



**COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY**

INTEROFFICE MEMORANDUM

Date: September 19, 2013

To: Board of Supervisors

From: Claudia Wade, Senior Civil Engineer

Subject: County Wide Intersection Analysis

During the July 30th Board of Supervisors presentation on the Green Valley Road Corridor as well as during the Measure Y Committee Presentation on August 26th, there were discussions regarding resources available for staff to review and/or complete an intersection level (micro) analysis for all intersections in the County. The following information provides a description of the software options, as well as the cost to complete the micro-analysis for all intersections. Two alternatives are discussed, along with their estimated costs. This information is also summarized in Table 1. See Table 2 for further detail.

Alternative 1

Purchase software and hardware to allow staff to perform micro operational analysis for all significant intersections, where roads identified on the El Dorado County General Plan Circulation Map (TC-1) intersect each other. There are approximately 260 such intersections.

The following is a cursory comparison of the software packages available for purchase that will allow LRP staff to perform operational analyses for all County intersections. These packages include:

- Synchro
- CUBE modules of Dynasim and Avenue
- Paramics, Transmodeler and VISSIM software

Paramics, Transmodeler and VISSIM are similar, very detailed, high end simulation packages. VISSIM is the most commonly used of the three in California, and therefore will be used for this comparison. The CUBE Dynasim and Avenue modules are not typically used in this area, but are included for discussion purposes, as the new Travel Demand Model (TDM) is based on the CUBE platform.

The Synchro software is widely used, the most user friendly, and is the most cost-effective software available for the level of analysis requested. It does not allow modeling of individual vehicles, pedestrians or bicycles. The micro intersection analyses would be done using the TDM output export as a basis.

Dynasim and Avenue modules can be purchased for the CUBE software, to allow more intensive individualistic modeling of vehicles. However, these modules can range from 3 times or 4 times the cost of the Synchro software, depending on how large a system will be modeled.

These modules would be an additional step in the TDM work stream, and would theoretically require fewer steps to complete. Both the Dynasim and VISSIM software can create better visuals than the Synchro software.

VISSIM software runs from 2 to 3 times the cost of Synchro, and is the most labor intensive software of the three. VISSIM allows the creation of a micro-simulation that can model unusual or complicated intersection conditions, and can include modeling of individual movements of pedestrians and bicycles.

The estimate assumes all intersections would be analyzed for the six different scenarios that development projects are required to analyze per the current traffic impact study protocols. It would not replace the operational analysis required during the preparation of a Traffic Impact Analysis.

Alternative 2

Contract with Kimley-Horn & Associates (KHA) to provide a planning level analysis tool in order to mass-process the significant intersections for the purpose of identifying likely operational challenges. This analysis would not replace the operational analysis required during the preparation of a Traffic Impact Analysis. KHA provided a very general scope and cost estimate for the two following options. These are rough estimates, and a more detailed scope of work and cost estimate can be provided by KHA upon Board request.

Option A: Fully integrated script

- Includes 6 to 8 week scripting and model development effort
- Requires \$35,000 - \$55,000 in labor (excludes traffic counts)
- Uses a database to manage intersection configurations (nodes, count volumes, etc.)
- Provides seamless integration and analysis within the Cube environment
- Incorporates FURNESS or other balancing techniques (depending on data availability) to post-process turning movement volumes
- Includes ICU analysis for LOS determination

Option B: Off model post processing

- Includes one month scripting and spreadsheet development effort
- Requires \$20,000 - \$30,000 in labor (excludes traffic counts)
- Maintains intersection configuration in spreadsheet (nodes, count volumes, etc.)
- Specifies nodes to save turning movements in assignment script
- Exports model turning movement counts for spreadsheet calculation and analysis
- Iterative use would be more labor intensive (required for each model run) than the fully integrated approach described in Option A (as it requires manual manipulation by user)
- Incorporates FURNESS or other balancing technique (depending on data availability) to post-process turning movement volumes
- Includes ICU analysis for LOS determination

These methods would be used to screen for intersections that meet an LOS criteria. For those select intersections an operational analysis would be conducted using Synchro to include the micro simulation.

Table 1: Alternatives for Intersection Analysis

	<i>Software Cost</i>	<i>Cost of Analysis (Rounded to nearest thousand. Includes cost of software.)</i>
Alternative 1: Purchase of Software for staff to run micro analysis (uses Synchro, CUBE micro-simulation modules, or VISSIM)		
Option A: Purchase Synchro - analyze all intersections	\$10,500	\$ 830,000*
Option A1: Purchase Synchro – analyze selected intersections	\$10,500	\$ 330,000
Option B: Purchase CUBE modules*	\$56,500	\$ 2,028,000*
Option C: Purchase VISSIM *	\$24,000	\$2,456,000*
Alternative 2: Cost for staff to run analysis based on specified CUBE model runs, and use results for micro-analysis. Requires CUBE and Synchro		
Option A - Integrated subprogram within CUBE, to determine the required intersections for Synchro analysis	\$26,600	\$ 480,000
Option B – Run the model using CUBE, and export results into a spreadsheet, then determine which intersections require analysis using Synchro	\$26,600	\$ 455,000

*Note: The cost includes the analysis for 260 intersections

If staff is directed to complete county-wide intersection level analyses, staff recommends Alternative 1, Option A1 based on input from the public, which includes requests for staff to have the capability to run a more detailed intersection analysis. Staff recommends the purchase of Synchro software, as it is the most cost-effective solution but can still provide a micro-simulation for signals and intersections. The cost of two Synchro licenses and needed hardware is approximately \$10,500.

TABLE 2: MICRO-SIMULATION SOFTWARE COMPARISON

	Name	Cost per Seat	No. of Seats Needed	Total software costs	Annual maintenance cost of software	Additional Computer Hardware cost	Additional CUBE license	Subtotal for Software and Hardware Costs	Collect Turning Movement Counts*	No. of intersections (including interchange ramp intersections with local roads)	Total Cost to Collect Turning Movement Counts	No. of Hrs Needed for typical local road intersection analysis per scenario	No. of Scenarios typically required in EDC**	Total No. of Staff Hours required	Total No. of Hrs. Needed for Intersection Analysis	Staff Hourly Cost	Staff Labor Cost	Total Cost First Year to Analyze all significant intersections	Annual Software Maint. Costs (Year 2+)*
Alternative 1: Analyze all Intersections	Option A: Synchro Software	\$ 4,098	2	\$ 8,196	\$ 1,229	\$ 1,050		\$ 10,475	\$ 500	256	\$ 128,000	3	6	18	4,608	\$ 150	\$ 691,200	\$ 829,675	\$ 1,229
	Option A1: Synchro Software, analyze select intersections	\$ 4,098	2	\$ 8,196	\$ 1,229	\$ 1,050		\$ 10,475	\$ 500	100	\$ 50,000	3	6	18	1,800	\$ 150	\$ 270,000	\$ 330,475	\$ 1,229
	Option B: Cube Dynasim (Pro version) and CUBE Avenue modules	\$ 18,000	2	\$ 36,000	\$ 5,400	\$ 1,050	\$ 14,000	\$ 56,450	\$ 500	256	\$ 128,000	8	6	48	12,288	\$ 150	\$ 1,843,200	\$ 2,027,650	\$ 5,400
	Option C: VISSIM (approximate cost)	\$ 10,000	2	\$ 20,000	\$ 3,000	\$ 1,050		\$ 24,050	\$ 500	256	\$ 128,000	10	6	60	15,360	\$ 150	\$ 2,304,000	\$ 2,456,050	\$ 3,000
		Synchro cost	Hardware Cost	Annual Maint. Cost Software	Additional CUBE License	Subtotal for Software and Hardware Costs	Total Cost to Collect Turning Movement Counts	KHA Contract Cost (Estimate)	No. of intersections	Total No. of Hrs. Needed for Intersection Analysis	Total No. of Hrs. Needed for Intersection Analysis	Staff Hourly Cost	Staff Labor Cost	Total Cost in First Year	Annual Software Maint. Costs (Year 2+)*				
Alternative 2: Screen all Intersections, Analyze select (assume 100 - 30 interchange, 70 local road intersections)	Option A: Fully Integrated Script	\$ 8,196	\$ 1,050	\$ 3,329	\$ 14,000	\$ 26,575	\$ 128,000	\$ 55,000	100	18	1800	\$ 150	\$ 270,000	\$ 479,575	\$ 3,329				
	Option B: Off-Model Post Processing	\$ 8,196	\$ 1,050	\$ 3,329	\$ 14,000	\$ 26,575	\$ 128,000	\$ 30,000	100	18	1800	\$ 150	\$ 270,000	\$ 454,575	\$ 3,329				
* Assume County hires traffic count firm to collect intersection peak hour volumes for \$500/intersection vs. assuming County staff collects the data at 10 hours per intersection @ \$120/hr. for a cost of \$1,200.00 per intersection (Hours needed to collect turning movement counts = minimum of 3 hours per each peak period (AM and PM) + 2 hours to reduce data + 1 hour travel time per peak period)																			
** Scenarios - 1) Existing, 2) Existing plus Project, 3) Existing plus approved plus pending projects, 4) Existing plus approved plus pending plus the proposed project, 5) Cumulative, 6) Cumulative plus project																			
*** Maintenance cost for the software does not include the cost of the CUBE license for the second BASE and VOYAGER modules used for the TDM																			