Review of Interstate 5 North Coast Project

Draft Environmental Impact Report / Environmental Impact Statement

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Prevent Los Angeles Gridlock Usurping the Environment

Summary

The Interstate 5 North Coast Project as described and documented in the June 2010 Draft Environmental Impact Report / Environmental Impact Statement (DEIR/DEIS) has several severe deficiencies including:

1) The DEIR/DEIS assumes that I-5 traffic volumes will increase at about twice the rate forecast in SANDAG's adopted Regional Transportation Plan (RTP). This unsupported assumption causes any benefits of widening I-5 to be exaggerated. This inconsistency with SANDAG's RTP is in direct contradiction with the stated Purpose and Need. Furthermore, the extreme amount of traffic growth assumed is inconsistent with the S.B. 375 regional greenhouse gas reduction target established by the California Air Resources Board.

2) Also contrary to the stated Purpose and Need, the DEIR/DEIS documents I-5 general purpose lanes as operating in the future Build scenarios with a lower level of service than in existing conditions. The project does not meet the Purpose and Need.

3) Widening I-5 also would cause increase congestion on other roadways in the study area. These impacts are partially documented in the DEIR/DEIS, but the full impacts would be much greater than those documented. The DEIR/DEIS fails to properly account for indirect traffic impacts that would result from land use changes induced by widening I-5. It also appears not to account for changes in trip destinations that would result from widening I-5, but it has been impossible to completely document this issue due to the failure of Caltrans to provide modeling documentation and modeling files that were requested on August 17, 2010.

4) The DEIR/DEIS fails to consider any non-freeway widening alternatives. Alternatives that should have been considered include:

    a. Land Use Policy –A smarter land use future would have a much larger and more beneficial impact on congestion in the corridor than the proposed project

    b. Land Use Policy Plus Transit – There is a strong synergy between the land use policy and expanded public transit. The benefits of both together are much greater than either approach individually.

    c. Local Roadway Improvements – It appears that a goal of this project is to attract local traffic onto the Interstate system. This is the opposite of good planning. A better alternative is to focus on local roadway improvements.

    d. Pricing I-5 General Purpose Lanes – A moderate toll on all traffic (possibly only during peak periods) would be sufficient to maintain good traffic flow while avoiding the problems of induced sprawl, traffic increases, and increased congestion on local roadways.

Invalid Traffic Forecasts Exaggerates the Need for the Project and Undercuts the Accuracy of the DEIR/DEIS' Conclusions

The DEIR/DEIS defines the project's Purpose and Need in this way:

The objectives of the project are to:

- Maintain or improve future traffic levels of service in 2030 over the existing levels of service;
- Maintain or improve travel times within the corridor;
- Provide a facility that is compatible with future bus rapid transit and other modal options;
- Provide consistency with the regional transportation plan, San Diego Regional Transportation Plan: Pathways for the Future (2030 RTP) where feasible and in compliance with federal and state regulations;
- Maintain the facility as an effective link in the national Strategic Highway Network; and
- Protect and/or enhance the human and natural environment along the I-5 corridor. (p. S-1)

The statement includes six elements. The first two elements are explicitly defined in terms of traffic analysis. The fifth element also implies the importance of traffic analyses through the word "effective". The other three elements are much more general. Therefore, determining whether the proposed project meets its stated Purpose and Need rests primarily on the traffic analysis.

Valid traffic analysis requires valid traffic forecasts. In this case, the DEIR/DEIS traffic forecasts are invalid because they assume roughly twice the rate of traffic growth as that projected by the San Diego Association of Government's (SANDAG's) adopted *Regional Transportation Plan* (RTP).[1] Assuming too much traffic growth obviously inflates the "need" and makes any benefits of widening appear greater. The I-5 DEIR/DEIS includes the tables reproduced below (p. 3.6-4).

Table 1: Reproduced from DEIR/DEIS

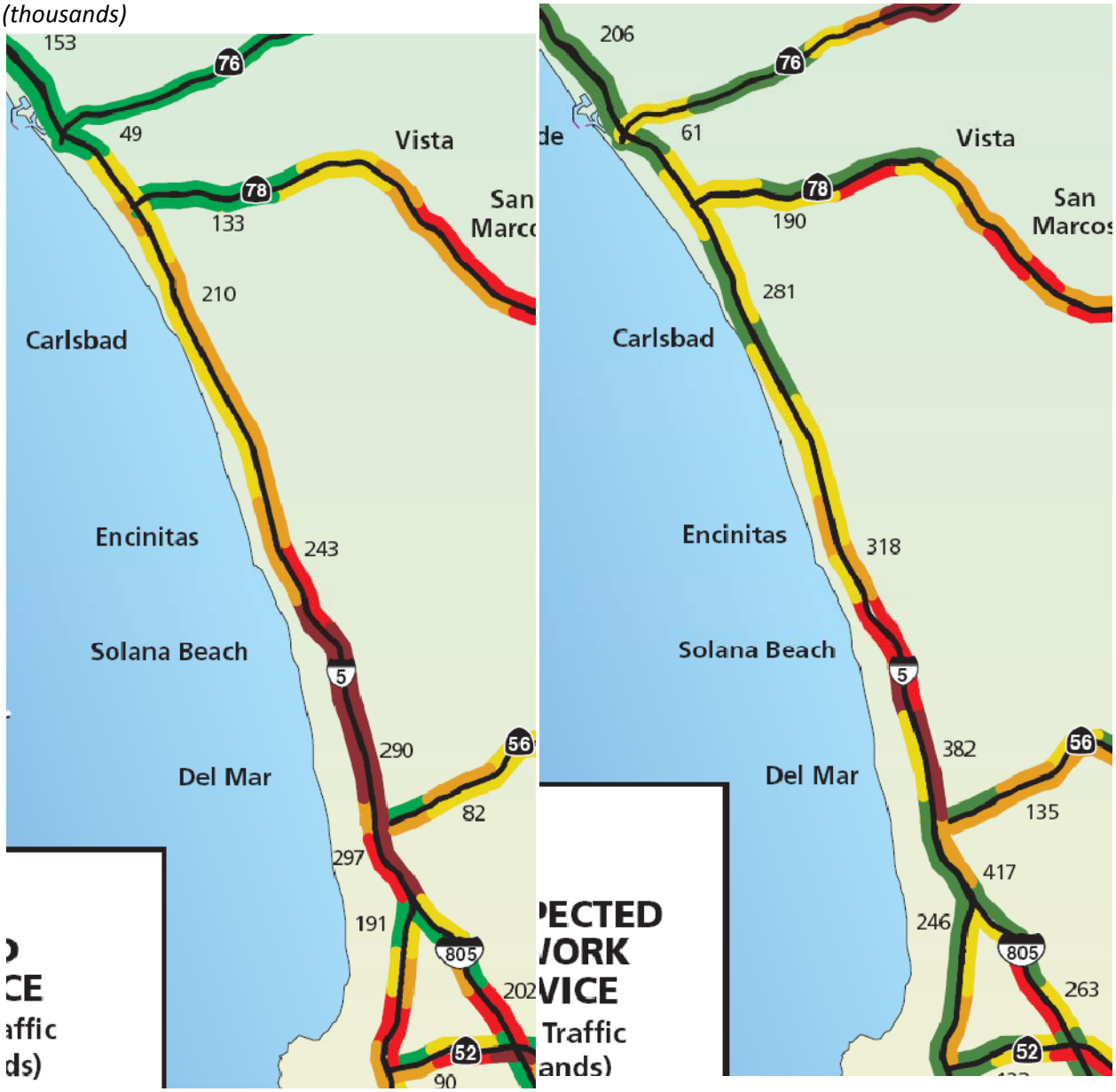
Table 3.6.1: Average Daily Traffic (ADT)

Location		2006 ADT	2030 ADT (No Build)	2030 8+4 Barrier/Buffer	2030 10+4 Barrier/Buffer
From	To				
La Jolla Village Drive	Genesee Ave	169,900	249,590	255,250	262,150
I-5 / I-805 Merge	Carmel Valley Road	281,400	412,640	425,750	434,250
Via de la Valle	Lomas Santa Fe	203,600	326,940	342,950	354,250
Encinitas Blvd	Leucadia Blvd	190,500	294,300	315,150	326,850
Palomar Airport Road	Cannon Road	188,500	290,100	309,850	320,350
SR-78	Oceanside Blvd	192,900	303,800	319,150	323,300
Mission Ave	SR-76	156,800	246,500	258,000	259,200

[1] San Diego Association of Governments (SANDAG). *Pathways for the Future: 2030 San Diego Regional Transportation Plan: Final*, November 2007.

These numbers are in stark contrast to the 2030 traffic forecasts for 2030 RTP, and cannot be considered consistent with the RTP (the fourth element of the project Purpose and Need). The figures reproduced below show 2007 and 2030 traffic volumes published in the RTP.

Figure 1: RTP Average Daily Traffic Volumes: 2007 and 2030 Reasonably Expected Revenue Network (thousands)



The RTP's Reasonably Expected Revenue Network matches the 8+4 Barrier/Buffer alternative in the DEIR/DEIS (RTP, p. A-5), so the RTP forecast traffic numbers are directly comparable to that column in Table 3.6.1 in the DEIR/DEIS (reproduced above).

The RTP graphics do not provide exact locations, but it is possible to generally compare the traffic growth: 2007 vs. 2030 for the RTP and 2006 vs. 2030 for the DEIR/DEIS.

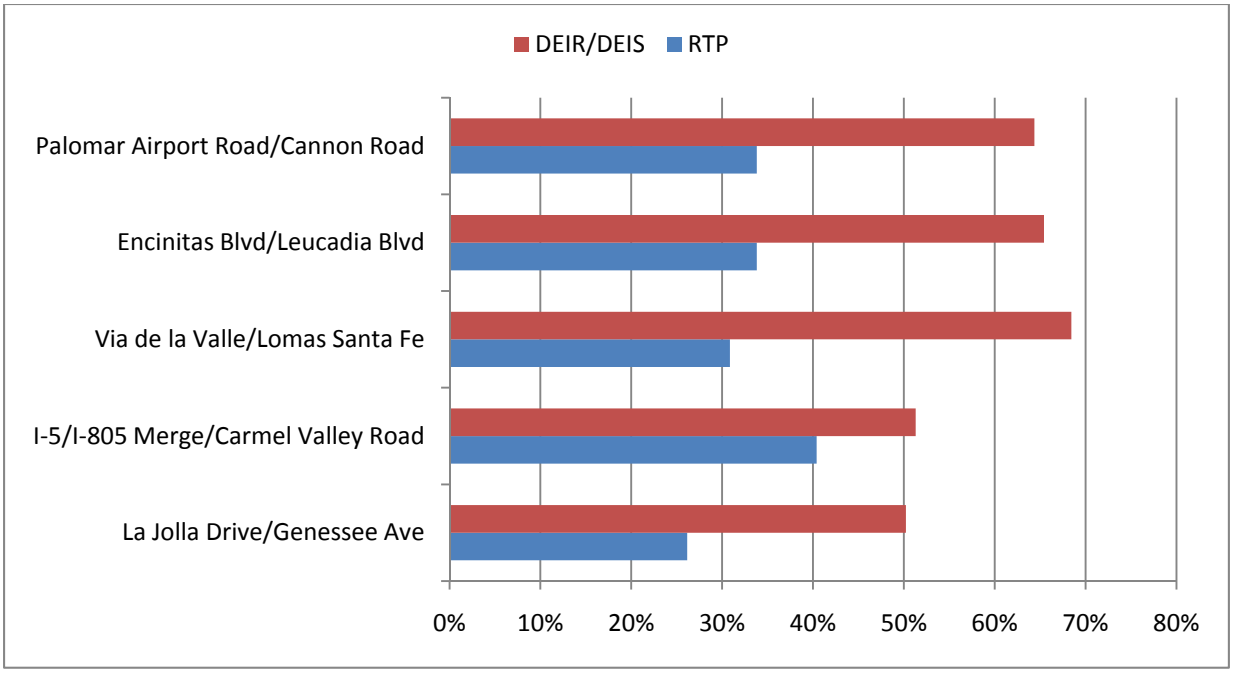
Table 2: I-5 Traffic Growth Between Base Year and 2030 – RTP vs. DEIR/DEIS

From	To	RTP	DEIR/DEIS
La Jolla Drive	Genessee Ave	26%	50%
I-5/I-805 Merge	Carmel Valley Road	40%	51%
Via de la Valle	Lomas Santa Fe	31%	68%
Encinitas Blvd	Leucadia Blvd	34%	65%
Palomar Airport Road	Cannon Road	34%	64%
SR-78	Oceanside Blvd		65%
Mission Ave	SR-76		65%

Note: the RTP doesn't show traffic forecasts for the segment between SR-78 and SR-76.

As shown in the figure below, the I-5 DEIR/DEIS forecast growth is about twice as high as the forecast growth in the RTP except for the segment just north of the I-5/I-805 merge where it is 1.27 where the forecast traffic growth in the DEIR/DEIS is 1.27 times as great as the forecast growth in the RTP.

Figure 2: Forecast I-5 Traffic Growth Between Base Year and 2030



This enormous discrepancy in traffic forecasts means that every future traffic statistic in the DEIR/DEIS is invalid. This includes the forecast traffic numbers, forecast travel times, and forecast delays.

The DEIR/DEIS provides no explanation as to why there is such a huge discrepancy between the I-5 DEIR/DEIS traffic forecasts and the RTP traffic forecasts. The discrepancy is not explained by the difference in the base year between 2006 (DEIR/DEIS) and 2007 (RTP). Traffic volumes in San Diego County as in the rest of the U.S. have been flat to slightly declining since 2005. Total Interstate vehicle miles traveled in San Diego County were 3.3 percent lower in 2007 than in 2006[2] and were also lower still in 2008 (the last year for which data are available). If the DEIR/DEIS assumed higher base traffic volumes in 2006 than the RTP assumed in 2007, the discrepancy in the forecasts would be even greater than that portrayed in the figure above.

The DEIR/DEIS asserts that it is not because the DEIR/DEIS relies on an earlier model version.

> Typically regional traffic forecast models are updated every three to four years to reflect such changes in assumptions as future land use, planned infrastructure, and modal mix. Because of the complexity of the *I-5 NCC Project*, the model used as the basis for the I-5 studies has been updated since traffic studies were initiated. The forecasts presented in this Draft EIR/EIS and the associated technical studies are based on the Region's Series 10 model, whereas the current model is referred to as Series 11. As the model forecasts forms the basis for the project scope and performance analysis presented in this Draft EIR/EIS, it's important to establish that the I-5 demand estimates (traffic volumes) are not significantly different between series 10 and series 11.
>
> One of the most meaningful ways of comparing model outputs is to look at screenlines. Screenlines are often used in traffic analyses to determine how much volume is entering or exiting a particular area as they capture all of the traffic that moves across a real or perceived barrier (e.g., a lagoon that has limited crossings). With that in mind, screenlines were developed that captured the regional travel demand patterns within the I-5 north coast corridor. The traffic volumes were compared on these screenlines from both versions of the model for the I-5 No Project Build and I-5 Project Build (10+4) conditions. Overall traffic for all screenlines is within 10 percent. A similar check was done by comparing the forecasted Vehicle Miles Traveled (VMT) in the corridor between each of the models. Similarly, the comparison for the Build scenario shows VMT estimates to be within 10 percent of each other. The comparison of traffic volumes and VMT clearly shows that the differences between the two versions of the model are not materially different. (DEIR/DEIS, p. 1-3)

The DEIR/DEIS excerpt echoes the point made earlier, i.e. that "the model forecasts forms the basis for the project scope and performance analysis." It is not completely clear whether "model" is meant as only the equations and coefficients comprising the travel demand model or whether "model" also includes 2030 household, employment and external traffic forecasts. The excerpt implies that "model" includes both. However, if the DEIR/DEIS does rely on outdated

[2] Caltrans, 2006, 2007 and 2008 *California Public Road Data: Statistical Information derived from the Highway Performance Monitoring System* (HPMS): Daily Vehicle Miles of Travel. For Interstate system in San Diego County 2006: 27,669,000, 2007: 26,736,510, 2008: 26,517,790.

household, employment and external traffic growth forecasts, this may explain part of the discrepancy between the 2030 RTP and DEIR/DEIS traffic forecasts. The EIR/EIS should be revised to explain this fundamental discrepancy.

The DEIR/DEIS Does Not Acknowledge That the Project Would Result in Increases in Traffic Congestion in Some Areas

The DEIR/DEIS shows that widening I-5 would attract additional traffic to I-5 that would increase congestion on some segments of I-5. Although the DEIR/DEIS suggests that the addition of managed lanes will aid those traveling in the general purpose lanes, it identifies a number of sections where the levels of service (LOS) in the general purpose lanes would decline with the project relative to the 2030 No Build scenario. For the 10+4 alternative, these locations include:

- Northbound:
    - from La Jolla Village Drive to Genesee Avenue – AM Peak F vs. E and PM Peak E vs. D
    - from Carmel Valley Road to Del Mar Heights Road – AM: D vs. C and PM: E vs. D
    - from SR-78 to California Street – AM: E vs. D and PM: F vs. D
    - from California Street to Oceanside Blvd. – AM: E vs. D and PM: F vs. D
    - from Oceanside Blvd. to Mission Avenue – PM: E vs. D
    - from Mission Avenue to SR-76 – PM: D vs. C
- Southbound
    - from Del Mar Heights Road to Carmel Valley Road – AM: F vs. D and PM: E vs. D
    - from Genesee Avenue to La Jolla Village Drive – AM: F vs. C[3]

The first element of the project Purpose and Need is: "Maintain or improve future traffic levels of service in 2030 over the existing levels of service." This is a much higher standard than improving levels of service relative to the future No Build scenario. The DEIR/DEIS shows the 10+4 alternative would result in the I-5 levels of service declining relative to existing conditions at the following locations:

- Northbound:
    - from La Jolla Village Drive to Genesee Avenue – AM Peak F vs. E and PM Peak E vs. C
    - from Sorrento Valley Road to I-5/I-805 Merge – PM Peak C vs. B
    - from I-5/I-805 Merge to Carmel Valley Road – PM D vs. C
    - from Carmel Valley Road to Del Mar Heights Road – AM: D vs. C and PM: E vs. D
    - from Del Mar Heights Road to Via de la Valle – AM: E vs. C and PM: F vs. D
    - from Los Flores Drive to SR-78 – PM: E vs. D
    - from SR-78 to California Street – AM: E vs. C and PM: F vs. C
    - from California Street to Oceanside Blvd. – AM: E vs. C and PM: F vs. C
    - from Oceanside Blvd. to Mission Avenue – AM: E vs. D and PM: D vs. D
    - from Mission Avenue to SR-76 – AM: D vs. C and PM: D vs. C
    - from SR-76 to Harbor Drive – AM: E vs. D

[3]DEIR/DEIS, Tables 3.6.5 and 3.6.6, p. 3.6-6.

- Southbound
    - from Harbor Drive to SR 76: AM: C vs. B and PM: D vs. C
    - from SR-76 to Mission Avenue: AM D vs. C and PM: D vs. B
    - from Mission Avenue to Oceanside Avenue: AM D vs. C and PM: E vs. C
    - from Oceanside Avenue to Cassidy Street – PM D vs. C
    - from Cassidy Street to SR-78 – AM: F vs. D and PM: E vs. C
    - from SR-78 to Las Flores Drive – PM: D vs. C
    - from Las Flores Drive to Carlsbad Village Drive – PM: D vs. C
    - from Carlsbad Village Drive to Tamarack Avenue – AM: E vs. D and PM: D vs. C
    - from Tamarack Drive to Cannon Road – AM: F vs. E
    - from Cannon Road to Palomar Airport Road – PM: D vs. C
    - from Via de la Valle to Del Mar Heights Road – AM: F vs. E and PM: E vs. D
    - from Del Mar Heights Road to Carmel Valley Road – AM: F vs. D and PM: E vs. D
    - from Carmel Valley Road to I-5/I-805 Merge – AM: F vs. D
    - from I-5/I-805 Merge to Roselle Street – AM: D vs. C
    - from Roselle Street to Genesee Avenue – AM: E vs. D
    - from Genesee Avenue to La Jolla Village Drive – AM: F vs. C and PM: F vs. D[4]

Clearly, the DEIR/DEIS fails to demonstrate that the project will satisfy the first element of the stated Purpose and Need: ""Maintain or improve future traffic levels of service in 2030 over the existing levels of service." Furthermore, as is discussed in the following section, the DEIR/DEIS underestimates the magnitude of negative indirect traffic impacts. The true impacts on peak period I-5 traffic would be much greater.

Even more significantly, the DEIR/DEIS shows that traffic would increase congestion on intersecting roadways. No trip begins or ends of I-5. Increasing the throughput on I-5 would necessarily increase the traffic volumes on intersecting roadways. Roadways where the DEIR/DEIS indicates that daily traffic would increase by 5,000 or more relative to the No Build scenario include:

- Nobel Drive between I-5 and Regents Road (+8,900)
- Leucadia Boulevard between I-5 and Saxony Road (+9,300)
- Leucadia Boulevard between Saxony Road and Garden View road (+7,600)
- Poinsettia Lane between I-5 and Paseo Del Norte (+5,800)
- Oceanside Boulevard between I-5 and Canyon Drive (+10,200)[5]

As shown in the Table[6] reproduced below, the DEIR/DEIS identifies many locations were peak period levels of service would decline with the project.

[4]DEIR/DEIS, Tables 3.6.5 and 3.6.6, p. 3.6-6.

[5] 2007 Traffic Technical Report #5, *Traffic Demand Forecasting*, Table 3.3, p. 22-23.

[6] I-5 North Coast Traffic Report, A summary of Traffic Reports: Prepared for the I-5 North Coast Corridor Project, revised June 2010.

Table 4.10 Summary of Impacted Intersections (HCM Method)

Interchange	ID	Location	AM Peak			PM Peak		
			2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR	2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR
La Jolla Village Dr	A4	Via La Jolla / La Jolla Village Dr	X					
	A6	I-5 NB Ramps / La Jolla Village Dr	X					
Genesee Ave	B1	I-5 SB Ramps / Genesee Ave				X		X
	B2	I-5 NB Ramps / Genesee Ave	X	X		X		
Roselle St	C1	Roselle St / I-5 SB On Ramp	X	X	X	X	X	X
	C2	Roselle St / I-5 NB Off Ramp	X	X	X	X	X	X
	C3	Roselle St / Sorrento Valley Blvd				X	X	
	C4	Sorrento Valley Rd / Sorrento Valley Blvd	X	X		X	X	
Carmel Mtn Rd	D1	I-5 Bypass SB Ramps / Carmel Mtn Rd				X	X	X
Del Mar Heights Rd	F2	I-5 NB Ramps / Del Mar Heights Rd	X	X				
Birmingham Dr	J1	I-5 SB Ramps / Birmingham Dr	X	X	X	X	X	X
	J2	I-5 NB Ramps / Birmingham Dr	X	X	X	X	X	X
Santa Fe Dr	K1	I-5 SB Ramps / Santa Fe Dr	X	X	X	X	X	X
Encinitas Blvd		I-5 SB Ramps / Encinitas Blvd				X	X	X
Poinsettia Lane	O1	Avenida Encinas / Poinsettia Lane				X	X	
	O4	Paseo Del Norte / Poinsettia Lane				X	X	
Palomar Airport Rd	P1	Avenida Encinas / Palomar Airport Rd	X			X	X	X
	P2	I-5 SB Ramps / Palomar Airport Rd	X			X		
	P3	I-5 NB Ramps / Palomar Airport Rd	X		X	X	X	
	P4	Paseo del Norte / Palomar Airport Rd	X			X	X	
Cannon Rd	Q3	I-5 SB Ramps / Cannon Rd	X					
	Q5	Paseo Del Norte / Cannon Rd	X	X	X		X	X
Las Flores Dr	T1	I-5 SB Ramps / Las Flores Dr				X	X	X
	T2	I-5 NB Ramps / Las Flores Dr				X	X	X
Oceanside Blvd	X2	I-5 SB Ramps / Oceanside Blvd	X					
	X3	I-5 NB Ramps / Oceanside Blvd				X		
SR-76	Z3	I-5 NB Ramps / SR-76				X	X	X

These impacts are highly significant. However, as discussed in the following section, the DEIR/DEIS understates the true impacts by a substantial margin.

The DEIR Fails to Fully Report the Project's Indirect Impacts and Therefore Underestimates the Project's Impact on the Environment

The DEIR/DEIS includes a set of voluminous traffic reports. However, there is very little and woefully inadequate documentation of the traffic forecasts that are the foundation for all of the DEIR/DEIS' traffic analyses. The only documentation is in 2007 Traffic Technical Report #5, *Traffic Demand Forecasting*. It states only:

> *Forecast model applications.* The initial forecast modeling was conducted by Caltrans using the SANDAG Regional Travel Demand Model Series 10, Year 2030 and 2015 forecasts. (p. 4)

In Traffic Technical Report #5, Wilson and Company massages the model outputs supplied by Caltrans, but fundamentally, the traffic forecasts were provided by Caltrans. By 2010, Caltrans appears to have forgotten the original source of the forecasts and cites Wilson and Company as the source.

> Wilson & Company's *Traffic Demand Forecasting Report* (Technical Report No. 5) provides information on future year traffic forecasts within the project limits. Five different traffic scenarios were modeled using the SANDAG Series 10 Transportation Model to produce future year traffic forecasts.[7]

Without access to documentation of the modeling process applied or to modeling files, it is not possible to verify the accuracy of the modeling. On August 17, 2010, a Public Record Acts request was made to Caltrans for these model files and for any documentation. As of November 8, 2010 (83 days later), the request has not been fulfilled.

Without access to the modeling files, these comments must be on our general experience with regional travel demand modeling in general (as documented in the attached resume), the partial documentation of the SANDAG model provided by SANDAG, and some available evidence concerning Caltrans and modeling.

Expanding highway capacity causes "induced traffic", increasing VMT and increasing greenhouse gas emissions. DeCorla-Souza (of the Federal Highway Administration) and Cohen define "induced demand" as an: "increase in daily vehicle miles of travel (VMT), with reference to a specific geographic context, resulting from expansion of highway capacity."[8] This definition includes both short-term effects and long-term effects. The short-term effects include more trips, longer trips, shifts from other travel modes to auto, and auto trips with lower occupancies. The long-term effects result from land development brought on by increased roadway capacity.

Induced demand effects are well known both to planners and laypeople, and there is a large and growing research literature quantifying the effects of induced demand. This process was kicked off in the United States with a 1997 study by Hansen and Huang that demonstrated large growth in VMT in California that resulted from increased freeway capacity.[9] Since then, there have been many other studies that have confirmed the importance of induced travel. These studies have become increasingly sophisticated in their use of statistical techniques. Robert Cevero of the University of California, Berkeley

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[7] California Department of Transportation District 11. *I-5 North Coast Freeway Operations Report: Prepared for the I-5 North Coast Corridor Project*, p. 11, June 2010.

[8]. DeCorla-Souza, P. and H. Cohen. *Accounting for Induced Travel in Evaluation of Metropolitan Highway Expansion*. TRB 77th Annual Meeting Preprint CD-ROM, TRB, National Research Council, Washington D.C., January 1998.

[9] Hansen, M. and Y. Huang. *Road Supply in California*. Transportation Research A, Vol. 31, No. 3, 1997, pp. 205-218.

revisited the California freeway case in a major study that is particularly relevant to the DEIR/DEIS.[10] Cervero writes:

> The longer-run relationship appears fairly strong – every 10% increase in travel speeds is associated with a 6.4% increase in VMT. (p. 157)

Most regional transportation modeling does an incomplete job of accounting for induced travel. Cevero writes:

> In many parts of the United States, travel-forecasting models used by planning agencies are not up to the task of adequately accounting for induced travel and induced growth (Transportation Research Board, 1995). Long-range forecasting models are needed that are robust and sophisticated enough to capture both short-run behavioral shifts and long-run land use shifts triggered by road improvements. Indeed, the general consensus of attendees at a recent conference convened by the Eno Transportation Foundation Policy Forum on induced demand was that the greatest value added of research in this area is to inform the calibration of long-range travel forecasting and urban simulation models, such as MEPLAN, TRANUS, and TRANSIMS (Hunt, 2002). (p. 160)

Complete induced demand modeling requires accounting for each of the separate components of induced demand including:

> shifts to longer routes
> changes in destinations causing longer trips,
> changing travel mode to auto, and
> changing home or work locations resulting in longer trips.

Carolyn Rodier of the Mineta Institute and the University of California has researched how well land use models and transportation models with feedback account for induced travel. She concludes:

> The body of literature on the ability of existing travel and land use models to represent induced travel indicates that when travel times are fed back to a land use model and/or the trip distribution step, then (1) models can represent induced travel within the range documented in the empirical literature and (2) the effect of new highway capacity on land use and trip distribution significantly contributes to the models' representation of induced travel. If induced travel is not represented in travel and land use models, then the need for, and the benefit of, the project will be overstated (e.g., 16% to 236% of VHT

[10] Cevero, Robert. Road Expansion Urban Growth, and Induced Travel: A Path Analysis. In Journal of the American Planning Association 69(2), p. 145-163, 2003.

[vehicle hours of travel]), and negative environmental effects will be understated (e.g., 72% to 192% of NOx emissions).[11]

Rodier reports on the share of induced travel caused by each of the four components of induced travel. Changes in destination produced the largest share of the total induced travel. In a Sacramento region case study with an integrated land use allocation model (MEPLAN), the land use component produced the second highest amount of induced travel. Changes in routing, the only one of the four components modeled in the DEIR/DEIS was the third highest factor.

While it is impossible to be certain without documentation and access to the model files, it appears the DEIR/DEIS modeling covers only one of the four components of induced travel – #1 shifts to longer routes. Rodier's research results suggest that routing changes alone probably represent only about 1/5 to 1/3 of total induced travel.

The DEIR/DEIS modeling almost certainly does not include #4 – changes in home or work locations, because there is no mention in the DEIR/DEIS of any such effects. Not considering the effects of this project on the future land development pattern is a failure in the planning process. The history of widening I-270 in Montgomery County, Maryland in the late 1980's demonstrates these failings. Traffic conditions improved briefly. Then land development boomed in the corridor. "In the five years before construction began, officials endorsed 1,745 new homes in the area stretching from Rockville to Clarksburg. During the next five years, 13,642 won approval." (*Washington Post*, January 4, 1999) By 1997, I-270 was routinely overrunning its designed capacity, and peak-hour traffic volumes on some segments had surpassed levels forecasted for 2010.

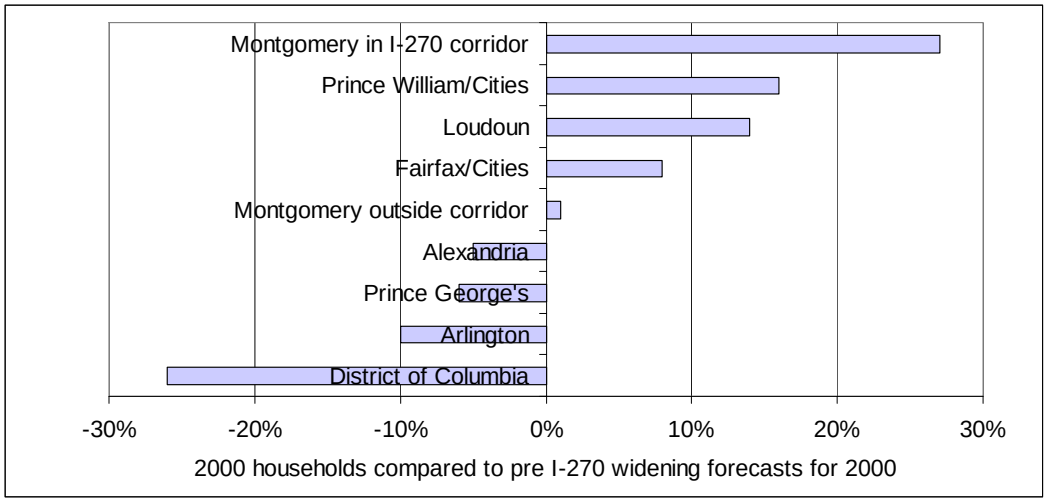
A primary cause of the inaccurate traffic forecasts was inaccurate land use forecasts, which were assumed to be the same for both no build and build analyses. The total number of households forecast for the Washington region for the year 2000 was only off by 2 percent. However, the forecasts were completely wrong about the distribution of the households. [12] Growth was much lower in the region's core than forecast, and much higher in western suburban areas, especially in the I-270 corridor.

The figure below compares the 2000 forecast made before the I-270 widening with actual 2000 numbers. The largest forecasting error was for Montgomery County in the I-270 corridor, where the actual number of households in 2000 exceeded the forecast by 27 percent. Widening I-270 was a primary cause.

[11] Rodier, Carolyn J. A Review of the Representation of Induced Highway Travel in Current Travel and Land Use Models, p. 8.

[12] Data from National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, "Comparison of 1984 Study Forecasts with Most Recent Data: I-270 Corridor, June 18, 2001.

Washington DC Region: Suburban Freeway Projects Shifted Households to Suburbs from Core



The total number of regional households in 2000 was 2 percent less than forecast prior to the I-270 widening project. When the I-270 widening project was planned, forecast housing and employment growth in the corridor was moderate, and growth in the region's core was expected to be much stronger.[13] The forecasts were completely wrong about the distribution of the households. Growth was much lower in the region's core than forecast, and much higher in western suburban areas, especially in the I-270 corridor.

The other areas where growth exceeded the forecast are suburban Virginia areas where freeway capacity also was expanded. Projects in these areas include construction of the Dulles Greenway, the Route 234 Bypass and widening I-66. The suburban increases were balanced by declines and slower growth in the core of the region, including D.C., Arlington, Prince George's County, and Alexandria.

With greater understanding of the interactions between land use and transportation, a number of Environmental Impact Statements for major roadway projects have analyzed no build and build scenarios with different land use scenarios. This has been especially true since a 1997 Federal Court ruling that forced an FEIS to be redone with different land use forecasts for the no build cases.

> *Environmental laws are not arbitrary hoops through which the government must jump*.
> (Federal District Judge Suzanne Conlon.)

The *Chicago Tribune'* noted at the time of the ruling that EPA had raised these issues two years earlier but was "dismissed airily" by "smug" state officials. The *Tribune* praised the ruling's "valuable service" … "to raise –very publicly, so that all may consider – one of the most vexing questions in American urban planning: To what extent do such beltways cause wasteful sprawl that would otherwise not occur?"

When Portland, Oregon does integrated land use/transportation modeling, the modelers report:

[13] Data from National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, "Comparison of 1984 Study Forecasts with Most Recent Data: I-270 Corridor, June 18, 2001.

> Under conditions of increasing congestion, nonresidential land uses increase their decentralization in order to take advantage of attracting labor and customers traveling in the off-peak direction. Over a period of time, this leads to equivalent travel times over a link in both directions of travel. As a result, the capacity of the transportation system is much greater than traditional modeling procedures indicate.[14]

They report that under congested conditions, the degree of directional traffic decreases as jobs and housing become more balanced at a subregional level. With more capacity in the peak direction, it follows logically that the subregional jobs/housing balances would be encouraged which likely would increase average trip lengths.

Indirect land use impacts from highway projects have been evaluated in Environmental Impact Statements and recommended methods for doing this have been published by the Transportation Research Board. This reference states:

> **Indirect Effects—**According to the CEQ definition, indirect effects are "caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable" (40 CFR 1508.8).
>
> Indirect effects "may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508.8).[15]

This reference outlines several different ways of estimating indirect land use impacts. The most sophisticated way is using integrated transportation/land use modeling. SANDAG has long operated land use allocation models and is currently implementing the PECAS[16] land use allocation model to evaluate the indirect effects of transportation projects. . Caltrans could have relied on such a model to develop separate Build and No Build land use allocations for the I-5 Project. Caltrans should have used one of these methods in its evaluation of the Project's traffic impacts.

The other two components of modeling - #2 changes in destinations and #3 changes in travel mode – would be included in the modeling if Caltrans had properly applied the entire SANDAG model. However, based on the traffic numbers (and without access to Caltrans' model files) it appears likely that the same vehicle trip table[17] was applied in the DEIR/DEIS/ no-build and

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[14] Conder, Sonny and Keith Lawton. Alternative Futures for Transportation and Land Use – Integrated Models Contrasted with "Trend-Delphi" Methods: The Portland Metro Results. Metro: Portland, OR, July 2001.

[15] National Cooperative Highway Research Program Report 466: *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects*, p. 2 2002.

[16] PECAS stands for "Production, Exchange, and Consumption Allocation System." Caltrans is also funding a statewide implementation of PECAS (http://pecas.ultrans.ucdavis.edu/).

[17] "Trip tables" are matrices that enumerate how many vehicles are traveling from one travel zone to another.

build scenarios, and factors #2 and #3 were not included in the modeling. Again, without the modeling files it is not possible to be certain, but Caltrans may have omitted these factors deliberately to make the project benefits appear greater than they would be.

Earlier this year, a Caltrans employee was looking for validation for this improper procedure on the FHWA-sponsored Travel Model Improvement Program (TMIP) listserv, writing:

> According to knowledgeable people in the field the gravity model is overly sensitive to travel times which therefore in the feedback loop process may lead to more VMT increase due to a highway project than is actually the case." Tony Van Haagen, Caltrans, District 7 Los Angeles

I replied[18]:

> There is evidence that gravity models do realistically replicate the induced travel impacts of roadway capacity. See Caroline Rodier, "A Review of the Representation of Induced Highway Travel in Current Travel and Land Use Models" (2004) at http://pubs.its.ucdavis.edu/publication_detail.php?id=190. She concludes:
>
> The results indicate that when travel times are fed back to a land use model and/or the trip distribution step, then (1) models can represent induced travel within the range documented in the empirical literature and (2) the effect of new highway capacity on land use and trip distribution can significantly contribute to the model's representation of induced travel. If induced travel is not represented in travel and land use models, then the need for, and the benefit of, a highway project will tend to be overstated..."
>
> Where is there evidence that gravity models overestimate the induced travel effect?"

Mr. Van Haagen's response to me (directly and outside list):

> Norm,
>
> Thank you for bringing the paper by Rodier to my attention. It makes a strong case that the gravity model with a feedback process does produce realistic outcomes regarding induced traffic. The paper by Waddell et al. makes a good case for feedback through land use for the long term impact of highway projects. Fortunately, these ideas are slowly being incorporated in models now. Tony Van Haagen Caltrans, District 7 Los Angeles

Mr. Van Haagen's response that Caltrans is "slowly being incorporated in models now" is an understatement. The use of a "gravity model with a feedback process" has been required by the Federal Clean Air Act Conformity modeling regulations in air basins that have been identified as being in

[18] The references to "gravity model" and "feedback" are technical terms related to the captured of induced travel effects #2 changes in destination and #3 changes in mode.

nonattainment and maintenance of the ozone and carbon monoxide ambient air quality standards since 1993. Indeed, FHWA's Air Quality Conformity Reference Guide states:

> Reasonable agreement between zone-to-zone travel times used in trip distribution and the travel times resulting from traffic assignment (i.e. feedback): This network modeling requirement is based on provisions of the November 1993 conformity rule (58 FR 62230 and 62249, November 24, 1993), which required feedback of travel times resulting from traffic assignment to travel times used in trip distribution. Reasons for EPA to retain this requirement include: there is clear theoretical justification for feedback between traffic assignment and trip distribution, especially in congested areas, and full feedback is already widely available and used.[19]

Again, it is important to emphasize that Van Haagen's initial position was that including distribution feedback would make the project appear to perform worse. It would appear worse because it would properly account for the induced traffic that would result from the project. This induced traffic obviously would reduce the benefits of widening on I-5. Even more importantly, it also causes increased peak period congestion for other roadways intersecting I-5. No trip begins or ends on I-5. Increasing peak period traffic throughput on I-5 necessarily would increase peak period traffic on intersecting roadways.

The use of these types of gravity models is standard modeling practice in the U.S. SANDAG, for example, relies on these models in its air quality conformity modeling. Caltrans should have relied on a gravity model with a feedback process to conduct its analysis of project impacts. The DEIR/DEIS's traffic analysis should be revised accordingly.

The DEIR/DEIS Fails to Consider Non-Freeway Widening Alternatives to the Project

The DEIR/DEIS fails to consider any alternatives to meeting the region's mobility needs other than widening the freeway. The DEIR/DEIS contains only a very short section on Transportation System Management (TSM), Multi-Modal and Transportation Demand Management (TDM). Yet the DEIR/DEIS groups these tactics together and provides no specific detail as to how TSM or TDM could effectively be implemented along the I-5 corridor to reduce traffic levels. Regarding multi-modal options, the DEIR/DEIS contains only a single sentence:

> Multi-modal alternatives integrate multiple forms of transportation modes, such as pedestrian, bicycle, automobile, rail, and transit. (p. 2-12)

Thus, the DEIR/DEIS fails to seriously consider a Multi-Modal, TDM, or TSM alternative.. The DEIR/DEIS states:

[19] http://www.fhwa.dot.gov/environment/conformity/ref_guid/chap6.htm#determin

> Although TSM measures alone could not satisfy the purpose and need of the project, TSM measures have been incorporated into the Build Alternatives for this project. (p. 2-12)

Although normally a statement such as the one above would follow some evidence that TSM measures alone "could not satisfy the purpose and need of the project", the DEIR/DEIS provides no such evidence. It simply assumes that TSM could not meet the purpose and need and implicitly assumes that no combination of Multi-Modal, TSM and TDM could meet the purpose and need while providing no evidence.

In addition, I question the DEIR/DEIS' approach to evaluating the project "build" and "no-build" alternatives. Caltrans apparently relies on a single population forecast and that forecast was used to analyze the build and no-build scenarios. For many of the reasons discussed above, it is highly unlikely that the same level of transportation needs would exist whether or not the I-5 widening project is implemented. Therefore, it is unreasonable for Caltrans to rely on the same forecast to model the build and no-build alternatives. Because Caltrans has taken this approach, the result is a forecast of future needs that only the proposed I-5 project can satisfy. Furthermore, as discussed above, the Project would not even meet its own objective of maintaining or improving future traffic levels in 2030 over the existing levels of service. Thus, if none of the proposed build alternatives would meet the project need, the DEIR/DEIS must be revised to consider other approaches that would meet the region's mobility needs.

Here are four alternatives that should be considered:

1) Land Use Policy – Based on the DEIR/DEIS, it appears that it is assumed that land development in the corridor is expected to grow rapidly (apparently by a faster rate than assumed in the approved Regional Transportation Plan). While Caltrans does not have land use authority, it nonetheless should have explored an alternative land use/transportation scenario that includes cities within the region increasing urban densities. Over the last few years, we have seen a sustained increase in transit-oriented development and a corresponding shift in the public's willingness to endure lengthy commutes from the suburbs. Reducing the rate of growth and/or changing the pattern of that growth towards more compact mixed use development would both reduce the "Need" for the project and also help the region meet another important planning goals including meeting the mandates of SB 375 (discussed below).

2) Land Use Policy Plus Transit – There is a strong synergy between the type of land use policy and expanded public transit. Transit investments help to focus the attention of local communities and developers; it can be "Development Oriented Transit". The combination of both is much stronger than either approach individually. Caltrans should have evaluated an alternative in which all of the proposed funding for the proposed Project was instead earmarked for regional transit development. It is important that this transit alternative assume already funded or otherwise committed transit projects already anticipated in the 2030 RTP.

3) Local Roadway Improvements – It appears that a goal of this project is to attract local traffic onto the Interstate system. This is the opposite of good planning. There is a reason why I-5 is part of the "Interstate" Highway System. Accommodating local traffic on Interstate Highways is very expensive and creates traffic congestion at interchanges. Local Roadway Improvements are cheaper, do not cause significant indirect impacts, and are smaller so they are easier to adapt to new forecasts. The DEIR/DEIS dismisses such an alternative without providing evidence. The problem originates in the overly narrow Purpose and Need statement which is based on a single roadway rather than on any larger need by the public. An alternative focused on local roadway improvements should have been included.

4) Pricing I-5 General Purpose Lanes – A moderate toll on all traffic (possibly only during peak periods) would be sufficient to maintain acceptable traffic flow while avoiding the problems of induced sprawl, traffic increases, and increased congestion on local roadways. Higher tolls could be avoided through some combination of the Land Use Policy, Transit, and Local Roadway Improvements alternatives described above. While tolling existing Interstate lanes is not permitted now, the Federal and state governments are desperately looking for solutions to long-term transportation funding issues, and tolling existing Interstate Highways is under discussion. If California strongly pursued this alternative, it is likely that the political will could be found in Washington D.C. to allow it, possibly as a "demonstration project."

Ken Orski, a long-term transportation policy insider, wrote extensively about the prospects of Interstate tolling in his May 1, 2010 issue of *Innovation Briefs*:

> Two bold predictions concerning the future of the federal surface transportation program have caught our eye in recent days. Both have come from respected veterans of the transportation scene so they cannot be lightly dismissed as speculations of some anonymous bloggers.
>
> The first prediction comes from Pennsylvania Governor Ed Rendel, a longtime advocate of greater investment in transportation infrastructure. "I have a prediction for you," the Governor said at an April 6 press conference called in the wake of the federal rejection of the state's application to toll Pennsylvania's Interstate-80. "When there is a reauthorization they (the Feds) will lift the ban on tolling. There is no appetite for raising the gasoline tax and it [tolling the Interstates] is one of the only ways for us to maintain these highways."
>
> The other prediction comes from former Secretary of Transportation, James Burnley. Since leaving the Department of Transportation in 1989, Burnley has remained an active player on the transportation scene as a regulatory lawyer. "I started saying a year ago that we were facing four years of short-term extensions of existing programs, and I am sorry to say this is a prediction that I believe will come true," Burnley said in an interview with *DC Velocity*, a local online newspaper. He went on to say that it will be difficult to raise the gas tax in a more Republican-leaning Congress next January. "What worries me is that the whole concept of the trust fund is breaking down," …

> In fact, both predictions— the tolling of Interstate Highways and increased reliance on general revenue appropriations to support the federal surface transportation program— have been a subject of an ongoing debate in the transportation community for some time.
>
> Interstate highway tolling has been discussed extensively in two online discussions — the National Journal's Transportation Experts Blog (week of August 17, 2009) and IBTTA's "Tolling Points" blog (week of April 11, 2010). Over 30 transportation professionals took part in the two online exchanges. The question of Interstate highway tolling was also a subject of a poll conducted by the trade publication "Roads & Bridges" (October 2009) and of a recent editorial in "Better Roads" magazine (April 2010).
>
> Political and professional opinion on tolling is divided, with neither proponents nor opponents scoring a decisive advantage. But Governor Rendell's prediction has given the prospect of Interstate highway tolling the kind of plausibility that it had not enjoyed before.

In sum, the revised DEIR/DEIS should identify and evaluate an alternative that tolls existing interstate lanes. Once this, and the other alternatives discussed above are developed, Caltrans must use appropriate modeling (i.e., gravity model with a feedback process) to evaluate the comparative effects of these alternatives (non-freeway widening) with Caltrans' proposed project (freeway widening).

The Project is Inconsistent with the Mandates of SB 375

On September 23, 2010, the California Air Resources Board approved a target for SANDAG of reducing its VMT-based greenhouse gas emissions per capita by 13% in 2035 relative to 2005 (not including the additional reductions from higher fuel efficiency and low carbon fuels). These emissions are 8.1% below those represented in the adopted Regional Transportation Plan.[20] As discussed above, the forecast VMT in the DEIR/DEIS is much higher than the numbers in the Regional Transportation Plan, and the modeled VMT is higher with the project than without. Furthermore, as discussed above, the DEIR/DEIS grossly underestimates the negative effects the proposed project would have on future VMT. Therefore, there is an enormous disconnect between the requirements of SB 375 and the DEIR/DEIS. The DEIR/DEIS section on climate change (4.6) fails to quantity the impacts of the project on greenhouse gas emissions or to make any reference to SB 375.

[20] CARB, http://arb.ca.gov/cc/sb375/mpo.co2.reduction.calc.pdf.

Resume

NORMAN L. MARSHALL, Principal

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EDUCATION:

Master of Science in Engineering Sciences, Dartmouth College, Hanover, NH, 1982

Bachelor of Science in Mathematics, Worcester Polytechnic Institute, Worcester, MA, 1977

PROFESSIONAL EXPERIENCE:

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

Climate Plan (California statewide) – Assisted large coalition of groups in reviewing and participating in the target setting process required by Senate Bill 375 and administered by the California Air Resources Board to reduce future greenhouse gas emissions through land use measures and other regional initiatives. This work including reviewing the transportation models of the four largest Metropolitan Planning Organizations (MPOs) and less detailed analyses of the planning efforts of the smaller MPOs.

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.

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.

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
Member, American Planning Association
Member, Congress for the New Urbanism