The Effect of Centerline Light Rail Street-Taking on Net Regional Capacity and Congestion

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The Problem

The OCTA Centerline Rail proposal at this stage comprises three rail alternatives, two at grade and one elevated, and a no-build (reference) alternative. Each of the three build alternatives comprises a bundle of 1) the rail build and 2) street building for mitigation of the adverse effects of loss of street capacity due to ROW taken from surface streets.

The OCTA Centerline Draft EIS/EIR, September 1999, in its executive summary, page S-27 contains the following astonishing statement :

> *"Compared to the No Build Alternative, all three build alternatives would have more adverse impacts on the environment (without mitigation) for traffic circulation, displacements, public services, visual quality, cultural resources, noise/vibration, hazardous materials, water resources, natural resources, parks/trails, and environmental justice. Mitigation measures are proposed to reduce these impacts. "*

Yes, you read that right. *The light rail system itself, (*stripped of the street building which is a separate option*) is worse in every quantifiable benefit measure than doing nothing.* This is not a mistake or misprint. It is a result of the fact that in either its at-grade or elevated alternatives, the rail system takes its right-of-way from heavily traveled Orange county streets. Of course this taking has a detrimental impact on congestion and environmental measures throughout the region.

The following analysis investigates the street ROW-taking in detail and confirms the adverse results found by the traffic modeling study.

We find that in either street level or elevated alternatives, the capacity lost to street-taking is greater than that gained by rail ridership, with the net result that irrespective of cost, the proposed light rail systems, are mobility and environmentally inferior to the no-build alternative.

Background:

The OCTA proposed light rail systems take most of their Right-Of-Way (ROW) from some of the most heavily traveled Orange County streets including Harbor, Anaheim, Katella, Chapman, Main, Bristol, and Jamboree. At their minimum widths, the elevated alternative takes most of 1 lane and the street level alternatives more than two lanes. This is a loss of capacity that has a detrimental impact on congestion on those streets and throughout the region. Is the beneficial rail capacity sufficient to make up for this loss? We find that it is not, fully explaining the astonishing DEIR statement above.

The analysis here provides a direct comparison of the beneficial capacity gained due to rail ridership with the loss of street capacity based on the no-build traffic projections and street area, or equivalent lane-miles taken.

RESULTS

The methodology, source data, and assumptions of the analysis are detailed in the following Table and Appendix. The major results are summarized here.

1. For all of the three rail alternatives the loss of street capacity due to lane reduction *exceeds* the effective rail capacity benefit, resulting in a net *loss* of regional capacity. For the elevated alternative, the loss is insignificantly small, it doesn't do much harm (but it doesn't do *any* good). For the Street Level Alternatives 1 and 2, the net capacity *loss* is significant, 18,000 and 14,000 person-trips per day respectively.

2. The net effect of the light rail system itself (separated from street building mitigation) is *detrimenta*l to regional capacity, congestion, and thereby to regional travel-time, emissions, and energy consumption, as confirmed in the DIES quotation at the top of this report.

3. In view of this adverse result, the no-build alternative is superior to any of the light rail systems in terms of overall system capacity and congestion and consequently in cumulative travel-time, emissions and energy consumption.

4. This result shows that whatever overall system gain may be claimed of the *complete* rail alternatives including mitigation , is attributable not to the rail system per se, but to the "mitigation" which, ironically, consists of *street* expansion, a bundled but separable option that could be taken with or without the light rail element.

5. In arriving at these results several simplifying assumptions have been made including:
    - Ignoring the extra ROW width due to stations, separate singlet alignment, and curve sections.
    - Ignoring the effect of adverse intersection capacity impacts.

Both of these have the effect of *understating* the adverse impact of the street lane-taking.

TABLE 1.
COMPARING LIGHT RAIL BENEFIT AND DETRIMENT

		Units	Rail Elev.	Rail SLA1	Rail SLA2
	BENEFIT = Reduction of Auto Trip Volume				
1	**Effective Rail Capacity Benefit**	ps-trips/day	17,400	29,700	26,200
	DETRIMENT = Loss of Street Capacity				
2	**No-Build ADT/ln**	veh/day/ln	7142	7142	7142
3	**Minimum Taking Width**	ft	9	28	28
4	**Lanes Taken**	lanes	1	2	2
5	**ADT Taken**	veh/day	7142	14284	14284
6	**Length of Street Taking**	miles	14.2	19.0	15.9
7	**Capacity Taken, vehicle-miles**	veh-mi/day	101,416	271,396	227,116
8	**Effective Street Capacity Detriment**	ps-trips/day	17,904	47,913	40,096
9	**NET CAPACITY CHANGE (loss)**	ps-trips/day	(504)	(18,213)	(13,896)
10	**Detriment / Benefit ratio**		1.03	1.61	1.53

Table Data Sources, Assumptions and Derivations

Line 1. Effective rail capacity benefit, person-trips/day. This is defined by FTA as the reduction in auto person trips/day, (roughly equivalent to increase of total transit ridership) and given in the DEIR (Ref 1] at tables 3.1-B, -C, and -D, total, county-wide trips. All the overall congestion and environmental benefits of the rail system stem from this measure. This is only 25% to 40% of the total rail ridership given in Table 3.1G. The remainder is diversion from one transit mode (bus) to another and is of no benefit to regional congestion or environment.

Line 2. No-Build street ADT/lane. Given by averaging the No-Build segment ADTs given in DEIR, tables 3.21, 3.25, and 3.31over the entire street-taking length.

Line 3. Minimum Taking Width. Minimum width taken from street, scaled from DEIR, Figures 2.2, 2.11. Extra width of stations is not taken into account. [Note 1]

Line 4. Lanes Taken. Number of standard 12 foot street lanes taken estimated by rounding line 3 to nearest multiple of 12 ft standard arterial lane width.

Line 5. ADT Taken. Calculated as line 2 times line 4.

Line 6. Length of Street ROW. Scaled from Figures 4.1.6.1 – 4.1.9.9 excluding portions of ROW not in existing street right-of-ways. Defined without regard to whether taken from street lanes, median or parking space, all regarded as essential parts of the integrated street structure. [Note 1]

Line 7. Capacity taken, vehicle-miles/day. Calculated as the product of lines 5 and 6.

Line 8. Effective street capacity detriment, person-trips/day. Calculated by dividing line 7 by 8.1 mile/trip, the average length of an automobile trip and multiplying it by 1.43 persons/vehicle, the Average Vehicle Occupancy (AVO). Both of these constants are from the Bureau of Census 1995 National Personal Transportation Survey, for all trip purposes, for Orange County.

This is the number of person trips that would have been supported by the taken lanes under the 2020 no-build alternative, directly comparable with the effective rail benefit capacity given on line 1.

Line 9. Net Effective Capacity Change, person-trips/day. Line 1 minus line 8. The net effective capacity impact is a loss of from 500 to 18,000 person-trips/day.

Line 10. Detriment/Benefit ratio. Calculated as the ratio of line 8 to line 1. The loss/gain ratio ranges from 1.03 to 1.61

Note 1. Approximated by scaling figures in published DEIR. Could be improved by scaling full sized drawings but unlikely to change bottom line results.

References

1. "The Centerline, Draft, EIS/EIR", September 1999. (Referred to herein as "DEIR")
2. "A Multimodal Regional Congestion Index", AJM Engineering, April 16, 1999. Available at <www.home.earthlink.net/~malli/>
3. National Personal Transportation Survey 1995, Bureau of Census for Orange County, for all trip-purposes.

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