TSM/TDM increases with population. No car sharing or pricing.
2: MTP + Land use enhancements	2020	Compact residential is 61% of growth. 44% of residential growth is in Transit Priority Areas.	No change from Adopted MTP.
	2035	Compact residential is 68% of growth. Overall residential density +28%. 46% of residential growth is in Transit Priority Areas.	No change from Adopted MTP.
3: MTP + Transit enhancements	2020	No change from Adopted MTP.	Transit service 15% above Adopted MTP.
	2035	No change from Adopted MTP.	Transit service 15% above Adotped MTP.
4: MTP + Transportation System and Demand Management enhancements	2020	No change from Adopted MTP.	TSM/TDM grows faster than population growth. Car sharing more widespread than in MTP.
	2035	No change from Adopted MTP.	TSM/TDM grows faster than population growth. Car sharing more widespread than in MTP.
5: MTP + Transportation Pricing	2020	No change from Adopted MTP.	$0.01/VMT, $0.10/congested VMT, +25% in employment center parking, 10% transit fare reduction.
	2035	No change from Adopted MTP.	$0.03/VMT , $0.25/congested VMT, +50% in employment center parking, 25% transit fare reduction.
6: MTP + Land use, Transit, and TSM/TDM	2020	See option 2.	See options 3 and 4.
	2035	See option 2.	See options 3 and 4.
7: MTP + All enhancements	2020	See option 2.	See options 3, 4, and 5.
	2035	See option 2.	See options 3, 4, and 5.

Source: SACOG, May 2010.

SACOG will transition from this scenario testing for GHG target setting to a more rigorous scenario analysis for its MTP update through Summer and Fall 2010. Through this MTP scenario analysis, SACOG will consult with local agencies in the SACOG region and the costs, cost-effectiveness and implementation potential of the various programs and projects will be considered.

Coordination with Other MPO's on Scenario Definition and Assumptions

As mentioned above, SACOG staff coordinated with other MPO's around the state in the definition of the scenarios, as follows:

- Definition of Scenarios
  - The MPO's agreed to create logical scenarios combining land use measures, transportation system development (i.e. capital and system expansion projects), demand and system management strategies, and pricing.
  - Each MPO combined these measures in different ways, but to the degree possible, standardized their descriptions of the deployment level of each measure.
- Fuel prices and average mileage for passenger vehicle fleets standardized:
  - Per gallon fuel prices, in Year 2009 dollars: $4.74 in 2020; $5.24 in 2035 (compared to $2.67 in 2005).
  - Average fleet mileage based on CARB EMFAC + Pavley/Low Carbon Fuel post-processor estimates by MPO. For SACOG:
    - 20.6 mpg in 2005
    - 25.5 mpg in 2020
    - 29.3 mpg in 2035
- Growth projections
  - The most recent growth projections should be used including the effects of the current housing and economic downturn.
  - SACOG's revised projections are shown in Table 2.

Table 2. Revised SACOG Growth Projections

	Growth Projections for 2008 MTP		Revised Growth Projections for Test Scenarios Analysis		Differences	
Year	Household Population	Jobs	Household Population	Jobs	Household Population	Jobs
2005	2,245,700	1,024,500	2,245,700	1,024,500		
2008	2,309,968	1,021,472	2,324,800	1,069,467	-14,832	-47,995
2020	2,660,127	1,172,053	2,769,200	1,282,426	-109,073	-110,373
2035	3,218,700	1,364,000	3,413,136	1,529,100	-194,436	-165,100

Source: Center for Continuing Study of the California Economy and SACOG, March 2010.

Scenario Analysis Approach

The test scenario options were evaluated using five basic travel indicators: passenger vehicle GHG; passenger vehicle miles traveled (VMT); transit trips; non-motorized (i.e. bike and walk) trips; and congested VMT.

The primary source of estimates for future year changes to travel indicators is the Sacramento Activity-Based Travel Simulation Model (SACSIM). SACSIM is unique among regional travel demand models in that it uses parcel-level land use data. SACSIM was one of the first regional travel demand models to implement a person-based simulation of travel demand for all household-generated travel, using a day-pattern, tour approach for representing travel. SACOG also elected to develop SACSIM using parcel level data mainly because the capacity to analyze the effects of land use on travel behavior requires data far more detailed than conventional traffic analysis zones. These features and SACSIM's documented sensitivity to key factors like land use, demographics, transportation costs and proximity to transit make SACSIM a powerful tool for measuring the potential for influencing travel through both land use and transportation policies.

SACOG recognizes that SACSIM does not explicitly model the effects of many "supply side" management policies (e.g. incident management, ITS, etc.)[1], transportation demand management policies (e.g. employer-based TDM strategies), and pricing (especially congestion pricing)[2]. For these policies, post-processing adjustments to SACSIM model results were made. Table 3 provides an accounting of the modeling and post-processing used for the analysis of scenario options.

Table 3. Analysis Approaches for Scenario Options

Analysis Approach	Policy Bundles			
	Land Use	Transp. System Devel.	System + Demand Mgmt.	Pricing
SACSIM	X	X	X	X
Post-Processing			X	X

Source: SACOG, May 2010.

[1] SACOG is engaged in the Strategic Highway Research Program, Phase 2 "C10" project, which will link SACSIM to a micro-simulation assignment software package; this work is expected to be complete in 2012, and will significantly enhance SACSIM as an evaluation tool for supply-side, operations-oriented strategies.

[2] SACOG has been awarded funding from the California Strategic Growth Council for enhancement of SACSIM's representation of travel costs, and development of the capability to represent pricing policies such as congestion pricing and transit fares. This work will be completed by 2012.

Post-Processing of SACSIM Forecasts

The "Moving Cooler" report provides information on the GHG reduction potential for several system and demand management strategies, at different deployment levels and for different horizon years. These reduction estimates for the "Aggressive Deployment" level for 2020 and 2030 are used as a basis for computing GHG reduction percentages which are applied to the basic SACSIM forecasts prepared for this analysis. The calculated post-processing reductions for system and demand management policies, cumulatively, are:

- For Scenario 1 (Adopted MTP), and for scenarios based on MTP (2, 3 and 5):
  - -0.6% in GHG per capita;
  - -0.5% in VMT per capita;
  - +0.2% in transit trips per capita (equivalent to about 600 trips per day in 2020, and 1,300 in 2035)
  - -0.4% reduction in congested VMT per capita.
- For Scenario 4 (MTP + System/Demand Management Enhancements), and for scenarios based on Scenario 4 (6 and 7):
  - -1.1% in GHG per capita;
  - -1.0% in VMT per capita;
  - +0.5% in transit trips per capita (equivalent to about 1,000 trips per day in 2020, and 1,900 in 2035)
  - -0.8% reduction in congested VMT per capita.

The pricing policy bundle was assumed to include four elements: congestion pricing; VMT charges; parking pricing; and additional transit fare subsidy. For each policy, the "market" for potentially affected travelers was based on the basic SACSIM model runs performed for this analysis. Each policy was enumerated in terms of the most likely increase to average travel cost to the affected travelers. Published elasticities are then applied to compute changes in VMT and number of trips to compute the most likely changes to travel indicators. The resulting changes in VMT are compared to those published for the above-referenced analysis performed by MTC, to judge reasonable-ness of the results.

- For Scenario 5 (MTP + Pricing) and for Scenario 7 (MTP + All Policies):
  - For 2020 deployment level (see Table 2):
    - -2.6% reduction in GHG per capita;
    - -2.2% reduction in VMT per capita;
    - +3.5% increase in transit trips per capita; and
    - -1.9% reduction in congested VMT per capita.
  - For 2035 deployment level (see Table 2):
    - -4.6% reduction in GHG per capita;
    - -4.1% reduction in VMT per capita;
    - +8.1% increase in transit trips per capita; and
    - -3.3% reduction in congested VMT per capita.

SACOG Scenario Analysis Results

Table 4 provides a detailed accounting of the results of the analysis for the seven scenarios options.

GHG Reduction Results

For GHG reductions, the key metric was the percentage reduction in per capita passenger vehicle GHG, compared to Year 2005[3]. Year 2005 estimated GHG per capita is 22.4 pounds per day.

- The Adopted MTP (#1) resulted in the following GHG reductions:
  - 4 percent by 2020
  - 13 percent by 2035
- The smallest added reductions, compared to the Adopted MTP, were generated by the Transit Enhancements (#3), and by Expanded System Management (#4). The reductions were less than 1 percent over-and-above the Adopted MTP for both 2020 and 2035.
- Land Use Enhancment (#2) and Pricing (#5) both generated additional reductions of 1 percent or greater, compared to the Adopted MTP, for most horizon years.
- Combining Land Use, Transit, and Expanded System Management (#6) resulted the following GHG reductions:
  - 7 percent by 2020 (3 percent more than the Adopted MTP)
  - 14 percent by 2035 (nearly 2 percent more than the Adopted MTP)
- Adding Pricing to the Scenario Option 6 resulted in the following GHG reductions:
  - 8 percent by 2020 (4 percent more than the Adopted MTP)
  - 17 percent by 2035 (5 percent more than the Adopted MTP)

Other Benefits

Although the focus of this scenario analysis was GHG reduction potential, other metrics are of interest as well, and are included in Table 4.

- For transit ridership:
  - Land Use Enhancement (#2) generated the largest individual increases (22 percent more transit trips than the Adopted MTP in 2020, and 14 percent more in 2035)
  - Transit Enhancement (#3) and Pricing Only (#5) had the next largest individual increases relative to the Adopted MTP (4 to 6 percent in 2020, 13 percent in 2035)
  - The combined scenarios (#6 and #7) both had 27 percent or greater increases in transit ridership, compared to the adopted MTP.

[3] Note that the estimates of GHG reduction presented in this report are "pre-Pavely/LCF"—i.e. they do not account for the effect of implementation of these other elements of AB32, and only include the effects of land use and transportation changes.

- Congestion reductions were forecasted for all options, relative to the Adopted MTP[4]:
    - Land Use Enhancement (#2) generated the largest individual decreases in congestion (8 percent reduction compared to the Adopted MTP in 2020, and 2 percent in 2035).
    - Pricing (#5) generated the next largest decrease in congestion (about one-half percent in 2020, and 2 percent in 2035).
    - The combined scenarios generated 11 percent decreases in 2010, and 4 percent in 2035.

[4] Some of the congestion reduction shown for all alternatives is related to the reduction in population and jobs in the revised growth projections. The final changes to congestion will take account of the reduced revenues, and reduced transportation projects funded through those revenues, in the update of the MTP.

Table 4. SACOG Scenario Testing Results

Scenario	Horizon Year:		Travel Indicators: Pass.Veh. GHG Per Capita (lbs per weekday)	Pass.Veh. VMT Per Capita (mile per weekday)	Transit Trips per Capita (trips per weekday)	Walk or Bike Trips per Capita (trips per weekday)	Congested Miles Traveled Per Capita (miles per weekday on congested
2005	Base Year for 2008 MTP		22.4	23.5	0.05	0.30	1.6
1:Adopted MTP (2008)	2020	#	21.5	23.0	0.06	0.32	1.4
		% Change From 2005	-4.0%	-2%	+31%	+6%	-11%
	2035	#	19.6	21.2	0.09	0.34	1.3
		% Change From 2005	-12.6%	-10%	+77%	+14%	-19%
2: Land Use Enhancements	By 2020:	#	21.1	22.6	0.08	0.33	1.3
		% Change From 2005	-5.9%	-4%	+53%	+10%	-18%
	By 2035:	#	19.3	20.9	0.09	0.36	1.3
		% Change From 2005	-13.8%	-11%	+91%	+20%	-21%
3: Transit Enhancements	By 2020:	#	21.5	23.0	0.07	0.32	1.4
		% Change From 2005	-4.1%	-2%	+37%	+6%	-11%
	By 2035:	#	19.6	21.2	0.09	0.34	1.3
		% Change From 2005	-12.7%	-10%	+89%	+14%	-19%
4: TSM/TDM Enhancements	By 2020:	#	21.4	22.9	0.06	0.32	1.4
		% Change From 2005	-4.5%	-3%	+31%	+7%	-11%
	By 2035:	#	19.5	21.1	0.09	0.34	1.3
		% Change From 2005	-13.1%	-10%	+77%	+14%	-19%
5: Pricing	By 2020:	#	21.3	22.8	0.07	0.32	1.4
		% Change From 2005	-4.7%	-3%	+35%	+7%	-11%
	By 2035:	#	19.0	20.6	0.09	0.35	1.3
		% Change From 2005	-15.1%	-12%	+90%	+15%	-20%
6: Combine Land Use, Transit, TSM/TDM	By 2020:	#	20.9	22.4	0.08	0.33	1.3
		% Change From 2005	-6.5%	-5%	+60%	+10%	-21%
	By 2035:	#	19.2	20.7	0.10	0.36	1.2
		% Change From 2005	-14.4%	-12%	+103%	+20%	-21%
7: Combine Land Use, Transit, TSM/TDM and Pricing	By 2020:	#	20.6	22.2	0.08	0.33	1.2
		% Change From 2005	-7.9%	-6%	+64%	+11%	-22%
	By 2035:	#	18.5	20.1	0.11	0.37	1.2
		% Change From 2005	-17.4%	-14%	+119%	+22%	-23%

Source: SACOG, May 2010.