



TRANSPORTATION PLANNING AND TRAFFIC ENGINEERING CONSULTANTS

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MEMORANDUM

To: SolTrans

From: Gordon Shaw, PE, AICP, LSC Transportation Consultants, Inc.

Date: November 19, 2018

RE: Initial SolTrans COA Recommendations

This memo presents LSC Transportation Consultant's initial comprehensive package of service modifications for the SolTrans Comprehensive Operational Analysis (COA) study. This work builds upon the detailed analysis of the individual service alternatives presented in *Working Paper Three: Service Alternatives Analysis* (November 5, 2018), as well as staff-level comments received regarding the individual alternatives. However, there are a myriad of ways that the 27 individual alternatives studied can be combined. Comments and alternatives for consideration are very welcome, as we work towards a final plan. A full recommended plan is first provided, followed by some less-aggressive options.

Recommended Plan

This final and most significant package of service alternatives consists of the following:

- Grand Circle Scenario – This reconfigures the Vallejo local routes to (1) make an important new east-west connection across northern Vallejo improving travel times, (2) enhances service in the Route 3 southwest Vallejo area, (3) solves inefficient route segments such as the northern portion of Route 2 and (4) reduces the need for transfers.
- Short-Term BRT Light Scenario – This provides convenient 15-minute service frequency along the key North Sonoma corridor using Route 1 and Route 2 and sets the stage for longer-term improvements in this key development corridor.
- Weekday Service Until 9 PM – This will enhance access to jobs, shopping and classes in the early evening and is a very popular request among riders.
- Provide Consistent Hourly Service on Saturdays – Service frequency in the middle of the day will be improved.

- Provide Consistent Hourly Sunday Service on the Grand Circle Route and Route 1 – This expands the area of Sunday service, and fills the mid-day gap in service.
- Eliminate Route 20 – This is a very unproductive demonstration service, and the specific need that it was intended to serve (focusing on medical trips between Benicia and facilities in Vallejo) can be addressed through Transportation Network Company (TNC) service, as discussed below.
- Replace General Public DAR with TNC Service – This will subsidize TNC passengers within Benicia and from Benicia to medical destinations in Vallejo and will increase overall ridership. Even with the cost of expanding paratransit service to serve those requiring this service, the overall subsidy requirement is not increased.

The key elements of this package are the Grand Circle Route and BRT Light route modifications, with the attendant changes in other routes. The overall modifications to Routes 1 through 8 are shown in the attached Remix graphic (other routes are not shown).

Table A¹ presents a comparison of service levels and costs of existing services versus the services under this package. These figures can then be included in the overall analysis of costs, ridership and subsidy needs, as summarized in Table B. This latter table also reflects the symbiosis between the individual plan elements with regards to ridership. As shown, overall operating costs would increase by \$394,400 per year, or 9 percent. Ridership, however, would increase by 162,700 passenger boardings, or a full 23 percent. Subtracting the additional fare revenues, operating subsidy would increase by \$224,600 per year, or 6 percent over current levels. Finally, this option would reduce the peak number of buses in operation by four.

Minor Revisions Option

To provide options, such as the need for phasing in the recommended plan, two packages of options were also developed. A minor revision option consists of the following elements:

- Reduce Route 20 to 4 Round-Trips per Day
- Provide Consistent Hourly Service on Saturdays
- Reduce Saturday Route 8 Service to 8:30 AM -- 4:30 PM
- Reduce Saturday Route 6 Service to 8:30 AM – 4:30 PM
- Provide Consistent Hourly Sunday Service on Routes 1 and 7
- Revise Route 8 to Serve Glen Cove and Revise Route 3 to 30 Min

This package includes route revisions only for Route 3 (to provide half-hourly service) and Route 8 (to pick up service in Glen Cove eliminated from Route 3 and to address the existing double loop section). The attached graphic generated in the Remix planning software shows the revised routes (other routes are not shown). Service frequency on Route 20 would be reduced to four round-trips per day, while a more consistent service plan would be provided on

¹ Beyond the TNC service and Route 20 elimination, all other service elements impact service levels, costs and ridership of the other elements. For instance, the ridership benefit of the Grand Circle realignment is increased further by the provision of evening service. As a result, the impacts of the individual elements under the plan differ from those presented in Working Paper 3.

Saturdays and Sundays and some reduction in Saturday span on Routes 6 and 8 would be implemented to eliminate very unproductive runs. As shown in Table C, as a whole this package would reduce operating vehicle-hours and costs by \$108,700 per year, or 3 percent of local fixed route and General Public DAR costs. Annual ridership, however, would increase by 6 percent (44,600 per year). Overall subsidy requirements would be reduced by \$161,600, or 5 percent. There would be no change in the number of peak buses in operation.

Moderate Revisions Options

Another “middle level” package of revisions consists of the following:

- Eliminate Route 20
- Weekday Service Until 9 PM
- Provide Consistent Hourly Service on Saturdays
- Provide Consistent Hourly Sunday Service on Routes 1 and 7
- Revise Route 8 to Serve Glen Cove and Revise Route 3 to 30 Min
- Revise Route 6 to 30-Minute Route
- Replace General Public DAR with TNC Service

In comparison with the Minor Revisions, this adds one more route revision, specifically the modification of Route 6 to a shorter half-hourly route (as shown in the attached Remix figure). Route 20 would be fully eliminated, rather than reduced in frequency. The largest element in terms of cost and ridership impact is the extension of weekday service to roughly 9:00 PM. This package also includes replacing the General Public DAR program in Benicia with a Transportation Network Company (TNC) subsidy service, supported by paratransit ADA service. The additional Saturday and Sunday service would be provided.

As shown in Table D, this package as a whole would increase annual operating costs by \$258,700, or 6 percent. Ridership would increase to a greater degree, equal to 118,900 additional passenger-trips per year or a 17 percent increase. With the additional \$122,900 increase in fare revenues, the additional annual operating subsidy would be \$139,600, or a 4 percent increase over current levels. This package would also reduce the peak number of SolTrans vehicles in operation by two.

COA Draft Plan

Filters ▾

1 Broadway

2 Northeast

4 Tuolumne

5 Fairgrounds

Grand Circle Rt

Rev 8 Glen Cove Short

Revised Route 3

Revised Rt 6 Long

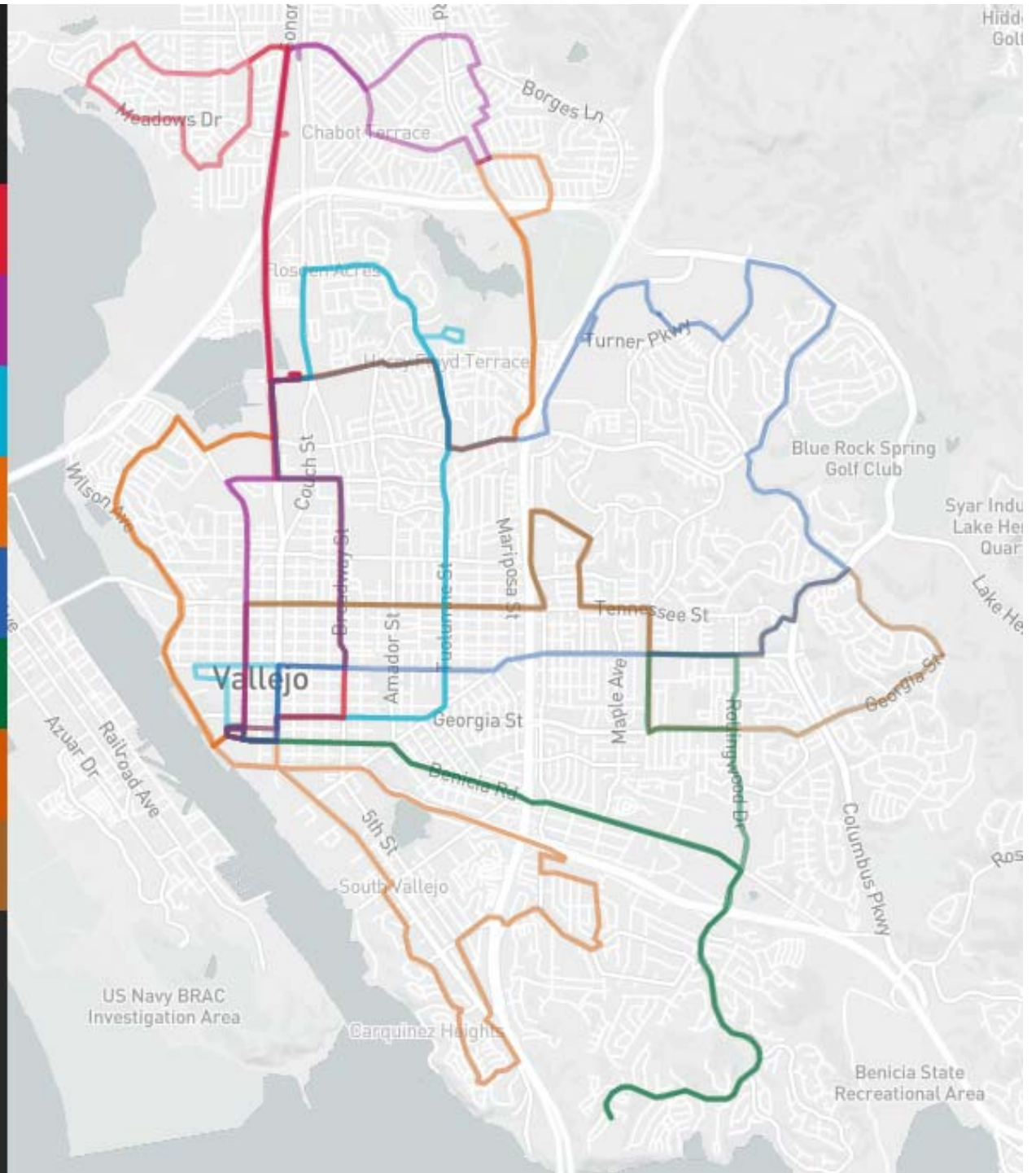


TABLE A: Operating Impacts of Grand Circle Weekday Until 9 PM, Consistent Saturday and Sunday Service and BRT Light Route 1 and 2 Alignment

	Round-Trip Parameters		Weekday Service ²			Saturday Service ²			Sunday Service ²			Annual		Annual Cost	Peak Buses	
	Hours ¹	Miles	Round Trips	Hours	Miles	Round Trips	Hours	Miles	Round Trips	Hours	Miles	Hours	Miles			
Existing																
Route 1	1	13	26.8	26.8	348.4	13	13	169	6	6	78	7,788	101,239	\$626,700	2	
Route 2	1.5	19.3	28	42	540.4	7.17	10.755	138.4	0	0	0	11,186	143,930	\$896,600	4	
Route 3	1	12.7	17	17	215.9	11.75	11.75	149.2	0	0	0	4,942	62,763	\$394,100	2	
Route 4	1	10.7	14	14	149.8	11	11	117.7	0	0	0	4,144	44,341	\$310,400	2	
Route 5	1	13.8	17	17	234.6	11.75	11.75	162.2	0	0	0	4,942	68,200	\$407,300	2	
Route 6	1	10.5	13	13	136.5	11	11	115.5	0	0	0	3,892	40,866	\$289,600	1	
Route 7	1.5	15	28.5	42.75	427.5	13	19.5	195	6	9	90	12,324	123,240	\$902,200	3	
Route 8	1	15.3	13	13	198.9	10.5	10.5	160.7	0	0	0	3,864	59,119	\$332,400	1	
Total			157	186	2,252	89	99	1,208	12	15	168	53,082	643,698	\$4,159,300	17	
With Major Revision Package																
Route 1	1	15	26.8	26.8	402	13	13	195	11	11	165	8,043	120,639	\$686,100	2	
Route 2	1	11.1	30	30	333	18.83	18.833	209.1	0	0	0	8,615	95,623	\$653,600	2	
Route 3	0.5	7.75	29	14.5	224.8	13	6.5	100.8	0	0	0	4,018	62,279	\$347,600	1	
Route 4	1	10.7	17.5	17.5	187.3	11	11	117.7	0	0	0	5,026	53,778	\$376,500	2	
Route 5	1	13.8	19	19	262.2	11.75	11.75	162.2	0	0	0	5,446	75,155	\$448,800	2	
Route 6	1	13	15	15	195	11	11	143	0	0	0	4,396	57,148	\$353,700	1	
Circle Route	1	13.6	62	62	843.2	26	26	353.6	24	24	326.4	18,304	248,934	\$1,499,500	4	
Route 8	1	14	15	15	210	10.5	10.5	147	0	0	0	4,368	61,152	\$362,100	1	
Additional Paratransit	2	24	2	4	48	0	0	0	0	0	0	1,008	12,096	\$78,700	0	
Total			216	204	2,705	115	109	1,428	35	35	491	59,223	786,804	\$4,806,600	15	
Net Change												6,141	143,106	\$647,300	-2	

Note 1: Includes driver layover time.

Note 2: Assumes no change in span of service.

Table B: SolTrans COA Recommended Plan

Service Strategy	Change In Annual Service						
	Service Hours	Service Miles	Operating Cost	Ridership	Fare Revenues	Operating Subsidy	Peak Buses
Eliminate Route 20	-2,772	-48,371	-\$252,900	-3,900	-\$4,900	-\$248,000	-1
Grand Circle Scenario							
Weekday Service Until 9 PM							
Provide Consistent Hourly Service on Saturdays	6,141	143,106	\$647,300	152,700	\$174,700	\$472,600	-2
Provide Consistent Hourly Sunday Service on Grand Circle Route and Route 1							
Short-Term BRT Light Scenario							
Replace General Public DAR with TNC Service - Expand Ridership	-2,453	-16,484	\$0	13,900	--	\$0	-1
TOTAL	916	78,251	\$394,400	162,700	\$169,800	\$224,600	-4
<i>Percent Change From Existing</i>	2%	12%	9%	23%	21%	6%	-22%

Minor Option

Filters ▾

Revised 8

Revised Route 3

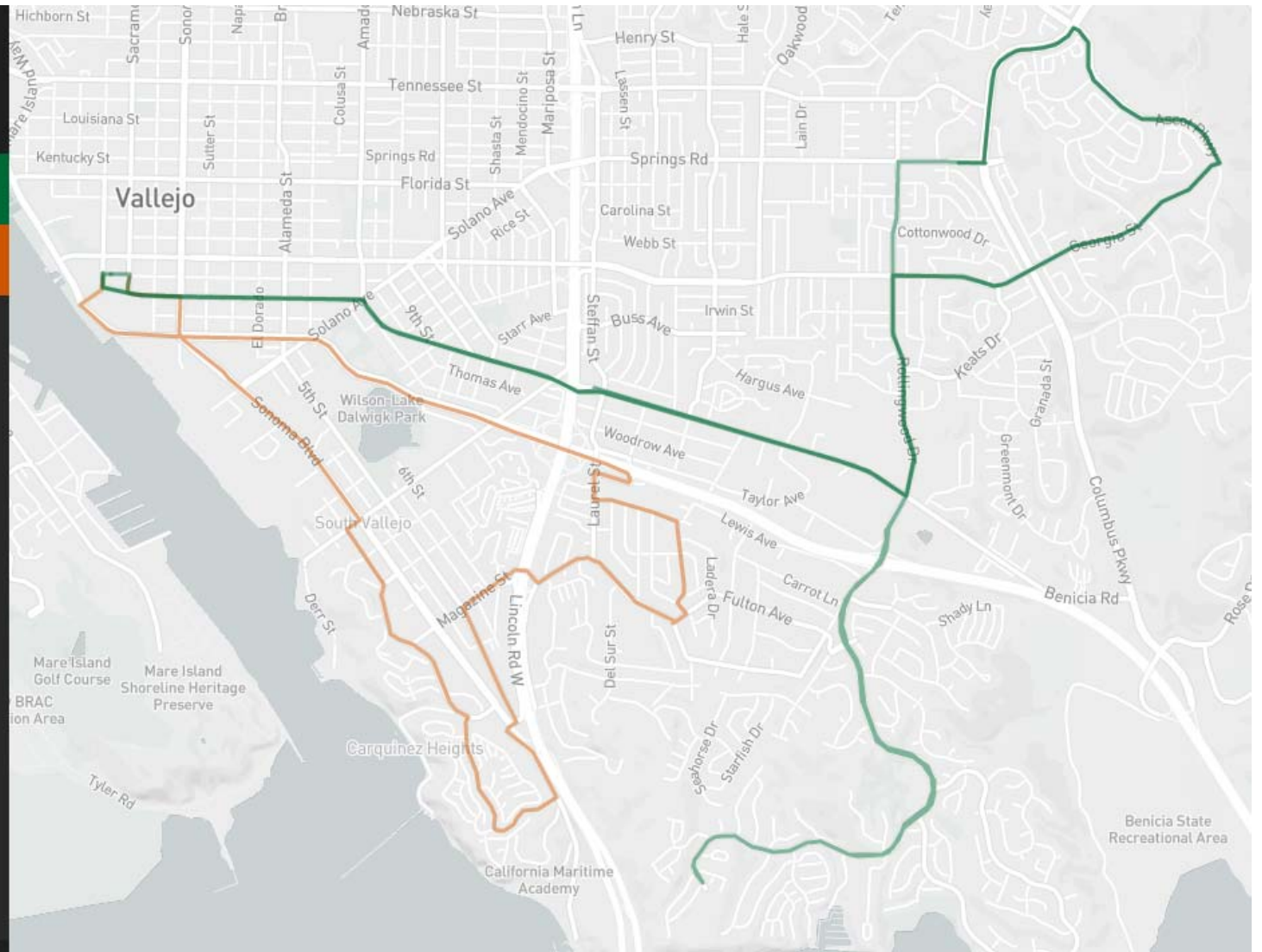


Table C: SolTrans Service Alternatives -- Minor Revision Package

Alternative	Change In Annual Service						
	Service Hours	Service Miles	Operating Cost	Ridership	Fare Revenues	Operating Subsidy	Peak Buses
Reduce Route 20 to 4 Round-Trips per Day	-1,008	-17,590	-\$92,000	-900	-\$1,100	-\$90,900	0
Provide Consistent Hourly Service on Saturdays	322	4,143	\$25,800	4,300	\$4,300	\$21,500	0
Reduce Saturday Rt 8 Service to 8:30 AM -- 4:30 PM	-140	-2,142	-\$12,000	-200	-\$300	-\$11,700	0
Reduce Saturday Rt 6 Service to 8:30 AM – 4:30 PM	-168	-1,764	-\$12,500	-300	-\$300	-\$12,200	0
Provide Consistent Hourly Sunday Service on Routes 1 and 7	408	4,845	\$31,700	7,400	\$8,800	\$22,900	0
Revise Route 8 to Serve Glen Cove and Revise Route 3 to 30 Min	-994	-410	-\$49,700	34,300	\$41,500	-\$91,200	0
TOTAL	-1,580	-12,918	-\$108,700	44,600	\$52,900	-\$161,600	0
<i>Percent Change From Existing</i>	-3%	-2%	-3%	6%	7%	-5%	0%

Moderate Option

Filters ▼

Revised 8 Glen Cove

Revised Route 3

Revised Rt 6 30 Min

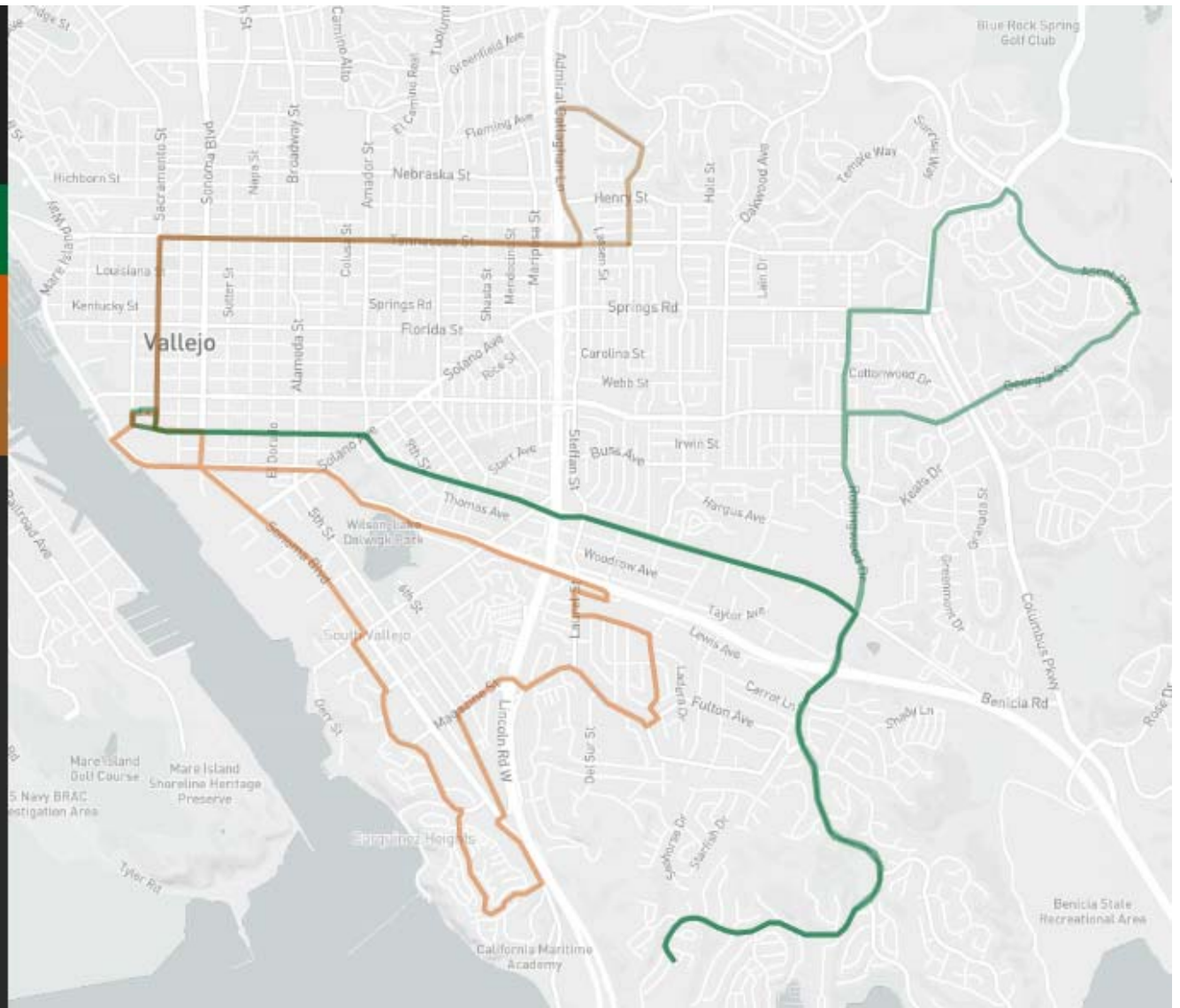


Table D: SolTrans Service Alternatives -- Moderate Revision Package

Change In Annual Service

Alternative	Service Hours	Service Miles	Operating Cost	Ridership	Fare Revenues	Operating Subsidy	Peak Buses
Eliminate Route 20	-2,772	-48,371	-\$252,900	-3,900	-\$4,900	-\$248,000	-1
Weekday Service Until 9 PM	6,300	76,671	\$494,400	53,200	\$61,000	\$433,400	0
Provide Consistent Hourly Service on Saturdays	322	4,143	\$25,800	4,300	\$4,300	\$21,500	0
Provide Consistent Hourly Sunday Service on Routes 1 and 7	408	4,845	\$31,700	7,400	\$8,800	\$22,900	0
Revise Route 8 to Serve Glen Cove and Revise Route 3 to 30 Min	-994	-410	-\$49,700	36,900	\$44,700	-\$91,200	0
Revise Route 6 to 30-Minute Route	-154	6,980	\$9,400	7,100	\$9,000	\$1,000	0
Replace General Public DAR with TNC Service - Expand Ridership	-2,453	-16,484	\$0	13,900	--	\$0	-1
TOTAL	657	27,374	\$258,700	118,900	\$122,900	\$139,600	-2
<i>Percent Change From Existing</i>	1%	4%	6%	17%	15%	4%	-11%



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MEMORANDUM

To: SolTrans

From: Gordon Shaw, PE, AICP, LSC Transportation Consultants, Inc.

Date: December 13, 2018

RE: SolTrans Additional Route 20 Options and Evaluation Methodologies

This memo presents LSC Transportation Consultant's analysis of additional plan alternatives and options. In addition, recommended means of tracking and evaluating the proposed changes in services are discussed.

Route 20 Express Options

LSC has conducted additional analysis of the performance of Route 20. Specifically, we reviewed the productivity (passenger-trips per vehicle-hour) history over the various changes in service. Ridership and vehicle-hours of service were summarized by month¹, as shown in Figure A. This figures also indicate the periods during which the service plan (daily vehicle-trips) was modified in an attempt to improve the route performance. As shown, productivity has improved in the most recent months (under the reduced 6-runs-a-day plan). However, the highest value of 3.1 passenger boardings is still far below the SolTrans fixed route standard of 12.0. Given the length of time that the service has been provided, it is clear that the current service plan for Route 20 is not expected to attain the performance standard.

One recently-suggested option for revision of Route 20 would be to revise the route to provide "express" service between Benicia and Gateway Plaza. This would consist of serving the existing stops within Benicia between Benicia City Park and Southampton Center (Raley's), and then operating as an express directly to Gateway Center. This route could be operated round-trip on an hourly schedule.

The boarding/alighting by stop data for Route 20 (see Table 20 of *Working Paper 2*) indicates that only 28 percent of the passenger activity on Route 20 occurs at the stops that would be served by this alternative. However, some passengers traveling to/from points west of Gateway Plaza would be able to use other routes (notably the Grand Circle Route) to complete their trip,

¹ Due to technical problems and missed runs, the available data between December 2017 and April 2018 was not considered to be valid.

and would still find the 20 Express route to provide a benefit. Overall, it is estimated that 40 percent of existing Route 20 ridership would be served by the revised route.

Two “20 Express” options were considered regarding the span of service:

- Service could be provided from 8:00 AM to 5:00 PM. As shown in Table A, this option would incur operating costs of \$189,500 per year -- \$82,700 less than the current Route 20 service plan. While the current operating plan requires a peak of two buses, the revised plan would require only one. Ridership would be reduced as a result of the limited number of stops. However, ridership would also tend to be increased by (1) the improved frequency of service and (2) the substantially shorter travel time provided to passengers. Overall, this option would reduce ridership by 300 passenger-trips per year (or 5 percent). Considering the loss of farebox revenue, operating subsidy would be reduced by \$82,400.
- Service could be limited to four round-trips per year. A review of existing Route 20 ridership indicates that the greatest ridership would be served by operating round-trips at 8:00 AM, 9:00 AM, 12:00 PM and 1:00 PM. This would cut the operating costs of service in half, but would only reduce ridership by 1,000 passenger-trips per year. Overall ridership on this service would be an estimated 5,200 boardings per year, or 20 percent less than current ridership. However, operating costs would be 67 percent less than at present.

The performance analysis of these additional alternatives are presented in the right-most portion of Table B. This indicates that both alternatives generate better performance metrics than the current Route 20. However, neither alternative achieves any of the performance measures. As an example, the better of the two options (four runs per day) generates 5.2 passenger-trips per vehicle-hour, which is less than half of the standard of 12.0 passenger-trips per vehicle-hour.

Recommended Plan – With 30 Minute Route 4 Weekday Service

In developing the recommended plan, one potential service improvement that was “on the cusp” is the provision of 30 minute weekday service on Route 4. The marginal passenger-trips per vehicle hour is 8.4 (not achieving the minimum standard of 12.0), but the marginal subsidy per passenger-trip for expanding from hourly to consistent 30-minute service is \$7.80 – achieving the maximum standard of \$8.00.

Table C presents a summary of the recommended plan with this additional improvement. Comparing with the figures for the recommended plan (without the additional improvement), including 30-minute Route 4 weekday frequency has the following impacts:

- Ridership would be increased by 17,000 passenger-trips per year (a 10 percent increase over the recommended plan).
- Operating costs would be increased by \$151,000 per year (a 9 percent increase)
- Operating subsidy would be increase by \$132,700 per year (a 59 percent increase)
- There would be no change in the peak number of buses required to operate the local fixed route service.

Tracking the Progress of New Services

SolTrans has developed an ongoing process of evaluating the fixed-route and demand-response services. This provides a good framework for the collection and review of service performance. Data that is collected and reviewed on an ongoing monthly or quarterly basis is as follows:

- Vehicle-miles
- Vehicle-hours
- Maintenance failures
- Accidents
- Complaints
- On-Time performance
- Ridership
- Operating costs

Key performance measures are as follows:

- 1.0 passenger-trips per revenue vehicle-mile on all service.
- 12.0 passenger-trips per revenue vehicle-hour on fixed route
- 2.0 passengers per revenue vehicle-hour on combined DAR and paratransit
- 25.0 passengers per revenue vehicle-hour on express service
- Operating cost of \$8 per passenger-trip for fixed-route
- Operating cost of \$35 per passenger-trip for the combined DAR and paratransit
- Operating cost of \$7 per passenger-trip for express service
- Ridership growth of 2 percent per year for fixed-route
- Ridership growth of 1 percent for the combined DAR and paratransit, and on express
- Operating cost of \$103 per vehicle revenue hour for fixed route
- Operating cost of \$78 per vehicle revenue hour for the combined DAR and paratransit
- Operating cost of \$115 per vehicle revenue hour for express
- Farebox recovery of 20 percent for fixed route
- Farebox recover of 10 percent for the combined DAR and paratransit
- Farebox recovery of 50 percent on express
- On-time performance of 90 percent for all services
- 80,000 miles between preventable accidents on all services
- 10,000 miles between major maintenance failures on all services

These standards are consistent with standards adopted by transit systems of similar size and setting.

This COA plan will result in several significant changes to existing routes. It is important to track the performance of the revised routes and/or additional runs on a monthly basis to evaluate the results of these changes and to adjust services as warranted.

In tracking the ridership impacts of new routes or services, it is important to consider that it takes a period of time for the full ridership potential of a new service to be achieved. At one level, it takes time for all potential riders to become aware of the benefits of new services (such as evening service), though a strong marketing effort can help to speed this process. At another level, it can take a longer length of time for potential passengers to change other aspects of their lives to take advantage of new services. For example, provision of evening

service can allow persons who currently cannot fill dinner shifts at restaurants to take a new job. In addition, families that struggle to afford a second car can over time decide to not replace the second vehicles if expanded transit service provides better mobility options. For these reasons, transit planners typically expect that the first year of an expanded service will attract on the order of 60 percent of the total potential ridership, while the second year will attract 90 percent. It is not until the third full year of a new service that the full ridership potential is realized.

Figure A: Route 20 Productivity History

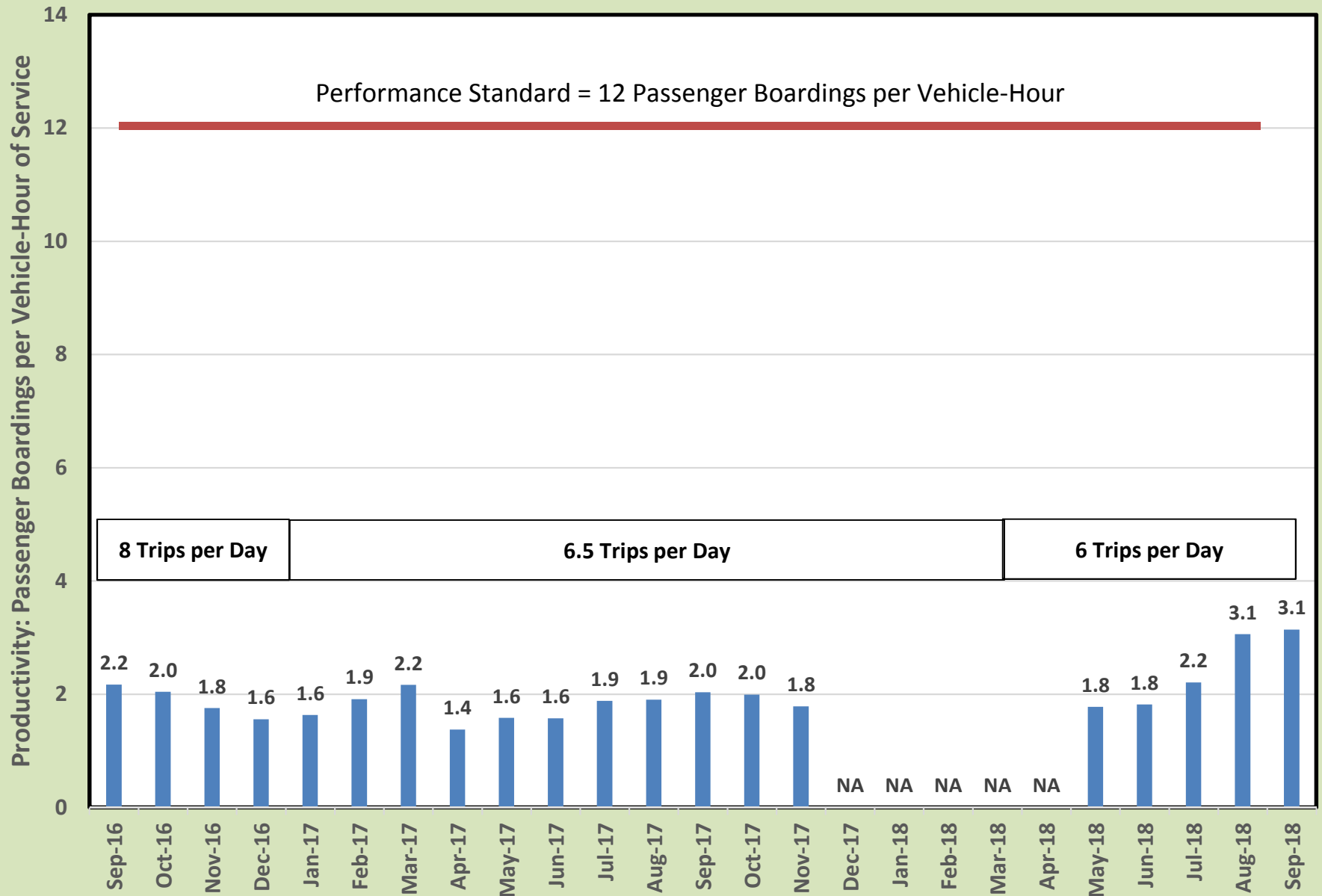


TABLE A: Additional Route 20 Alternatives Service Analysis

	Round-Trip Parameters		Weekday Service ²			Saturday Service ²			Sunday Service ²			Annual		Annual Cost
	Hours ¹	Miles	Round Trips	Hours	Miles	Round Trips	Hours	Miles	Round Trips	Hours	Miles	Hours	Miles	
Existing	2	34.9	5.85	11.70	209	0	0	0	0	0	0	2,948	52,769	\$272,200
Express -- 8 AM to 5 PM	1	18.6	8	8	148.8	0	0	0	0	0	0	2,016	37,498	\$189,500
<i>Net Change</i>												-932	-15,271	-\$82,700
Express -- 8 AM, 9 AM, 12 PM and 1 PM Rui	1	18.6	4	4	74.4	0	0	0	0	0	0	1,008	18,749	\$94,800
<i>Net Change</i>												-1,940	-34,020	-\$177,400

TABLE B: Additional Route 20 Alternatives Summary

	Change In Annual Service							Percent Change		Performance Measures				
	Service Hours	Service Miles	Operating Cost	Ridership	Fare Revenues	Operating Subsidy	Peak Buses	Annual Ridership	Annual Op. Subsidy	Values Achieving Performance Standards Shaded				
										Psgr-Trips per Service-Hour	Psgr-Trips per Service-Mile	Cost per Psgr-Trip	Subsidy per Psgr-Trip	Farebox Ratio
										Performance Standard				
										12.00	1.00	< \$8.00	No Standard	20%
Existing	2,948	52,769	\$272,200	6,500	\$8,100	\$264,100	2			2.2	0.1	\$41.88	\$40.63	3.0%
Express -- 8 AM to 5 PM	2,016	37,498	\$189,500	6,200	\$7,800	\$181,700	1			3.1	0.2	\$30.56	\$29.31	4.1%
<i>Net Change</i>	-932	-15,271	-\$82,700	-300	-\$300	-\$82,400	-1	-5%	-31%					
Express -- 8 AM, 9 AM, 12 PM and 1 PM Runs	1,008	18,749	\$94,800	5,200	\$6,500	\$88,300	1			5.2	0.3	\$18.23	\$16.98	6.9%
<i>Net Change</i>	-1,940	-34,020	-\$177,400	-1,300	-\$1,600	-\$175,800	-1	-20%	-67%					

Table C: SolTrans COA Recommended Plan Option - With 30 Minute Route 4

Service Strategy	Change In Annual Service						
	Service Hours	Service Miles	Operating Cost	Ridership	Fare Revenues	Operating Subsidy	Peak Buses
Eliminate Route 20	-2,772	-48,371	-\$252,900	-3,900	-\$4,900	-\$248,000	-1
Grand Circle Scenario							
Weekday Service Until 9 PM							
Provide Consistent Hourly Service on Saturdays	6,141	143,106	\$647,300	152,700	\$174,700	\$472,600	-2
Provide Consistent Hourly Sunday Service on Grand Circle Route and Route 1							
Short-Term BRT Light Scenario							
30-Minute Route 4 Weekday Frequency	2,016	21,571	\$151,000	17,000	\$18,300	\$132,700	0
Replace General Public DAR with TNC Service - Expand Ridership	-2,453	-16,484	\$0	13,900	--	\$0	-1
TOTAL	2,932	99,822	\$545,400	179,700	\$188,100	\$357,300	-4
<i>Percent Change From Existing</i>	2%	12%	9%	23%	21%	6%	-22%