APPENDIX 6

Operating Plan

Introduction

Running Times

Running time estimation is provided by a spreadsheet model that incorporates route distances, maximum speed limits, radii of curves with corresponding speed restrictions, signalized intersections, and stops at stations including station dwell time. Vehicle progress along the route recognizes normal bus acceleration and deceleration rates. Traffic signal delay times are manually entered according to the anticipated presence or absence of bus priority measures. For this implementation plan, the speed limits and bus priority measures have been modeled in accordance with a capital improvement sequence that completes BRT implementation in the year 2023. The effect of each year's capital improvements is considered to begin with the following year. The end-to-end one-way running time for the BRT route is estimated to range from 62 minutes in the opening year (2014) to 49 minutes after completion of all BRT capital improvements, which would be effective in year 2024.

Ridership

Ridership forecasts for BRT implementation begin with the Fehr & Peers opening year and year 2035 forecasts for the LPA: 2,930 weekday passengers in the first year, and 6,800 (the high-end figure) for year 2035. Straight-line growth in ridership is assumed from the opening year, 2014, to year 2035. Yearly ridership levels in the implementation plan forecasts are considered to be sensitive to bus running times and service frequency, using peak-period frequency as the service-level indicator. An arbitrary value of 2 percent change in ridership per one-minute change of in-vehicle time or one-minute change in service frequency has been applied. Although average passenger waiting time is only half the service headway, this approach recognizes the typical finding that time spent waiting for transit has twice the effect on ridership that applies to in-vehicle time.

The running-time effect on ridership is based on station-to-station running times, applied to an estimated production-attraction distribution of each year's projected BRT ridership. The Fehr & Peers total trip forecast was distributed on a gravity-model basis using hypothetical percentages of trips produced from and attracted to each station location. The resulting trip matrices yield a total weekday station-to-station passenger flow along the BRT route, from which estimated peak-hour peak-direction passenger flows have been estimated, assuming that half of all transit ridership occurs during the two three-hour daily peak periods, and half of each peak-period's ridership occurs during a single hour.

Service Levels

Required service levels have been specified on the basis of assumed operation of articulated buses, which would be allowed to carry a maximum load of 70 passengers at any point along the route. Peak-period service headway choices have been limited to values that repeat hourly, such as 30, 20, 15, 12, 10, and 7.5 minutes. The effect of headway on ridership is based upon 10 minutes as the "standard" value, with ridership reduced if longer headways are used (but not increased if headways closer than ten minutes are used).

Operating Results

The implementation operating plan has been built upon the year-by-year running times and headways derived from the running time estimates and ridership projections described above. Weekday service has been assumed to include six hours of peak-period service, and nine hours of off-peak service. An arbitrary annualization factor of 300 has been applied; this allows for a reduced level of service on weekends and holidays. The operating plan indicates a need for a maximum of five buses to be in service during peak periods for the first four years, then rising periodically to 11 buses by the year 2034. An allowance of 20 percent for spares should be applied to determine the total bus fleet size.

O&M Cost

O&M cost has been estimated by application of the cost model applied in earlier analyses. It is in the form of a linear equation with cost coefficients applied to revenue vehicle hours, revenue vehicle miles, directional route miles, the number of stations, peak vehicles in operation, and passenger boardings.

Performance Measures	Mitigation Period		Implementation Period								Post Implementation											
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Weekday passengers	1,346	1,424	1,495	1,781	2,618	2,800	3,510	3,966	4,166	4,359	4,849	5,071	5,293	5,515	5,737	5,959	6,182	6,404	6,626	6,848	7,070	7,292
PHPD psngrs at max load point	104	110	115	142	211	227	290	329	346	362	405	424	442	461	479	498	516	535	553	572	590	609
Duration, peak	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Duration, off-peak	8	8	8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10
Headway, peak	30	30	30	30	20	20	15	12	12	12	10	10	10	10	7.5	7.5	7.5	7.5	7.5	7.5	6	6
Headway, off-peak	40	40	40	40	30	30	20	20	20	20	15	15	15	15	12	12	12	12	12	12	10	10
One-way route length (miles)	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
Stations	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
One-way running time (minutes)	62	61	61	57	56	53	52	51	51	51	49	49	49	49	49	49	49	49	49	49	49	49
Round trip plus layover (min.)	133	131	131	122	120	113	111	109	109	109	105	105	105	105	105	105	105	105	105	105	105	105
Buses in service, peak	5	5	5	5	6	6	8	10	10	10	11	11	11	11	14	14	14	14	14	14	18	18
Spares	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
Fleet requirement	6	6	6	6	7	7	10	12	12	12	13	13	13	13	17	17	17	17	17	17	22	22
Revenue bus hours, peak	35	35	35	35	42	42	56	70	70	70	77	77	77	77	98	98	98	98	98	98	126	126
Buses in service, off-peak	4	4	4	4	4	4	6	6	6	6	7	7	7	7	9	9	9	9	9	9	11	11
Revenue bus hours, off-peak	32	32	32	32	32	32	54	54	54	54	70	70	70	70	90	90	90	90	90	90	110	110
Revenue bus hours, total weekday	67	67	67	67	74	74	110	124	124	124	147	147	147	147	188	188	188	188	188	188	236	236
Revenue bus miles, peak	573	573	573	573	860	860	1,147	1,434	1,434	1,434	1,720	1,720	1,720	1,720	2,294	2,294	2,294	2,294	2,294	2,294	2,867	2,867
Revenue bus miles, off-peak	492	492	492	492	655	655	1,106	1,106	1,106	1,106	1,639	1,639	1,639	1,639	2,048	2,048	2,048	2,048	2,048	2,048	2,458	2,458
Revenue bus miles, total weekday	1,065	1,065	1,065	1,065	1,516	1,516	2,253	2,540	2,540	2,540	3,359	3,359	3,359	3,359	4,342	4,342	4,342	4,342	4,342	4,342	5,325	5,325
Equivalent weekdays per year	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Revenue bus hours per year	20,100	20,100	20,100	20,100	22,200	22,200	33,000	37,200	37,200	37,200	44,100	44,100	44,100	44,100	56,400	56,400	56,400	56,400	56,400	56,400	70,800	70,800
Revenue bus miles per year	319,512	319,512	319,512	319,512	454,690	454,690	675,890	761,912	761,912	761,912	1,007,690	1,007,690	1,007,690	1,007,690	1,302,624	1,302,624	1,302,624	1,302,624	1,302,624	1,302,624	1,597,558	1,597,558
Annual O&M Cost																						
RVM-related	$ 790,413	$ 790,413	$ 790,413	$ 790,413	$ 1,124,818	$ 1,124,818	$ 1,672,027	$ 1,884,830	$ 1,884,830	$ 1,884,830	$ 2,492,840	$ 2,492,840	$ 2,492,840	$ 2,492,840	$ 3,222,451	$ 3,222,451	$ 3,222,451	$ 3,222,451	$ 3,222,451	$ 3,222,451	$ 3,952,063	$ 3,952,063
RVH-related	$ 876,693	$ 876,693	$ 876,693	$ 876,693	$ 968,288	$ 968,288	$ 1,439,347	$ 1,622,537	$ 1,622,537	$ 1,622,537	$ 1,923,492	$ 1,923,492	$ 1,923,492	$ 1,923,492	$ 2,459,976	$ 2,459,976	$ 2,459,976	$ 2,459,976	$ 2,459,976	$ 2,459,976	$ 3,088,054	$ 3,088,054
Route-mile related	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575	$ 197,575
Stations-related	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000
Related to vehicles in service	$ 6,044	$ 6,044	$ 6,044	$ 6,044	$ 7,253	$ 7,253	$ 9,670	$ 12,088	$ 12,088	$ 12,088	$ 13,297	$ 13,297	$ 13,297	$ 13,297	$ 16,923	$ 16,923	$ 16,923	$ 16,923	$ 16,923	$ 16,923	$ 21,759	$ 21,759
Related to weekday boardings	$ 81,088	$ 85,787	$ 90,064	$ 107,294	$ 157,718	$ 168,682	$ 211,456	$ 238,927	$ 250,975	$ 262,602	$ 292,122	$ 305,502	$ 318,881	$ 332,261	$ 345,640	$ 359,020	$ 372,399	$ 385,779	$ 399,159	$ 412,538	$ 425,918	$ 439,297
TOTAL	$ 2,276,813	$ 2,281,512	$ 2,285,789	$ 2,303,019	$ 2,780,652	$ 2,791,616	$ 3,855,075	$ 4,280,957	$ 4,293,005	$ 4,304,632	$ 5,244,325	$ 5,257,704	$ 5,271,084	$ 5,284,464	$ 6,567,565	$ 6,580,945	$ 6,594,324	$ 6,607,704	$ 6,621,084	$ 6,634,463	$ 8,010,368	$ 8,023,748