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Memorandum

TO: Lou Thompson, CHSRA Peer Review Panel

COPY: Frank Koppelman, CHSRA Ridership and Revenue Peer Review Panel
Gregg Albright, PB

FROM: Jeff Buxbaum, David Kurth, CS
Nick Brand, Sudhish Verma, PB

DATE: November 29, 2011

RE: Additional information on ridership and revenue forecasts

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You requested additional information with respect to the ridership and revenue forecasts used in the California High Speed Rail Authority's 2012 Business Plan. In particular, you requested information on station-station movements, induced travel, seat miles, and passenger miles. This memo provides that requested information at the 2030 forecast year.

As we discussed on the phone, the ridership and revenue forecasts begin with ridership and revenue model runs specified by the Authority's program manager, Parsons Brinckerhoff. The vast majority of those forecasts were done at the 2030 forecast year, with a few forecasts done at 2020 and 2050 levels to obtain estimates of growth.

When the model runs were complete, CS provides extensive workbooks with forecast results to PB, who then made additional adjustments to reflect factors not addressed well by the model or to reflect refinements to the operating plan after PB reviewed the model results. For the most part, the team did not go back to reflect the adjustments to the station-station movement level. To make it easiest for you to understand what we did, we have not attempted to apply the adjustments to the station-station level, but rather, provide the pieces of the work that led to the ridership and revenue that appears in the business plan.

Please let us know if further explanation is needed on this material, or if you have any further questions.

Ridership and Revenue Model Results

Attached are four Excel workbooks, each representing one of the scenarios used in the Business Plan:

- Run 14b represents Phase 1
- Run 31d is IOS North

- Run 26c is Bay to Basin
- Run 28d is IOS South

Each workbook has four tabs:

- **Station-station summaries** (the summaries you requested). These are shown for the trip purposes: business/commute, recreation/other, and total for riders, revenue, and passenger miles. They are expressed on an average daily basis, with the annualization calculation shown below the table. Note that we have given you unrounded values. The values in the Ridership and Revenue Draft Technical Memorandum are rounded at a stage earlier in the process, and therefore the numbers do not match those in the Business Plan identically. The top right portion of the triangle shows the two-directional daily interchanges between stations, and the bottom left portion shows the percentage that each movement represents of the total. We have summed up both the values and percentages at the bottom of each table.
  - Note that the passenger miles are an approximation because the travel models do not use station-to-station distances via the HSR alignment; rather they use travel times. Our estimates in the workbooks is based on station-to-station auto distances, which is what we used to estimate HSR fares. This approach keeps alignment variances from affecting station-to-station fares.
  - Each trainset is assumed to have 500 seated places. Trainset miles with a 6 percent contingency for deadhead miles are shown for each year in the O&M cost tech source document for each of 24 scenarios beginning on p. 13 of that document. Each scenario assumes a particular level of ridership, and year of opening of service. The two corresponding to the Chapter 6 schedule are Scenario 8 for the IOS North first, and Scenario 20 for IOS South first. Although neither of these shows a year 2030 scenario of full build out corresponding to the ridership forecast, the table below shows the trainset miles without contingency for deadhead following the same methodology used to construct the table. It also shows the corresponding seat miles.

	Annual Trainset Miles (in millions)	Annual Seat Miles (in millions)
IOS North	7.0	3,478
IOS South	8.8	4,380
Bay to Basin	20.0	10,019
Phase 1	33.4	16,680

- **Ridership by mode for major markets.** This tab is one of our standard model summaries. You did not specifically request this, but thought it might be of interest.

- **Ridership by mode for all region-region interchanges.** This tab is another of our standard model summaries. Also not specifically requested, but perhaps of interest.

- **Source of HSR travel.** This tab shows the modes from which HSR riders were forecast to be diverted, by region-to-region movements. This summary was developed by comparing mode specific travel for the alternative in question to the base, no-build alternative. Since long distance trip frequency and destination choice are affected by changes in accessibility afforded by HSR, induced travel was estimated as the differences in travel diverted from the other modes and the total travel on HSR. This tab is another of our standard model summaries.

Adjustments

PB made adjustments to the modeled forecasts, which are conceptually described on pages 6-1 and 6-2 of the Ridership and Revenue Forecasting Draft Technical Memorandum. Further detail on the specifics is provided on the following pages, by scenario, followed by an appendix that provides the analysis for ridership expected for access to San Francisco International Airport via the Millbrae station. All dollar amounts are in 2010 dollars.

Phase 1 Ridership and Revenue Adjustment Summary

	Riders	Revenue	Notes
CS Forecast 10-014b	37.1	$2,307	
San Jose changes	0.2	$12	Split two double set trains LA-SJ to add two frequencies in peak, from 5 TPH to 7, increase of 40%. Applied to 33% of riders for peak four hours, & assumes applies to 1/2 of Bay Area markets b/c only to San Jose
Millbrae SFO access	2.0	$36	Average weekday volume of 6,700 each way estimated off-model with regional team and BART planners, see Appendix A.
Merced-SF direct train	(0.6)	($32)	Train and direct service removed, eliminating all 630,000 north San Joaquin riders at $40, and reduces frequency SJ-SF from 6 to 5 at peak hours and 5 to 4 TPH off-peak for loss of 60,000 MTC riders at $18 each.
Merced changes	0.3	$18	Add one train per hour peak Merced- LA; doubles north San Joaquin Valley frequency and increases LA – south SJ from 4 to 3, +33% Applied to 62% of riders for off-peak 4 hours to applicable markets region to region.
Bus connections to Sacramento	2.8	$239	Provide dedicated bus connections between Merced and Sacramento
Phase 1 2030 100% for BP base	41.8	$2,580	

-- Sensitivity (arc-elasticity) of 0.22 applied to appropriate frequency change for each major market
-- TPH – trains per hour

Phase 1 – Annual ridership adjusted from 37.1 million to 41.8 million, and revenue from $2,307 million to $2,580 million; Influence on daily boardings.

Origin Station	Boardings per Model Result				Adjusted Boardings			Percentage Change		
	Inter-regional	SCAG	MTC	Total	Inter-regional	Local	Total	Inter-regional	Local	Total
San Francisco (Trans	21,200	-	4,800	26,000	20,600	6,400	27,000	-3%	33%	4%
San Francisco (4th &	200	-	500	700	100	600	700	-50%	20%	0%
Millbrae	800	-	2,000	2,800	700	5,300	6,000	-13%	165%	114%
Redwood City	1,400	-	1,400	2,800	1,300	1,800	3,100	-7%	29%	11%
San Jose	5,600	-	1,800	7,400	5,400	2,400	7,800	-4%	33%	5%
Gilroy	3,800	-	600	4,400	3,700	800	4,500	-3%	33%	2%
Merced	4,600	-	-	4,600	8,500	-	8,500	85%		85%
Fresno	3,200	-	-	3,200	3,300	-	3,300	3%		3%
Visalia	1,400	-	-	1,400	1,400	-	1,400	0%		0%
Bakersfield	5,400	-	-	5,400	5,600	-	5,600	4%		4%
Palmdale	3,700	4,300	-	8,000	4,100	4,300	8,400	11%	0%	5%
San Fernando Valley	2,400	1,400	-	3,800	2,600	1,400	4,000	8%	0%	5%
Los Angeles Union St	5,100	5,900	-	11,000	5,700	5,900	11,600	12%	0%	5%
Norwalk	2,600	3,500	-	6,100	2,900	3,500	6,400	12%	0%	5%
Anaheim	17,000	3,700	-	20,700	19,000	3,700	22,700	12%	0%	10%
Daily	78,400	18,800	11,100	108,300	84,900	36,100	121,000	8%	21%	12%

Bay to Basin Ridership and Revenue Adjustment Summary

	Riders	Revenue	Notes
CS Forecast 11-030b	20.7	$1,512	
Split double trainset trains to create more frequency	2.0	$148	Increase trains in each peak/direction to/from San Jose from 8 to 13, +62%
			Increase trains in each peak/direction to/from Merced from 3 to 5, + 67%
			Increase peak trains in the Fresno - San Fernando markets from 11 to 18, +63%
			Increase off peak per hour to/fr San Jose from 2 to 3, +66%
			Increase off peak per hour to/fr in Valley from 3 to 4, +33%
Phase 1 2030 100% for BP base	22.7	$1,660	

-- Sensitivity (arc-elasticity) of 0.22 applied to appropriate frequency change for each major market
-- TPH – trains per hour

Bay to Basin - Annual ridership adjusted from 20.7 million to 22.7 million, and revenue from $1,512 million to $1,660 million; Influence on daily boardings.

Origin Station	Boardings per Model Result				Adjusted Boardings			Percentage Change		
	Inter-regional	SCAG	MTC	Total	Inter-regional	Local	Total	Inter-regional	Local	Total
San Jose	17,200	-	100	17,300	18,900	100	19,000	10%	0%	10%
Gilroy	2,500	-	100	2,600	2,800	100	2,900	12%	0%	12%
Merced	6,400	-	-	6,400	7,100	-	7,100	11%		11%
Fresno	2,900	-	-	2,900	3,200	-	3,200	10%		10%
Visalia	100	-	-	100	100	-	100	0%		0%
Bakersfield	4,700	-	-	4,700	5,200	-	5,200	11%		11%
Palmdale	3,700	800	-	4,500	4,100	900	5,000	11%	13%	11%
San Fernando	17,900	800	-	18,700	19,700	900	20,600	10%	13%	10%
Daily	55,400	1,600	200	57,200	61,100	2,000	63,100	10%	11%	10%

IOS South Ridership and Revenue Adjustment Summary

	Riders	Revenue	Notes
CS Forecast 11-030b	12.8	$904	
Split double trainset trains to create more frequency	0.5	$36	Peak of 9 trains per direction increased to 10 trains per direction, +11% in relevant markets
Phase 1 2030 100% for BP base	13.3	$940	

-- Sensitivity (arc-elasticity) of 0.22 applied to appropriate frequency change for each major market
-- TPH – trains per hour

IOS South – Annual ridership adjusted from 12.8 million to 13.3 million, and revenue from $904 million to $940 million; Influence on daily boardings.

Origin Station	Boardings per Model Result				Adjusted Boardings			Percentage Change		
	Inter-regional	SCAG	MTC	Total	Inter-regional	Local	Total	Inter-regional	Local	Total
Merced	14,400	-	-	14,400	15,100	-	15,100	5%		5%
Fresno	2,100	-	-	2,100	2,200	-	2,200	5%		5%
Visalia	100	-	-	100	100	-	100	0%		0%
Bakersfield	2,400	-	-	2,400	2,500	-	2,500	4%		4%
Palmdale	2,000	800	-	2,800	2,100	800	2,900	5%	0%	4%
San Fernando	12,800	800	-	13,600	13,300	800	14,100	4%	0%	4%
Daily	33,800	1,600	-	35,400	35,300	1,600	36,900	4%	0%	4%

IOS North Ridership and Revenue Adjustment Summary

	Riders	Revenue	Notes
CS Forecast 11-030b	11.5	$769	
Reduce low load factor train service	(0.8)	($59)	Off -peak from 2 to 1 TPH Bakersfield – San Jose, 90% of the decrease; off-peak Merced – Bakersfield from hourly to every two hours (10% of the decrease).
Phase 1 2030 100% for BP base	10.7	$710	

-- Sensitivity (arc-elasticity) of 0.22 applied to appropriate frequency change for each major market
-- TPH – trains per hour

IOS North – Annual ridership adjusted from 11.5 million to 10.7 million, and revenue from $769 million to $710 million; Influence on daily boardings.

Origin Station	Boardings per Model Result				Adjusted Boardings			Percentage Change		
	Inter-regional	SCAG	MTC	Total	Inter-regional	Local	Total	Inter-regional	Local	Total
San Jose	10,900	-	100	11,000	9,900	100	10,000	-9%	0%	-9%
Gilroy	1,300	-	100	1,400	1,200	100	1,300	-8%	0%	-7%
Merced	4,000	-	-	4,000	3,700	-	3,700	-8%		-8%
Fresno	2,000	-	-	2,000	1,800	-	1,800	-10%		-10%
Visalia	100	-	-	100	100	-	100	0%		0%
Bakersfield	13,200	-	-	13,200	12,100	-	12,100	-8%		-8%
Daily	31,500	-	200	31,700	28,800	200	29,000	-9%	0%	-9%