Kimley-Horn
and Associates, Inc.

Memorandum

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To: Claudia Wade, P.E.
El Dorado County DOT

Cc: Steve Kooyman, P.E.
El Dorado County DOT

From: Michael Schmitt, AICP, PTP
Matt Weir, P.E., T.E., PTOE

Date: December 8, 2011

Subject: Technical Memorandum #1 – Review of Existing Models and County's GIS

As part of efforts to fully understand El Dorado County's options for updating their existing travel forecasting process, Kimley-Horn and Associates, Inc. (KHA) conducted a review of documentation related to both the existing El Dorado County Model and SACOG's SACMET model platforms. Although both models are based on the traditional four-step process (Trip Generation, Trip Distribution, Mode Split, and Trip Assignment) they are markedly different, both in terms of their data requirements and operation. In addition, a cursory review of the County's Geographical Information System (GIS) was completed in recognition that County's traffic forecast process could likely benefit from greater integration with the County's existing GIS system.

Comparison of El Dorado County and SACOG SACMET Models

A comparative matrix documenting the major elements of these two platforms is provided in the attached **Model Comparison Matrix**. It is important to note that this comparison was based on SACOG's SACMET platform and not the current SACSIM platform. Although SACOG has indicated that it no longer plans to continue its development of the SACMET platform, it is more similar to the existing El Dorado County model and it is more useful to ongoing discussion regarding the future of the El Dorado Model. The SACSIM model is an activity based model, which is commonly considered to be a more complicated model to develop and operate than a more traditional four step model. In the future it may be worthwhile to consider an activity based model, however for the purposes of this analysis it was not considered.

KHA obtained a copy of the current version of the SACMET model as well as associated future year traffic forecasts from SACOG. Likewise, KHA received

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files and future year traffic forecasts from Dowling Associates (Consultant that provides ongoing model support to El Dorado County). For the purposes of comparison, KHA selected 17 locations along major roadways within El Dorado County to review daily traffic volumes for the 2025 planning horizon.

As shown in the attached **El Dorado County Traffic Model – Sample Output** table, there appears to be significant differences between the two models at the selected locations. The following observations are provided based on this limited analysis:

- At eight locations, either El Dorado County or SACOG are projecting 2025 volumes that are less than existing 2010 counts.
- The El Dorado County model forecasts higher 2025 traffic volumes for 13 of the 17 selected segments (an average of 27 percent greater than SACOG). Overall, the 2025 El Dorado County volumes are 16 percent greater than the SACOG forecasts.
- In general, it appears that the El Dorado County model forecasts more traffic (ranging from 6 to 26 percent more) on US-50 than the SACOG model.
- The selected locations exhibiting the greatest difference between forecasted volumes are predominantly arterial roadways with known, planned alignment or alternative route alignments (i.e., Bass Lake Road, Silva Valley Parkway, Cameron Park Drive).

These observations are offered for discussion purposes only, and as pointed out previously are based on a limited number of samples.

Traffic Analysis Zones in El Dorado County

El Dorado County's current model has 318 Traffic Analysis Zones (TAZs) and provides coverage for the entirety of the County. The SACMET TAZ structure from 2007 has a total of 1,528 zones, of which 126 zones are in El Dorado County. The SACMET model does not include coverage of the Tahoe Basin (as the Tahoe Metropolitan Planning Organization has responsibility for this planning area).

KHA understands that County staff had, in 2010, undertaken an effort to update the TAZ structure. KHA received a memorandum dated February 16, 2010 prepared by Fehr & Peers from El Dorado County DOT staff that indicated a revised TAZ structure had been created that had 1,098 zones, with 875 in El Dorado County and 223 in Sacramento County. According to the memo the TAZs had been created based on the following:

- Update the old TAZ system to better align with the County Parcel database, roadway centerline geography, SACMET TAZ geography, and water features
- Input from County Staff
- Input from the members of the Traffic Impact Fee Mitigation Working Group

El Dorado County staff requested the electronic files from Fehr & Peers of this TAZ structure, but it appears, as of the preparation of this memorandum, that an interim work product was provided instead of the final product (materials provided via FTP from an email dated November 10, 2011). Interestingly the TAZ structure that was received had 934 zones with the highest identification number being 1,534. The authors of this memo have heard anecdotal stories of a "1,500+" zone system and wonder if this in fact is that zonal system. As such it is likely that many people misunderstand that the numbering scheme does not necessarily correspond to the number of zones and as such are under the impression that a 1500+ zone system exists (which may not be the case). It should be noted, that this is purely the speculation of the authors of this memorandum.

Geographical Information System (GIS) and Transportation Modeling

El Dorado County has a sophisticated modern GIS system. It is maintained by the Surveyor's department which among other things is responsible for maintaining computerized maps of parcels, roads, and political jurisdictions in El Dorado County. The system has approximately 50 layers and utilizes industry standard ESRI products. Based on interviews conducted with County staff the following was also determined:

- GIS data is frequently updated, sometimes multiple times a day, and existing GIS layers are current.
- Existing server storage and capabilities should be more than adequate to meet the needs of a typical travel forecast model. It was also indicated that there were no known network limitations that would make it difficult for DOT staff to utilize modeling/GIS applications.
- There are approximately 35 active licenses for ESRI software products. Additionally, a viewing application is available for additional installs.
- The primary user of GIS information is currently the Assessor's Office.

The current El Dorado County model does not utilize GIS. Although the TAZ layer is available as a GIS layer from El Dorado County, it is not a functional aspect of the actual operation of the model. As such the existing TAZ layer's primary value is for the purpose of mapping and other visual depictions unrelated to the actual forecasting process. The existing model platform, MINUTP, a

Citilabs product was not developed with GIS compatibility. Citilabs did not introduce full GIS compatibility until about 2006 as part of its CUBE platform. No other current GIS layers have a direct relationship to the exiting travel demand model.

As the County contemplates the development of its next generation model, GIS will likely be an integral part. Accordingly, several GIS layers from among the approximately 50 available layers will be critical to the development of the model, including the following:

- Roads
- Road Names
- Traffic Analysis Zones

These layers will likely be copied and subsequently renamed and edited to fit the specific requirements of the model. For example, the Roads layer will need to be reduced to include only those roadways that will be modeled and will need to have numerous attributes such as capacity and number of lanes (and others depending on the specific design of the model) associated with it to function as part of the model. Additionally, it will be desirable to have traffic count data associated with the model network layer for the purpose of calibration, validation or other comparative analyses. Ideally traffic count data should be uploaded on a regular basis to GIS. A GIS based model will likely result in several new layers, including:

- Model Network
- Traffic Analysis Zones (revised for updated model)
- Numerous outputs (for example 2025 forecast)

Numerous other layers will be of value during the associated land use forecast process and for the purposes of mapping output, including:

- Aerials (SID format 2006)
- Community Regions
- Land Use
- Market Regions
- Parcel Data
- TIM fee zones
- Multi family unit database (not a GIS layer, but it is understood that it can be linked to the parcel database).

Assuming the model is constructed on the basis of parcels, alternative scenario runs will require that the Parcel Data also be identified as a critical layer.

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Model Comparison Matrix

	El Dorado County	SACOG SACMET
Source Document	El Dorado Travel Demand Forecasting Model Development Report, October 1999, Fehr & Peers Associates, Inc.	Model Update Report, Sacramento Regional Travel Demand Model Version 2001 (SACMET 01), 2002, DKS Associates
Software Platform	MINUTP (supported by Citilabs but no longer available for purchase)	CUBE (a Citilabs product)
GIS Compatibility	No	Yes with binded ESRI product.
# of TAZs	319 covering the entire County	1,528 (126 covering El Dorado County with the exception of the Tahoe Basin)
Trip Generation	▪ Utilizes linear equations (trip generation rates) for 2 residential categories of land use (single family and multifamily) ▪ Utilizes linear equations (trip generation rates) for 3 non-residential trip rates (retail employment, service employment, other employment). ▪ Based on 3 trip purposes (Home-based Work, Home-based Other, and Non-Home-based).	▪ For residential, utilizes a sophisticated cross classification model based on household data including persons, workers, income, and auto ownership. ▪ For non-residential, utilizes 5 categories of employment (manufacturing, office, retail, medical, education, other). Two types of school enrollment: K-12 and college are also used. ▪ Based on 8 trip purposes (Home-based work, Home-based Shop, Home-based School, Home-based Other, Work-Other, Other-Other, 2 Axel Commercial, 3+ Axel Commercial)
Trip Distribution	Gravity models using friction factors	Gravity models using friction factors for all purposes except Home-based Work which utilizes a nested destination/mode choice model.
Mode Split	Does not include a mode choice model, instead factors are applied to person-trips to reflect the impact of transit. This option was originally selected based on the model purpose and limited usage of transit.	Extensive mode choice models. Includes a system of four independent logit models and considers 7 modes (drive alone, shared ride-2, shared ride-3+, transit-walk access, transit-drive access, walk, and bicycle).
Trip Assignment	The standard volume delay function included in MINUTP was modified to steepen the volume-delay curve based on Consultant experience	User-equilibrium with the adaptation that single occupant vehicles cannot use high occupancy vehicle (HVO) facilities.

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El Dorado County Traffic Model - Sample Output

	Road	Location	Count Source 2010	Count 2010	EDC 2025	SACOG SACMET 2025	EDC/SACOG Dif		EDC Annual Growth Rate	SACOG SACMET Annual Growth Rate
							Absolute	%		
1	Bass Lake Road	south of Serrano	EDC DOT	9,832	12,800	5,100	7,700	60%	2%	-4%
2	Salmon Falls Road	north of Lakehills	EDC DOT	2,707	6,000	2,700	3,300	55%	5%	0%
3	Missouri Flat Road	between Green Valley and El	EDC DOT	7,442	6,400	3,300	3,100	48%	-1%	-5%
4	Silva Valley Parkway	south of Green Valley	EDC DOT	7,308	10,200	5,300	4,900	48%	2%	-2%
5	Cameron Park Drive	south of Meder	EDC DOT	16,720	20,800	13,700	7,100	34%	1%	-1%
6	Pleasant Valley Road	east of Greenstone	EDC DOT	6,630	13,100	9,100	4,000	31%	5%	2%
7	US-50	east of Greenstone	Caltrans	46,000	70,200	52,000	18,200	26%	3%	1%
8	Latrobe Road	south of White Rock	EDC DOT	8,075	57,300	42,600	14,700	26%	14%	12%
9	Green Valley Road	between Bass Lake and Cambridge	EDC DOT	10,458	21,300	15,900	5,400	25%	5%	3%
10	White Rock Road	east of Sac County line	EDC DOT	8,072	7,900	5,900	2,000	25%	0%	-2%
11	US-50	east of Bass Lake	Caltrans	62,000	123,500	103,300	20,200	16%	5%	3%
12	SR-49 (South)	south of Pleasant Valley	Caltrans	9,600	9,900	9,200	700	7%	0%	0%
13	US-50	west of EDH/Latrobe	Caltrans	93,000	131,200	123,000	8,200	6%	2%	2%
14	Pleasant Valley Road	west of Big Cut	EDC DOT	12,251	13,000	14,000	-1,000	-8%	0%	1%
15	Green Valley Road	east of Sac County line	EDC DOT	24,739	28,300	31,000	-2,700	-10%	1%	2%
16	SR-49 (North)	north of Middletown	Caltrans	4,700	5,300	7,000	-1,700	-32%	1%	3%
17	El Dorado Hills	north of Serrano	EDC DOT	22,569	20,500	28,400	-7,900	-39%	-1%	2%

Note: The El Dorado County Model has not had any post processing applied

Note: Shading denotes futrue traffic forecasts less than 2010 counts

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From: Michael Schmitt, AICP, PTP
Matt Weir, P.E., T.E., PTOE

Date: December 8, 2011

Subject: Technical Memorandum #2 – Summary of Stakeholder and Agency Interviews/Meetings

Kimley-Horn and Associates, Inc. (KHA), as of the preparation of this memorandum, had completed eight of ten planned interviews of select El Dorado County staff and other stakeholders for the purpose of understanding perspectives on the existing El Dorado County model including: its usage, its value in existing and future planning processes, and any challenges or opportunities that might exist. Particular attention was given to understanding how existing GIS capabilities, as well as existing transportation and land use data bases are utilized during transportation planning processes.

Following is a list of the interviewees and information regarding their organizational affiliation and the date of interview:

- El Dorado County Department of Transportation, Design - Steve Kooyman and Paul Hom (11/2/11)
- El Dorado County Department of Transportation, Discretionary & Planning - Eileen Crawford and Claudia Wade (11/2/11)
- El Dorado County Surveyors Office (GIS) - Jose Crummet and Shawna Purvines (11/2/11)
- El Dorado County Planning Services - Peter Maurer, Pierre Rivas, and Shawna Purvines (11/2/11 and 11/10/11)
- El Dorado County Transportation Commission (EDCTC) - Dan Bolster (11/2/11)
- Sacramento Area Council of Governments (SACOG) – Bruce Griensenbeck (11/3/11)
- Dowling Associates, Inc. – Rick Dowling, Jim Damkowitch, and Abhishek Parikh (11/8/11)

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- El Dorado County Transportation Commission (EDCTC) – Kathy Matthews (scheduled for 11/22/11)
- El Dorado County Department of Transportation, Director – Jim Ware (scheduled for 11/22/11)

Significant Findings

Although many of the perspectives and information captured during the interviews are important to the development of an updated traffic forecast process, the following significant findings are provided to help frame future discussions regarding the traffic forecasting process:

- There are several examples where output from the existing traffic forecast model has been contrary to expectations as a result of:
  - Network access issues resulting from centroid connector placement and the size and shape of some Traffic Analysis Zones (TAZs)
  - Location and intensity of future land uses
- There is universal support amongst County staff to have in-house modeling capabilities.
- There are several opportunities to leverage existing GIS capabilities to assist in the development of a future model, and to organize and display existing and future transportation data. Some of which can be implemented with minimal effort.
- The land use forecast will need to be updated if the traffic model is to evolve beyond its existing 300+ TAZ arrangement in a timely manner.

A more thorough summary of discussion items and findings from the interviews is provided in the **Summary of Interviews** attached to this memorandum.

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Summary of Interviews

Existing Model

- The existing model is maintained by Dowling Associates, Inc., Dowling Associate's contract for another three years of on-call as-needed modeling support was recently requested by staff and extended by action of the Board of Supervisors.
- All current model files are maintained by Dowling Associates at its offices.
- There is recognition of the value of having consistency in traffic forecasting with adjacent models (Connector project was provided as an example).
- County staff expressed interest in having the capability to "true" existing count data to make sure that it truly reflects existing conditions and can be better used to develop a trend of conditions.
- Interviewees cited examples where forecasted volumes were contrary to expectations given known conditions. One example cited forecast volumes that were less than existing on a major roadway without a logical change to conditions to explain. Under some circumstances, issues with output resulted in project delays and additional costs (the worst example noted was an approximately $30k to $40k in additional project costs) to address model output issues.
- There have been instances where the model output was a flashpoint when dealing with the development community.
- County staff indicated very little understanding regarding model inputs and the accuracy of recent development within the model. In general, it is widely regarded by staff to be a "black box".
- County staff did not indicate an ability to operate the existing model or having any direct "hands on" experience with the El Dorado County model.
- County staff indicated that they were not aware of any existing travel demand software licenses the County might own.
- No preference for any particular software package was indicated by County staff.
- There is agreement amongst interviewees that numerous existing TAZs should be further disaggregated given recent development.
- Interviewees indicated that the existing model has access issues as the result of centroid connector placement and size and shape of some TAZs.
- County staff discussed the recurring need to shift-share TAZ land uses between adjacent zones, for the purpose of analysis, given limitations related to land use data within TAZs.
- County staff indicated that Dowling Associates would be asked to undertake a process to update recent developments within the model to match their current status (including removing those that are no longer active).

Land Use Forecasts

- County staff indicated that they have not formally determined control totals for major land uses in 2030.
- County staff indicated an understanding of EDAC land use efforts but that they had not analyzed them in sufficient detail to draw any specific conclusions.
- County staff indicated that, given recent changes in development trends, the existing 2025 land use forecast is more likely representative of 2030 conditions. However, they indicated that the location of future development may not be the same as previously forecasted for 2025.
- There is not a specific course of action, at this time, to finalize a 2030 land use forecast.
- The TAZs were originally overlaid over larger market area forecasts. As a result, TAZ land uses may not be accurately reflected within the correct TAZ (they could in some instances be reflected in adjacent TAZs).
- County staff described the options identified previously to prepare a 2030 land use forecast. Staff indicated that they would forward information from a presentation prepared last spring regarding this topic (which has been received).

Resources and Costs

- There is universal support amongst County staff to have in-house modeling capabilities. At a minimum, staff want the ability to easily and quickly test project alternatives to identify significant impacts to transportation infrastructure.
- County staff expressed the desire to hire a part-time traffic/transportation planning resource to provide data quality control, run an updated travel demand model, and to evaluate developer generated data.
- There was some discussion regarding whether a new hire would require a P.E. to complete traffic studies on behalf of the County. A specific conclusion was not drawn, but it was agreed that this should be researched prior to making any hires.
- One of the benefits cited for having in house staff manage the model was that that person would have a heightened awareness of the status of ongoing projects within the County.
- County staff is sensitive to the cost of software, hardware, training, and required software maintenance agreements. It was indicated that cost would need to be a consideration when selecting a new software platform.

GIS & Data Considerations

- County staff indicated that GIS data is frequently updated, sometimes multiple times a day, and that the existing GIS layers are current.
- County staff indicated that a separate database can be joined to the land use layer to determine the number of multifamily homes that exist in locations where multi-family housing is not identified as an individual parcel (townhomes and patio homes are most often developed as their own parcel, apartment and condos are not).
- County staff indicated that GIS compatible building footprints are not widely available for commercial uses. While there is significant interest in having this data it would require resources that are not currently available. Alternatively, it was discussed that a vendor through the use of aerial photography and imaging software could provide this information to the County. It was suggested that it might be worthwhile to determine an order of magnitude cost for this activity.
- Although the County has aerial photography dating back to 2007, the 2006 data is more frequently used given quality concerns.
- It is anticipated that existing server storage and capabilities should be more than adequate to meet the needs of a typical travel forecast model. It was also indicated that there were no known network limitations that would make it difficult for DOT staff to utilize modeling/GIS applications.
- The County has an annual count program, but the data is not currently provided in a GIS format. Based on discussions, it is anticipated that this could be accomplished with minimal effort.
- There are approximately 35 active licenses for ESRI software products. Additionally, a viewing application is available for additional installs.
- Interviewees indicated that transportation results from any future model would be more useful if they could be easily displayed in a high quality GIS format.
- There was strong interest among County staff to be able to easily share information related to travel demand forecasts in a GIS friendly format.

Regional Considerations

- SACOG staff indicated that they are eager to provide assistance to El Dorado County.
- SACOG staff indicated they understood why it is important to some member jurisdictions to maintain separate land use and traffic forecasts.
- SACOG staff indicated that it would be helpful if El Dorado County could use the same base year data (2008) as the current SACOG model.
- SACOG staff indicated that they would provide multiple assignments as well as land use and TAZ information for use by El Dorado County during the development of its model.

- SACOG staff did not indicate a preference for which software package El Dorado County might select.

Model Update Considerations

- Interviewees recommended that the model avoid significant complexity to avoid potential issues where the model becomes solely reliant on a single individual's institutional knowledge.
- Interviewees indicated that the basic model design and functionality is not flawed, but rather data and network issues have been the primary source of issues in the past.
- Interviewees indicated that several different platforms could meet El Dorado County's needs. Some of the positive comments related to more common models included:
    - Cube – There is a good local user base and it is the same platform as SACOG
    - VISSUM – Increased control over the assignment which can be helpful in smaller models such as the El Dorado County's
    - TransCAD – GIS based model could be a good fit with County's desire to share more information in GIS format
- Interviewees indicated a need to include post-processing techniques (similar to those currently utilized) to improve model output.
- Interviewees indicated that the cost to operate should be a consideration when selecting a software package.

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From: Michael Schmitt, AICP, PTP
Matt Weir, P.E., T.E., PTOE

Date: December 12, 2011

Subject: Software Platform Matrix

In an effort to evaluate the current software platform options for macroscopic transportation modeling, Kimley-Horn researched the top four widely used products. These products were chosen based on the relative use and acceptance by jurisdictions. They include: Emme by INRO, Cube by Citilabs, TransCAD by Caliper, and VISUM by PTV America. All four software packages are readily available in the U.S. and can import/utilize existing model data from other platforms.

In response to this technical memorandum, El Dorado County staff provided several questions regarding TransCAD and Cube. Written responses to those questions are provided in the last section of this document.

Software Comparison

The initial step in the evaluation was to update a previous comparison of software packages prepared by *The Urban Transportation Monitor*. This monthly periodical published a comparison of seven software packages in late 2006 (September 15 and 29) which included the four selected above. While the periodical's information was useful at the time, all companies have indicated that the modeling software is continually updated and all have gone through significant changes since 2006. As such, Kimley-Horn contacted each company for updated information and reviewed company product information/documentation in an effort to update key information that was considered pertinent to this selection process. Staff contacted during the process include: Mike Florian (Emme), Colby Brown (Cube), Howard Slavin (TransCAD), and Kiel Ova (VISUM).

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The results of the updated comparison are provided in the attached **Software Platform Matrix**. It should be noted that several of the companies, in particular INRO (Emme), indicated that a direct comparison of the software platforms on paper is not as beneficial as an actual demonstration. INRO offered an on-site demonstration of their software so the end-user could get a sense of how it operates prior to purchase and other vendors offered similar online demonstrations.

Jurisdiction Experience

The second step in the evaluation was to conduct a limited review of readily available documentation of jurisdictional software reviews. Similar to the first step, Kimley-Horn utilized an internet search supplemented with as needed phone interviews. Agencies from differing geographical locations and with different focuses were selected to allow for a broader perspective. It should be noted that most of the agency selection processes were focused on a transition – moving data effectively from an existing platform to the newly selected platform. It should also be noted that some of the reviews identified are slightly dated and may not fully reflect existing conditions. However, they are valuable from the perspective of developing a longer term relationship with a software developer.

The University of Vermont Transportation Research Center evaluated software packages in 2010 in an effort to select the preferred platform for a Vermont Statewide travel demand model. The existing model was based on Cube/Voyager after a migration in 2007 from the original TRANPLAN model. The evaluation included comparisons of the existing Cube applications to TransCAD and VISUM. Overall, there was not a recommendation to switch software platforms – the report sites only user-preference or conformity with other models as the main differences.

The City of Irvine, in 2007, was utilizing TRANPLAN for model forecasting and needed to transition to a new software platform. Software evaluated included TransCAD, Emme, TRANPLAN, Cube, and others. The City narrowed the options to TransCAD and Cube prior to selecting both. Irvine decided to upgrade their TRANPLAN model using Cube in the short-term and reach consistency requirements of the region. Long-term, the conversion to TransCAD was preferred in order to fully integrate into the Orange County Transportation Authority (OCTA) network that was at the time being converted to TransCAD.

In Arizona, the two largest model users are Maricopa Association of Governments (MAG) and Pima Association of Governments (PAG). In 2004, MAG decided to switch their existing Emme model to a new platform. While documentation of the selection process was not available, staff indicated that vendors were invited to Phoenix to demonstrate the available packages and

propose services for the conversion. Ultimately TransCAD was selected over Cube and VISUM. Following the Phoenix direction, PAG switched their model (based in Cube) to TransCAD in 2007. According to staff, the primary reasons for the switch were not technical travel demand issues but rather user preference and GIS-compatibility. During the 2006/2007 timeframe, the current versions of Cube were not compatible with GIS platforms while TransCAD had the GIS functionality built-in. In addition, the modeling manager had previous experience with TransCAD which likely spurred the switch.

The most extensive of those identified was the selection processes by the Florida Department of Transportation during the 2002-2003 timeframe. The Statewide modeling software (FSUTMS) at the time was based on a TRANPLAN platform which was becoming outdated and losing vendor support. Software packages that were reviewed included: TransCAD, Cube, VISUM, and Emme. The options were shortlisted to TransCAD and Cube and the committee could not select a clear winner. Additional input was requested from 14 other jurisdictions that were using the two shortlisted software packages. The experiences and feedback provided did not indicate a significant difference between the two with agencies typically preferring their particular package over the other and vice versa. The committee deemed both software equally effective from a technical standpoint. The ultimate selection of TransCAD was made after a presentation of cost. The following year, after selecting TransCAD, Florida switched to Cube for non-technical reasons.

El Dorado County Staff Questions

1. *Does TransCAD integrate with Synchro?*

No - we are not aware of any major macro modeling software package that integrates with Synchro. Several of them (including TransCAD) can analyze intersections using the Intersection Capacity Utilization (ICU) methodology popularized by Synchro. Software developers are likely not motivated to create this integration given that signal timing is not a useful input into macro modeling.

TransModeler (TransCAD's micro model) and well as the other major micro models are capable of integration with Synchro.

2. *It would be helpful to have a presentation of some type to give staff a clearer understanding of the pros and cons of TransCad vs Cube.*

One way to accomplish this may be through a webinar. Kimley-Horn staff are available to help organize this based on interest and availability of El Dorado County staff.

3. *What platform do the smaller agencies use (i.e Placer County, San Joaquin County, Stanislaus County)?*

Both CUBE and TransCAD are utilized by numerous "small agencies" across the United States. The following representative list of local and/or more rural counties/agencies were identified based on our local knowledge and vendor input:

TransCAD	CUBE
▪ Tahoe Regional Planning Agency ▪ Calaveras COG ▪ Lake County ▪ Butte County (BCAG) ▪ Amador County (ACTC) ▪ Nevada County (NCTC)	▪ Sacramento Area Council of Governments (SACOG) ▪ San Joaquin Council of Governments ▪ Stanislaus Council of Governments ▪ City of West Sacramento ▪ Placer County

Both CUBE's website (www.citilabs.com) and TransCAD's website (www.caliper.com) include additional examples of jurisdictions that utilize their respective software.

4. *In the matrix TransCAD states that it supports detailed modeling of intersections, would we able to use this data to propose improvements.*

Possibly - depending on the level of detail desired regarding improvements. Macro models are typically more useful for determining planning level rather than operational improvements (i.e. the likely need for signalization vs the length of storage bays).

As with any detailed output from a macro model it is important to use sound technical judgment to determine the reasonableness of the output. The usability of intersection output is typically greatly enhanced through post processing techniques.

Software Platform Matrix

NAME OF SOFTWARE PROGRAM		EMME	CUBE (TP+, TRANPLAN, TRIPS, MINUTP)	TransCAD	VISUM
PRICE, PRICE OPTIONS		Prices start at $9,000 and vary by network size. Multiple license and academic discounts are available.	The price varies by module, varying between $1,500 to $12,500. The software can be installed on individual PCs or on a server. Annual subscriptions to Cube Cloud Services range in cost from $500/month to $5,000/month plus overage charges depending upon user resource consumption. Multi-seat and research discounts are available. The software is free to universities for teaching purposes.	$12,000 for a single license. Multiple license and academic discounts are available.	$6,000 - $30,000 depending on network size. Multiple license and academic discounts are available.
IS YOUR PACKAGE SOLD AS A SINGLE ENTITY, OR ON SOME FORM OF MODULAR BASIS?		EMME is sold as a single entity. There is no additional charge for utilities and macros.	Cube is a modular software system. The core of the system is Cube Base, the system interface, which provides the GIS, application and scenario managers, and report functions. Additional modules are available for specific functions - passenger forecasting, commodity flow forecasting, microsimulation, statistical estimation, dynamic equilibrium traffic assignment, land value and use forecasting, or to create tables and charts.	TransCAD is a single integrated package with a full suite of procedures for passenger and freight demand forecasting. No other modules must be purchased, and there are no model size limitations.	The standard VISUM package contains all features necessary for basic MPO-type planning and modeling and for dynamic time-of-day assignments, transit planning etc. additional modules are available for transit operations planning (fleet planning, line costing etc.), transit survey processing, .
OPERATING SYSTEMS ACCOMMODATED		Windows XP, Vista, Windows 7, major Linux distributions	Windows 95/98/2000/XP/NT/Vista/7. Dynasim runs under Windows and Linux. Recommended: Windows 7; 32 or 64-bit; Professional, Enterprise, or Ultimate	Windows 7, XP Professional, Vista, 2003 Server and 2008 Server. Recommend 64-bit versions of OS for future compatibility. Windows NT no longer supported.	Windows 2000/XP. Supports 64-bit versions of OS.
MINIMUM / RECOMMENDED HARDWARE REQUIREMENTS	CPU	Intel i5 dual-core preferred	Minimum: Intel Pentium 4, AMD Athlon Recommended: Intel Core 2, i5, i7; Intel Xeon; AMD Phenom, II; AMD Athlon II	Recommend 4-core and 6-core single and dual processors. Hyperthreading can also speed up processes. Do not recommend single CPU computers with only one core or any of the Intel NetBurst Pentiums (though it will still work).	266 MHz/ 1 GHz
	RAM	256 MB/1GB (projectsize- and graphics-dependent)	1 GB minimum, 4 GB or higher recommended With Cluster: 2GB per core recommended	Minimum requirement for small models is 1GB. Large models, recommend 4GB RAM. Dual processor, 4-core CPU should have 6-8GB. Future 64-bit TransCAD will recommend at least 12GB of RAM.	128 MB/512 MB
	Hard disk storage space	100 MB for software, data additional	Minimum: ATAPI IDE; 5,400 rpm Recommended: SATA 3 Gb/s or SATA 6 Gb/s; 7,200-10,000 rpm Storage: 10 GB for the application as well as supporting applications and data (like GIS) 100+ GB for output files	200GB or more for data. Write speed is most important feature. The 7200rpm SATA drives are inexpensive. Two SAS 15,000rpm drives with RAID 0 controller in software or hardware is faster.	1 GB/75 GB
	Monitor	1024x 768/1280x 1024, 1600x900 recommended	Screen Resolution: Minimum: 1024 x 768 higher at Normal size (96dpi);	Recommmend 1280x1024 (20" monitor)	1024 x 768 / 1600 x1200
	Other	USB port,network connection or parallel port	Cube Cluster can distribute model run processes across multiple computers/processors.	Video cards are essential to graphics. Recommend 512MB video memory. Examples are the ATI Tadeon HD5800 and nVidia GeForce GTX200.	CD Drive, any Windows compatible printer
SIZE LIMITATIONS a–no. of zones b–no. of links c–no. of nodes d–no. of transit lines		a = 8,000 b = 256,000 c = 80,000 d = 32,000	a = 32,000 (arbitrary) b = 999,999 c = 999,999 d = unlimited	a = unlimited b = unlimited c = unlimited d = unlimited	a = 5,000 b = 750,000 c = 3,000,000 d = 40,000 (larger network sizes are also avaialble for special cases)

Software Platform Matrix

	NAME OF SOFTWARE PROGRAM	EMME	CUBE (TP+, TRANPLAN, TRIPS, MINUTP)	TransCAD	VISUM
SOFTWARE CAPABILITIES	INTEGRATION WITH TRUE GIS PACKAGES	Emme has Shapefile input/output utilities that allow networks and attributes to be transferred between GIS and modeling environments. GIS data can be displayed alongside Emme data for network editing or map display purposes, and dBASE data can be joined to Emme data for map display and graphical analysis. An ESRI ArcGIS plug-in provides common toolsets.	Fully embedded GIS functions through ESRI's ArcGIS Engine.	TransCAD is a fully integrated travel demand modeling and GIS package, displaying GIS data and information natively in addition to the modeling data. TransCAD can also import/export to ArcGIS, ArcView, MapInfo, and MAPTITUDE. All GIS functionality is available without having to export to GIS and then re-import data.	Fully embedded GIS functions through ESRI's ArcGIS Engine.
	COMPATIBILITY WITH LAND USE ALLOCATION MODELS	Interface with land use methods have been done with UrbanSim, Dram/Empal and MEPLAN. Interface can be achieved via Python scripts with Emme Modeller.	The Cube Land module provides a library of programs for forecasting land use. Fully integrated into Cube Base. User-defined scenarios can be evaluated for supply and demand under different conditions. Cube Voyager has also been integrated with other (third-party) land use forecasting systems.	TransCAD is compatible with virtually all land use models and can be linked to them through GIS files. TransCAD can host the inputs and maintain the outputs of land use models, display and color code parcel and land use data directly, and can transform data between disparate zone systems and networks. TransCAD has been intergrated with UrbanSim and Uplan in the past. A TransCAD version of the legacy DRAM-EMPAL system is also available.	VISUM has a COM interface that can be used for integration with most land use models. Users can define custom attributes for zones, areas/territories, etc and communicate land use model inputs and outputs through these attributes. In addition, zoning/parcel layers can be displayed and visualized. VISUM has been integrated with MetroScope and various other land use models around the world.
	EMISSIONS ESTIMATION	Performed using the network calculator. MOBILE , MOVES and other emissions models have been implemented. Results can be displayed on links, nodes, or gridcells.	Post-process scripts developed by users are available for determining impacts to air quality/emissions. Citilabs has helped several users connect Cube Voyager models to the latest MOVES software provided by EPA.	Prediction of air quality factors (cold starts); VMT by link type, speed class, vehicle type, and by time of day. Built-in two-way interface to Mobile6 and soon to support MOVES. Mobile6 output can be stored and visualized in TransCAD.	Emission models included for NOx, CO2, particles, HC and noise based on vehicle speeds after assignment, this is the European emission model. MOVES post-processor will be available soon.
	TIME OF DAY HIGHWAY ASSIGNMENT PROCEDURES	Flexibility for time-of-day results can be accomplished through multiple scenarios in a project, which permits common model data to be shared across a project and time-of-day assignments to be automated in a consistent manner.	Standard diurnal factoring and static equilibrium highway assignment procedures are available using built-in Cube Voyager functions, along with more advanced tour-based model templates which simulate entire activity day-patterns. Additionally, Cube Avenue is an extension to Cube Voyager that enables dynamic traffic assignment with mesoscopic simulation. This allows the user to build true time-dependent shortest paths across a time-varying network and load different trip tables for each time segment within a model period (such as hours within a day).	Yes. Separate networks and assignments can be run for multiple time periods. P-A to O-D conversions include user-defined and default time-of-day directional splits. Any set of time periods can be specified. Dynamic assignment over short time intervals is an advanced alternative.	An analytical dynamic assignment with time-dependent OD is available, this is a wave based assignment method. All attributes and assignment results are stored as time-dependent variables. VISUM also allows time-dynamic travel path decisions that take into account capacity constraints and metering/spill-back. Time varying assignments can be displayed with an animation tool and with strip/column charts showing variations by time period.
	TRIP TABLE ESTIMATION PROCEDURES	Can automatically adjust the demand matrix to better reflect observed link counts for each mode. Open, flexible implementation permits customizability for local use,eg. weighting, simultaneous class adjustment, etc.	The Cube Analyst module estimates existing trip tables using base year count data. The methodology is based on maximum likelihood statistical techniques with user-defined data quality weights. Cube Analyst 2.0, currently in Beta testing, supports distributed processing for large problem sizes, as well as a proprietary algorithm developed by Citilabs for dynamic origin-destination matrix estimation, which can be used to prepare inputs for Cube Avenue.	A trip table estimation routine is provided that can update or generate an origin-destination matrix based upon traffic counts and iterative runs of a user-selected traffic assignment. The counts can be link counts, turning movements, or a combination thereof. Weights and limits can be set on changes in trip table values. Support is provided for simultaneous estimation of trip tables for multiple vehicle classes. Transit trip table estimation is also provided.	VISUM can develop trip matrices using current traffic count data and a module called TFlowFuzzy. The updated matrices affect only the demand matrix and always referes to total volumes. The TFlowFuzzy is available for highway and transit assignments. In addition it is also possible to estimate gravity model parameters based on observed trip length distributions

Software Platform Matrix

NAME OF SOFTWARE PROGRAM		EMME	CUBE (TP+, TRANPLAN, TRIPS, MINUTP)	TransCAD	VISUM
	INTERSECTION MODELING CAPABILITIES	Any turn penalty function formulation can be specified on turning movements.	Within Cube Voyager static highway assignment it is possible to model all traffic control and geometrics for intersections (importing signal data from Synchro is an option). This procedure takes intersection capacity/delays into account during pathbuilding, skimming, and assignment. When used with Cube Avenue, this feature provides the capability to estimate up stream queues due to intersection failure (spillback).	TransCAD supports detailed modeling of intersections and provides flexibility with respect to treatment of delay for each specific movement. Volume dependent HCM queuing models are used to calculate intersection delays in traffic assignments taking traffic signal settings into account. More detailed modeling of intersections of all types with very high geographic accuracy is performed in the TransModeler traffic simulator.	Intersection modeling can be applied during the assignment process via several approaches. One method utilizes capacity constraints based on turn movement types with volume delay functions. A second uses a node delay function in addition to turn capacities in order to better model the differences in delay at two way stop controlled intersections as well as signalized v/s stop controlled intersections, it has also been used for modeling ramp merges. The third approach uses specific signal timing and geometry with an HCM calculation running in the loop with the assignment to update capacities.
SOFTWARE CAPABILITIES	INTERSECTION CAPACITY ANALYSIS TOOLS	Map worksheets can be customized to display HCM results. HCM analysis can be performed using EMME analysis tools and assignment results.	Cube provides intersection LOS using the Intersection Capacity Utilization (ICU) method popularized by SYNCHRO as well as the Highway Capacity Manual (HCM) and European methods.	TransCAD provides intersection LOS using the Intersection Capacity Utilization (ICU) method popularized by SYNCHRO as well as the Highway Capacity Manual (HCM).	VISUM provides intersection LOS using the Intersection Capacity Utilization (ICU) method popularized by SYNCHRO as well as the Highway Capacity Manual (HCM). Capacity analysis can be run within assignment or after assignment.
	SIMULATION CAPABILITIES	Provided by complementary software - Dynameq. Traffic phenomena that trigger congestion are modeled explicitly, including signals,conflicting movements at intersections, lane permissions for turning movements and vehicle classes, and weaving. Each vehicle travels along a particular lane, performs lane changes where appropriate, and crosses signalized and unsignalized intersections. Congestion builds as queues spill across lanes and spill back through upstream intersections. Dynameq's event-based supply-side simulator provides order-of-magnitude performance improvements over traditional time-step traffic microsimulation, with congested networks exhibiting even greater speed-ups.	Cube Avenue includes simulation of the movement of vehicle-trips through the network as they encounter capacity bottlenecks and generate queues that propogate from link to link. This meso-scopic simulation produces two-dimensional animations that can be overlaid on ArcGIS maps without requiring as much detail as a microscopic model. Microsimulation of individual vehicles is available in 3D as well as 2D using Cube Dynasim. Users can import 3D backgrounds using 3DS formats.	TransModeler is a companion package that provides advanced multimodal traffic simulation capabilities in 2D and 3D. TransCAD and TransModeler are integrated and make it straightforward to simulate large networks in great detail.	VISUM network data and travel demand output can be exported to VISSIM for microsimulation. VISSIM is a separate program available within the PTV Vision Suite and provides graphic 2D and 3D microsimulation. In addition, the detailed data and results of VISSIM can be imported into VISUM for additional network analysis.
	WEB PUBLISHING/SERVICES	Emme 3 supports graphical export to the SVG XML-based format. Maps and graphics(.svg) can easily be published online.Many web browsers offer native .svg support, and other 3rd party plug-ins are commonly available.	Cube Cloud Services is a web-based platform for sharing access to model runs in a high-performance grid computing environment. Users can launch multiple runs in parallel or use Cube Cluster in the Cloud to distribute model computations across a processing grid without consuming any local resources. A streamlined web-based interface provides access to upload model inputs and download outputs, or the user can create their own web-based maps and reports from existing data.	TransCAD for the Web provides access to all of TransCAD's functionality on the web. Templates are provided for development free creation of web applications such as viewing planning data and networks, activity diary surveys, intersection level of service forecasting, transit customer information systems, etc.	Web publishing is available via VISUM Information Server (IS). VISUM IS enables users to share model data and evaluations over an Intranet or the Internet. The user only needs a browser. Different access rights can be configured.
TOOLS AND FUNCTIONALITY PROVIDED FOR DEALING WITH PROJECT AND SCENARIO MANAGEMENT		An Emme project is a single entity that permits central management of related EMME databases, associated media(eg. images, GIS data) and customized worksheets. The EMME database provides a consistent, structured and flexible way of working with network data, demand data, and macros for model automation across transportation planning scenarios. Each database stores multiple scenarios, which the software can access simultaneously. The macro language permits completely automated builds (and re-builds) of the entire EMME database, so users are free to integrate with project management systems and/or version control systems of their own choosing.	Cube Base includes a Scenario Manager that allows users to define, edit, and run scenarios. Reviewing input data and output results by scenario is done within a graphical user interface. Cube Cloud Services implements essentially the same interface within a web-based framework.	TransCAD includes powerful Model and Scenario Managers. The Model Manager allows users to create, manage, and edit models based on a flowchart interface. It allows you to specify the order of the modeling steps, select input and output files, and edit paramters. The Manager includes tools for visualizing inputs and outputs. Macro source code is provided for the scenario manager and the standard user interface so that they can be customized by consultants and other users.	Scenarios can be stored in a single database in VISUM. This binary file allows the user to store all data inputs and outputs, as well as all paths of one assignment or multistage model run. For more complex trip chaining models, a GUI manager for scenarios but also for different model runs inside of a scenario helps to handle inputs and outputs of the model.

Software Platform Matrix

NAME OF SOFTWARE PROGRAM	EMME	CUBE (TP+, TRANPLAN, TRIPS, MINUTP)	TransCAD	VISUM
TOOLS AND FUNCTIONALITY PROVIDED FOR DEALING WITH SCENARIO DATA MANAGEMENT	In Emme, data validation is built directly into the data model to ensure model integrity. Emme requires no network or transit 'build' processes to complicate model troubleshooting. Emme provides a host of scenario management utilities to lock/protect scenarios, check status, and perform other administration. A central log book can be used to track user modifications to all scenario data, audit model runs and validate model correctness. Emme Modeller provides avriety of tools for scenario data mangement.	Data is managed within a "catalog" format which allows variations to individual inputs. In addition, Citilabs has developed a Data Manager graphical user interface which allows the user to import data and build networks from common GIS formats, as well as linking models to file, personal, and enterprise ArcGIS geodatabases.	The Scenario Manager lets users choose the input files associated with any "sub" scenario and specify the output filenames and their location. New sub-scenarios can be created with the click of a button and will initially inherit all the model settings from its parent scenario. Parameters can then be modified interactively through dialog boxes or by editing batch scrips. The built-in relational database facilitates all forms of data management and maintenance.	Scenarios are stored in VISUMs database format, which is like a geodatabase. This provides a rhobust data management environment for scenario management. Scenarios can also be managed in applications that include standard databases like MS Access. Python or VB applications can be built to handle the data from multiple scenarios. Usually a master network is defined and scenario networks are derived from the master by simple attribute changes.
TOOLS AND FUNCTIONALITY PROVIDED FOR DEALING WITH SCENARIO COMPARISON	EMME provides both comprehensive command-line and highly-customizable graphical tools for scenario comparison. Exhaustive textual comparison reports can be generated for scenarios to showcase any/all differences. Alternatively, EMME worksheets provide a flexible way to call out network and/or results differences on maps that incorporate data from multiple scenarios. A powerful expression engine allows users to plot maps of network 'diffs' in order to validate editing modifications, or for use indecision analysis. Emme Modeller provides avriety of tools for scenario comparisons and evaluation.	Cube provides easy to use tools for creating comparison charts, tables and maps highlighting differences between scenarios.	The Scenario Manager allows the user to make multiple runs simultaneously and provides user friendly tools for output comparison. The comparison tools provide reports, as well as informative map graphics. A preprogrammed procedure provides detailed statistics on differences between two assignments.	Automated difference network analysis allows comparison of assignment results for all network objects in the model.
TOOLS AND FUNCTIONALITY PROVIDED FOR DEALING WITH CROSS SCENARIO SIMULTANEOUS DATA EDITING	Network edits can be applied directly to other scenarios in an automated, repeatable fashion using editing transcripts. After applying edits to one scenario, users can easily save complete transcripts of their editing session for application of cross-scenario data editing. The state of Undo/Redo operations are also reflected in the editing transcript.	Data files may be used for individual or shared across multiple scenarios, allowing for clear and efficient data editing for multiple scenarios. Edit log files may be stored and "re-played" across multiple scenario networks to enable transactional database workflows. Transit networks can be "synchronized" to highway networks with the same geodatabase to automatically detect and correct topological inconsistencies. Concurrent users can edit network detail, including shape vertices, and automatically merge/reconcile changes.	The Scenario Manager enables cross-scenario editing since scenarios can be defined in such a way that they share common datasets. This allows users to specify master networks that can be used in one form or another by different scenarios. Using the unique capability to enable and disable links, multiple scenarios can be run from the same network.	Editing data across scenarios can be done in multiple ways. Data from one scenario can be applied to another. Scenarios can be setup as a combination of input files, which can be shared among scenarios. In addition, the multi-user extension allows for groups of users in different agencies/locations to have different access rights to work on a common network database.
NUMBER OF YEARS SOFTWARE HAS BEEN USED IN THE U.S.	25+	25+	25+	10+
NO. OF ORGANIZATIONS USING SOFTWARE INSIDE U.S.	200-299	400+	400+	400+
NO. OF ORGANIZATIONS USING SOFTWARE OUTSIDE U.S.	1000+	400+	1000+	1000+
OPTIONS PROVIDED FOR SUPPORT AND TRAINING	Software maintenance, individual training, group training, on-screen tutorials, online help, user groups, telephone support, newsletter. INRO lists on-line discussion forums facilitate communications among Emme users.	Software maintenance, individual training, group training, web-based training, self-study tutorials, online help, user groups, newsletter, telephone and e-mail support. Also annual international user conference.	Software maintenance, individual training, group training, on-screen tutorials, online help, user groups, newsletter, telephone support, computer-assisted remote training and support.	Software maintenance, individual training, group training, on-screen tutorials, online help, user groups, newsletter, telephone support, e-mail hotline service; usergroup meetings.
ANNUAL COST OF SUPPORT FOR SOFTWARE	12% of purchase price.	Typical annual maintenance contract cost is 15% of the initial software purchase price.	$1,200 to $2,000 depending on NAVTEQ data	15% of the purchase price ($600 min)

Source: The Urban Transportation Monitor (September 15 and 29, 2006). Fully updated by Kimley-Horn in November 2011.

Kimley-Horn
and Associates, Inc.

Memorandum

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To: Claudia Wade, P.E.
El Dorado County DOT

Cc: Steve Kooyman, P.E.
El Dorado County DOT

From: Michael Schmitt, AICP, PTP
Matt Weir, P.E., T.E., PTOE

Date: December 13, 2011

Subject: Technical Memorandum #3 – Traffic Forecast Workshop

In order to build consensus on a recommended approach for traffic forecasting for El Dorado County, a stakeholder working group meeting was held on November 29, 2011. At the workshop, Kimley-Horn staff summarized the results from Tasks 1 through 3 of the needs assessment, and presented their resulting recommendations for traffic forecasting in the County. The workshop included representation from the County and the El Dorado County Transportation Commission (EDCTC), all of whom had previously participated in interviews in support of this effort. Specifically, the following staff were present at the workshop:

- Steve Kooyman, El Dorado County Department of Transportation, Acting Deputy Director of Transportation Planning & Land Development (TP&LD)
- Paul Hom - El Dorado County Department of Transportation, Engineering Division
- Claudia Wade, El Dorado County Department of Transportation, TP&LD – Long Range Planning
- Jose Crummet , El Dorado County Surveyors Office (GIS)
- Shawna Purvines, El Dorado County Planning Services, Long Range Planning
- Peter Mauer, El Dorado County Planning Services, Long Range Planning
- Woodrow Deloria, El Dorado County Transportation Commission (EDCTC)

The draft recommendations developed in Tasks 1 through 3 and presented at this workshop were: (1) in response to specific topics identified in the scope of work of the contract between El Dorado County Department of Transportation and Kimley-Horn; and (2) those developed by Kimley-Horn based on findings developed over the course of the study.

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The following sections provide the consensus recommendations that resulted from the Traffic Forecast Workshop.

Should the County continue to maintain its own model?

It is recommend that the County continue to maintain its own travel demand model. The only reasonable alternative to maintaining its own model is to utilize the SACOG model for traffic forecasts within the County. While the SACOG model is widely accepted as being a well developed and reasonable travel demand model, it is not considered ideal for the County's use for the following reasons:

- The SACOG model is at a much grosser scale than the existing El Dorado County model. It has only 126 Traffic Analysis Zones (TAZs) within the County and does not included coverage of the Tahoe Basin.
- SACOG traffic forecasts are not refined enough for County use. In particular, they appear to be low on some critical roadways within the County.
- The network is not curvilinear (stick figure), which does not make it ideal for presentation to the public or decision makers.
- SACOG is not planning to continue support of the SACMET model and the next generation SACSIM model may not be the best fit for County's needs due to its complexity.
- The SACOG model is not tasked with assisting in the determination of Traffic Impact Mitigation (TIM) Fees, which has implications to the model design, including which roadways are modeled and the size and shape of traffic analysis zones.

How best to resolve inconsistencies between agency models?

Based on a review of the SACOG SACMET and El Dorado County models, and our understanding of Caltrans model output, it is unlikely that the differences between the three models can be fully addressed. Historically, differences between the SACOG SACMET model and El Dorado County model have been rooted in land use assumptions. One example is the forecasts included in the *El Dorado County Land Use Forecasts for Draft General Plan*, EPS, March 5, 2002, which showed similar population forecasts for 2025 but significantly different employment estimates. The complexity of this issue is compounded by limitations imposed by regional control totals imposed on the SACOG model. Given that the employment differences are an important reflection of El Dorado County economic development policy, it is recognized that parity between the two models is likely not achievable. Accordingly, it is instead recommended that

the underlying methodologies be the general focus of any efforts to improve consistency between the models. Following are areas of focus for those efforts:

- The following elements of the SACOG model should be reviewed for their applicability in the El Dorado County model. It is important to note this recommendation does not suggest that they should necessarily be wholesale incorporations into a future version of the El Dorado County model, as there may likely need to be allowances made for the desired complexity of the model given the time and resources that the County has to maintain its model.
    - Trip generation function/data
    - External station data, particularly along US 50
    - 2008 Base TAZ Data for applicability (note that SACOG had indicated that they thought it would be helpful if the two models could use similar base data).
- To facilitate future comparisons, County TAZs should fit within existing SACOG TAZ borders.
- County staff responsible for maintaining the model should develop a regular rapport with SACOG staff in order to reduce duplication of effort and take advantage of future model updates and associated data collection efforts. County staff can also use this increased coordination as an opportunity to work with SACOG staff to better understand location of perceived inconsistencies in SACOG model output.
- The County should consider establishing policies to resolve inconsistencies in forecasts (SACOG, EDC, or Caltrans) particularly when they might result in differing levels of improvement.
- The County should document known differences between their model and SACOG, so that it can be clearly articulated when necessary to facilitate decision-making.

Should County staff or a consultant maintain the model?

It is recommended that County staff maintain the El Dorado County model, for the following reasons:

- There is universal support amongst County staff and stakeholders contacted during the course of this study.
- By maintaining the model in house, staff will be able to more easily coordinate model usage for County needs.
- Assuming the platform is also migrated to a Geographical Information System (GIS) base, other departments will be able to more easily share information related to model inputs and outputs.

- In general, a County maintained model should reduce the "black box" effect, which is commonly associated with the existing model. Over time, with an improved understanding of the model, County staff and stakeholders will likely increasingly perceive model output as trustworthy.

Recommendations related to software procurement and staff training?

Appropriate software selection and proper staff training will be key to developing a successful model-forecasting program. In support of this, the following recommendations are made:

- The next generation model should be based on a Geographical Information System (GIS) platform. The network and TAZs should be drawn with curvilinear lines based on actual locations. The advantages of this approach include:
    - Network will have a correct appearance (not a stick figure), which will facilitate the use of output by staff and others who do not have a modeling background.
    - Off the shelf GIS maps, including thematic mapping, can be easily prepared to analyze data and model results.
    - Improves ease and quality of data sharing between departments.
    - The ability to create high quality, true to life, graphics for decision makers, the public, and incorporation into future grant applications.
    - Ability to incorporate existing data more easily into model development and application (ie traffic count data, parcel data, etc.).
- It is recommended that the County select either TransCAD or CUBE as their software platform. Both products are well established in the United States, have a good track record on support, and have the requisite GIS capabilities suggested for the County's next generation model. As noted during the workshop, TransCAD is a standalone GIS product while CUBE will require that it is binded to an ESRI product. Kimley-Horn and County staff plan to make a final recommendation during the process of finalizing this memorandum.
- Staff skills and availability should influence model development. It is important to recognize that limited County staff time will be available to manage the model; as such care should be taken to not develop an overly burdensome model. Additionally, it may be desirable that the model be able to be operated and understood by multiple staff, which would likely have additional implications to its overall design and user interface.

- It is recommend that County staff that is identified to operate the model, assuming they do not have the requisite experience, attend formal vendor software training. One of the significant benefits of attending vendor training in lieu of consultant training is that County staff will be able to develop a working relationship with the vendor and potentially users from other jurisdictions which, over the long term can prove to be very beneficial.
- It is recommended that consultant services be utilized for training related to specific model functions developed to meet El Dorado County's needs (not the basic software platform itself) or other specific needs as defined by the County.

Additional Recommendations

Following are the additional recommendations discussed and generally identified as having support during the course of the Traffic Forecast Workshop:

- Consideration should be given to incorporating the development of the updated land use forecast into this project. The updated land use forecast will need to be a critical path item if the model is to provide traffic forecasts in a timely fashion. Advantages of an integrated approach include:
    - Potential cost and time savings resulting from having GIS work completed by one consultant as a result of the need for reduced coordination.
    - Potential cost and time savings resulting from the ability to coordinate model needs on an as-needed basis.
    - It is worth noting that this recommendation is predicated on a coordinated land use forecast approach similar to that discussed during the workshop.
- It is recommended that a mode split model not be developed at this time. Given current transit usage, ridership can be reflected through a factoring approach (as was done in the existing model). This does not exclude a mode split model from being incorporated at a later date if desired.
- It is recommended that the following activities be undertaken to improve the 2010 TAZ structure:
    - Define the roadway network (prior to undertaking any further TAZ updates).
    - Review locations and size of TAZs to make sure they have reasonable access to the roadway network (TAZs should not serve as the conduit for other TAZs to connect to the network).
    - Review the number of TAZs to make sure they are appropriate given the overall model design.

  - Review and consider reducing the number of zones outside of El Dorado County. Although the provision of zones outside of El Dorado County may be ideal from the standpoint of better understanding El Dorado County trip making characteristics, it adds complexity to the model and raises multiple policy questions regarding land use coordination with the City of Folsom (both regarding the source of initial forecasted land uses and the tracking and incorporation of any ongoing development that might exist or change). Reducing the number of outside zones does not preclude the excluded zones from being incorporated at a later date.
- It is recommended that as part of the model development process, an effort to educate staff, decision makers and the public be undertaken to improve their understanding of both the appropriate use of macroscopic models and their associated limitations.

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and Associates, Inc.

Memorandum

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To: Claudia Wade, P.E.
El Dorado County DOT

Cc: Steve Kooyman, P.E.
El Dorado County DOT

From: Michael Schmitt, AICP, PTP
Matt Weir, P.E., T.E., PTOE

Date: December 13, 2011

Subject: Travel Demand Model Specification and Implementation Tasks

This technical memorandum summarizes the preferred model's specifications and associated implementation tasks. While this memorandum includes many of the activities necessary to update the El Dorado County model; there are additional activities that may be desirable and or necessary to complete an update of the model (i.e., research activities, data collection, coordination with other County departments, etc.). The recommendations provided in this document were developed during the course of previous tasks, through the Traffic Forecasting Workshop conducted on November 29, 2011, as well as with input and direction from El Dorado County Staff.

Model Specification

As of the preparation of this technical memorandum, a final software platform selection has not yet been made. It is anticipated that a final selection will be made during December 2011. Software vendor specifications, including hardware and operating system requirements and detail on software platform features are provided in the Appendix of the draft *Software Platform Matrix* submitted to the County on November 17, 2011.

GIS Integration

It is recommended that the model network, Traffic Analysis Zones (TAZs), and output be both GIS compatible and accurate GIS representations. The following activities are recommended to be undertaken in support of this recommendation:

- Select a travel demand model that supports GIS integration.
- Determine the extent of the roadway network for the updated model.
- Create the model network and link attributes in GIS using the County's Roadway GIS layer as a base file.

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- Obtain the final GIS version of the 2010 TAZ structure.
- Finalize the GIS version of the 2010 TAZ structure by completing the following:
    - Review locations and size of TAZs to make sure they have reasonable access to the roadway network.
    - Review the number of TAZs to make sure they are appropriate given the overall model design.
    - Confirm County TAZs will conform to census data and SACOG TAZs boundaries.
    - Reducing the number of zones outside of El Dorado County.
- Integrate existing intersection and segment traffic count data into a GIS compatible format.
- Create standardized GIS based templates, which include thematic mapping options and the ability to include existing GIS layers that display landmarks such as political boundaries and waters feature, for presenting model output.

Land Use and Trip Generation Function

It is recommended that the El Dorado County model and updated land use forecast be developed cooperatively through the following activities:

- Develop model functionality to facilitate the conversion of GIS based parcel level land use updates into land use information that can easily be incorporated into the TAZ structure.
- Review the current SACOG SACMET trip generation function for its applicability in developing an El Dorado County specific trip generation function.
- Review the 2008 SACOG model data to determine the extent to which an opportunity to coordinate base year data is reasonable.
- Determine the most appropriate way to represent the 12 identified Traffic Impact Mitigation (TIM) Fee land uses in the land uses identified for model usage.
- Coordination with land use forecast update.

Distribution, Mode Split, and Assignment

- Select a distribution model appropriate to the updated El Dorado County model.
- Develop a method or model appropriate to account for transit trips in El Dorado County.
- Select an appropriate assignment algorithm for the updated El Dorado County model.

Traffic Data Collection and Model Calibration/Validation

- Review available traffic count data at the onset of the model's development to determine if sufficient data exists to properly calibrate/validate the model. Data should be reviewed both for completeness and reasonableness. Data needs should be documented and then collected.
- Obtain and review data available from SACOG related to trip characteristics and lengths.
- Validate model using Caltrans and FHWA recommended error limits for total error by roadway functional classification.
- Establish the location of major screen lines and validate to within 10% of actual counts.

Software Customization and System Management

- Develop a scenario tool (i.e. scenario manager or catalog) tailored to the needs of the updated El Dorado County model.
- Develop a user plan to document the different levels of user operation desired (i.e. manipulate the entirety of the model, run with a scenario tool only, need output only).
- Establish an electronic file management plan to document scenarios and organize scenario input and output files.
- Determine methods to make select output files available to El Dorado County and/or public GIS users.
- Establish policies regarding the use of forecasts (SACOG, El Dorado County, or Caltrans) on particular roads or roadway types.
- Document differences between the updated El Dorado County model and SACOG model; including model assumptions, input data, and traffic forecasts.
- Identify and develop recommended post-processing techniques including those related to traffic volumes, turn movements, and air quality.

Model User's Manual and Documentation Development

- Prepare a model development document that includes model inputs, assumptions, methodologies, and validation results and techniques.
- Prepare a model user's manual detailing the operational work flow of the model including use of the scenario tool.
- Prepare a document detailing model results for selected future scenarios.

Staffing Requirements, Training, and Education

- Identify an existing (or hire) transportation professional at the County to maintain and operate the County's model on an ongoing basis.
- Have county staff, that is identified to regularly operate the model, complete vendor provided training (assuming they are not already competent in the software).
- Utilize consultants for training related to local model attributes (not the basic software platform).
- Educate staff, decision makers and the public to improve their understanding of both the appropriate use of macroscopic models and their associated limitations.