Working Paper 1
RIDERSHIP FORECAST

INTRODUCTION

The purpose of this working paper is to assess the ridership potential for a new commuter rail service between the Matanuska-Susitna (Matsu) Valley and Anchorage. The planning years for the service is assumed here to be 2012 and 2020. The service would offer either 2 or 3 inbound peak trips in the morning commute period, and the reverse in the evening, with the potential of mid-day or off-peak service as well.

Stations assumed in this analysis include, from north to south, Downtown Wasilla, Matanuska (Glenn Highway / Park Highway Interchange), Eklutna, Birchwood, Eagle River, Elmendorf, Anchorage, Spenard and Anchorage Airport.

Forecasts were done assuming two station stopping patterns: one for a traditional pattern, with stops every 6 to 8 miles; the other for express service having 2 and 3 stations.

FORECASTING METHODOLOGY

The methodology described below was pioneered in a similar commuter rail planning effort conducted for the *Orange County Commuter Rail Strategic Assessment* in 2003-2004. That study focused on improvements to Metrolink service between Orange County and Los Angeles Union Station near Downtown Los Angeles. The forecasting process was developed based on various existing data, but mostly on origin-destination information from Metrolink's 2002 *On-board Passenger Survey.*[1] The methodology as adapted to the current effort consists of several steps outlined below.

Determining Station Catchment Areas

The catchment areas represent the areas around stations where riders are most likely to be originating (home end) or terminating (work end) their commuter rail trips. Origin catchment areas are larger than the destination catchment areas, as travelers can use their own cars to access their origin stations but must either walk or ride local transit on the destination end. Catchment areas vary generally from about 3 to 5 miles around a station, but the reach of more distant stations can extend further outward.

For this study, the origin catchment areas were defined as 5 miles for Wasilla and Matanuska stations and as 3 miles for the Eklutna, Birchwood and Eagle River. These five stations are considered originating stations.

The destination catchment areas were defined as 3 miles around all stations. Destinations stations include Elmendorf, Anchorage, Spenard and Anchorage Airport.

Identifying the Universe of Work Trips

With the station catchment areas defined, the study team identified the universe of work trips that could be attracted to commuter rail between any pairing of an origin catchment area and a destination catchment area. This was done using the travel demand model developed for the Knik Arm Bridge and Toll Authority

[1] In 2005, the methodology was applied to forecast Metrolink system-wide ridership. In 2007, it was adapted to forecast ridership in three studies: one for service expansion of the San Joaquin Regional Rail Commission's commuter rail program in Northern California; another for an update of the Atlanta, Georgia, commuter rail plan; and a third for a conceptualized Fairbanks commuter rail service.

(KABATA). More specifically, the home base work (HBW) trip tables developed as part of the KABATA model were used. A HBW trip (also known simply as a work trip) occurs when a worker travels to a workplace. Thus, a commuter from Wasilla heading to a job in Anchorage would generate two work trips on a regular weekday: one to the workplace and another returning home.

Work trips made between the aggregation of traffic analysis zones (TAZs) at the origin station and the aggregation of TAZs at destinations were extracted from the KABATA trip tables for 2005, 2012 and 2020.

Determining the Commuter Rail Trips

A comparison of actual Metrolink peak period ridership between station catchment areas and the universe of work trips between those catchment areas provided an understanding of the commuter rail mode share, i.e. the percentage of all work trips that commuter rail could capture. If, for example, a commuter rail line carries 100 out of 1,000 eligible work trips between an origin station catchment area and a destination station catchment area, then the commuter rail line captures 10 percent of that work trip market.

The comparison showed a relationship existed between the shares of work trips and both the distance traveled and the frequencies of trains. Commuter rail tends to capture more commute trips if the trips are longer and if service levels are higher (more frequencies). Furthermore, trips heading to Downtown Los Angeles tended to have higher mode splits than to anywhere else (this fact appears a result of higher parking fees and good transit connections Downtown versus origin or suburban stations). Thus a table of capture rates varying with the distance to a city center and the frequency of train was be developed and refined over the time. The capture rates were then applied to the Anchorage projections of work trips between station areas.

Potential Adjustments

The application of capture rates by distance and train frequency from the Metrolink study to the current effort assumes implicitly that the other factors affecting ridership are similar between the conceptualized Anchorage commuter rail system and the Metrolink system at the time of the survey (2002). These assumptions were reviewed as described below and adjustments were developed when needed.

- ***Congestion*** – Los Angeles is well known as one of the worse cities in the U.S. when it comes to congestion. Anchorage has some congestion but not at the same level as in Los Angeles. Based on the Texas Transportation Institute's *Annual Urban Congestion Report*, the annual hours of delay per peak traveler averaged 69 hours in 2002 in Los Angeles. Based on the 1995 to 2007 trend, the estimate of annual hours of delay for Anchorage has stayed pretty steady around 10 hours. Accordingly, a factor was estimated to adjust the capture rates developed in Los Angeles for use in this study.
- ***Gas price*** – The price of gasoline is usually higher in California than in Anchorage. At the same time, the incomes of travelers in Los Angeles are higher than in Anchorage. As a result, it was assumed that no adjustment for a gas price differential was necessary.
- ***Fares*** – Since the assumption for this study was to use distance-based, "typical" commuter rail fares, there was no need to make adjustment for fares.
- ***Parking availability and cost*** – Most of the Metrolink stations have free parking. Parking at origin stations of an Anchorage system will be free. So, again, no adjustment was necessary to reflect the impact of paid parking.
- ***Seasonality*** – It is reasonable to assume ridership would be higher in winter, when road conditions are more dangerous. However, it is difficult to identify how much more. To be conservative, there was no adjustment made for seasonality.

- ***Train speed*** – The average Metrolink train speed was estimated at 42 mph, similar to the one assumed for the Anchorage assuming a traditional stopping pattern. Matsu-Anchorage express service would have higher speeds, as they would have fewer station stops.

COMMUTER RAIL LINES DESCRIPTION AND ASSUMPTIONS

The distance and travel times between the 9 stations assumed for the Anchorage commuter rail system appear in Table 1.

Table 1: Commuter Rail Line Description

From	To	Miles	Minutes
Wasilla	Matanuska	8.50	13
Matanuska	Eklunta	9.38	14
Eklutna	Birchwood	5.65	9
Birchwood	Eagle River	8.20	12
Eagle River	Elmendorf	7.62	11
Elmendorf	Anchorage	5.87	9
Anchorage	Spenard	3.19	5
Spenard	Airport	3.04	5

The ridership forecasts for 2012 and 2020 rested on various assumptions. The assumptions pertain to five cases. Cases 1 through 2 reflect a typical commuter rail service with stations every 6 to 8 miles on average. Cases 3 through 5 reflect an express service.

- ***Case 1*** – 2 alternatives: 2 and 3 trains inbound in the morning peak period, with the reverse pattern assumed in the afternoon peak period, and a total of 9 commuter rail stations.
- ***Case 2*** – 2 alternatives: 2 and 3 trains inbound in the morning peak period, with the reverse pattern assumed in the afternoon peak period, and a total of 7 commuter rail stations.
- ***Case 3*** – 2 alternatives: 2 and 3 trains inbound in the morning peak period, with the reverse pattern assumed in the afternoon peak period, and a total of 2 commuter rail stations: Wasilla and Anchorage.
- ***Case 4*** – 2 alternatives: 2 and 3 trains inbound in the morning peak period, with the reverse pattern assumed in the afternoon peak period, and a total of 2 commuter rail stations: Matanuska (Glenn Highway / Parks Highway Interchange) and Anchorage.
- ***Case 5*** – 2 alternatives: 2 and 3 trains inbound in the morning peak period, with the reverse pattern assumed in the afternoon peak period, and a total of 3 commuter rail stations: Wasilla, Matanuska, and Anchorage.
- ***In All Cases*** – Free and available parking at station outside Downtown Anchorage, along with a feeder bus service, as needed.

While forecasts were performed for the planning years of 2012 and 2020, both forecasts progressed from a Base Year of 2005 forecast. The 2005 forecast relied on the 2005 work trip table coming from the KABATA model. The study team ascertained that the KABATA model's 2005 work trip table reflected reasonably accurately the work trips made in 2005 along the Glenn Highway. Accordingly, the team could assume that the work trips forecasts for future years would be reasonably reliable.

Illustrative schedules for Cases 1 and 5 appear in the Appendix.

GROWTH ASSUMPTION

As explained earlier in this working paper, the universe of potential work trips for the proposed commuter rail was extracted from the KABATA model for 2005, 2012, and 2020. The number of work trips is expected to increase (or decrease) with the level of employment and population in the area. As in most models of this type, the KABATA model uses number of household and employment assumptions to estimate work trips (as well as other purposes trips). These assumptions are summarized in Table 2 for the areas around the proposed 9 stations.

Table 2: 2005, 2012, and 2020 Household and Employment

Station	2005 Households	2005 Employment	2012 Households	2005-2012 Growth	2012 Employment	2005-2012 Growth	2020 Households	2005-2020 Growth	2020 Employment	2005-2020 Growth
Anchorage Airport (D)	12,277	14,114	13,017	6.0%	14,545	3.1%	13,478	9.8%	14,255	1.0%
Spenard (D)	10,147	19,906	11,050	8.9%	21,206	6.5%	11,741	15.7%	21,519	8.1%
Anchorage (D)	20,350	67,806	22,339	9.8%	74,043	9.2%	23,910	17.5%	77,001	13.6%
Elmendorf (D)	5,429	11,096	6,379	17.5%	11,265	1.5%	7,242	33.4%	10,861	-2.1%
Eagle River (O)	7,769	2,941	8,944	15.1%	3,504	19.1%	9,984	28.5%	3,935	33.8%
Birchwood (O)	3,156	787	4,157	31.7%	1,136	44.3%	5,134	62.7%	1,460	85.5%
Eklutna (O)	326	62	670	105.5%	192	209.7%	1,026	214.7%	324	422.6%
Matanuska (O)	7,561	5,306	10,792	42.7%	7,969	50.2%	15,175	100.7%	10,460	97.1%
Wasilla (O)	11,560	10,016	15,563	34.6%	14,788	47.6%	21,099	82.5%	19,207	91.8%
Total HH Origin	30,372		40,126	32.1%			52,418	72.6%		
Total Emp. Destination		112,922			121,059	7.2%			123,636	9.5%
Total all O and all D	78,575	132,034	92,911	18.2%	148,648	12.6%	108,789	38.5%	159,022	20.4%

The stations in the above table are organized as either Origin (O) or Destination (D). The proposed commuter rail will have 2 or 3 trains in the morning from Wasilla to Anchorage and 2 or 3 trains in the afternoon from Anchorage to Wasilla. This means that it will serve work trips from people residing in Wasilla (origin) and working in Anchorage (destination). As a result, the universe of potential work trips for the proposed commuter rail is linked to the number of households in the Wasilla area (origin) and the number of employment in the Anchorage area (destination).

It is worth noting that while households in the Matsu area will grow by almost 73 percent between 2005 and 2020, employment in Anchorage will grow by only 9 percent. At the same time employment in Wasilla and Matanuska will grow by more than 90 percent. These figures indicate that, in the future, more Matsu residents will find opportunities to work closer to home instead of having to go to Anchorage.

RESULTS

A summary of ridership forecasts are presented in Tables 3 through 7. The figures are rounded to the nearest 100.

Ridership estimates for Case 1 appear in Table 3. This case assumed all 9 stations. A trip from Wasilla to Anchorage would be done in 68 minutes, at an average speed of 40 mph. Ridership is expected to increase by about 38 percent in 2012 and by about 33 percent in 2020 with the addition of a third round trip.

Table 3: Weekday Ridership Summary Case 1

9 Stations

	Wkdy. Psgr. Trips	
Year	2RT	3RT
2005	700	1,000
2012	800	1,100
2020	1,200	1,600

Note: RT stands for rail round trips

Ridership estimates for Case 2 appear in Table 4. This case assumed 7 stations as opposed to 9. Dropped were Eklutna and Birchwood, neither of which generates significant work trip ridership for the near or long term. As shown, eliminating these two stations would reduce ridership by about 100 riders a day or less than 10 percent. Average speed would be slightly higher than Case 1, but the time savings would be small and unlikely to attract any additional ridership by themselves.

Table 4: Weekday Ridership Summary Case 2

7 Stations

	Wkdy. Psgr. Trips	
Year	2RT	3RT
2005	700	900
2012	700	1,000
2020	1,100	1,500

Note: RT stands for rail round trips

Ridership estimates for Case 3 appear in Table 5. This case assumed an express stopping pattern of Wasilla and Anchorage. The 45-mile trip would be done in 55 minutes, at an average speed of 49 mph. The greater travel time savings serve to attract ridership, while the reduced number of stations serves to restrict ridership. The net effect is very similar to Case 2.

Table 5: Weekday Ridership Summary Case 3

	Wkdy. Psgr. Trips	
Year	2RT	3RT
2005	600	900
2012	700	900
2020	1,000	1,500

Note: RT stands for rail round trips

Ridership estimates for Case 4 appear in Table 6. This case assumed an express stopping pattern of Matanuska, or the Glenn Highway / Parks Highway Interchange, and Anchorage. The 37-mile trip would be done in 45 minutes, at an average speed of 49 mph. This scenario has weaker ridership, as the sole origin station will be 9 miles from Downtown Wasilla and thus less desirable for Wasilla commuters than a Downtown Wasilla Station.

Table 6: Weekday Ridership Summary Case 4

	Wkdy. Psgr. Trips	
Year	2RT	3RT
2005	500	700
2012	500	700
2020	600	900

Note: RT stands for rail round trips

Ridership estimates for Case 5 appear in Table 7. This cased assumed an express stopping pattern of Wasilla, Matanuska, and Anchorage. The 45-mile trip would be done in 58 minutes, at an average speed of 47 mph. This is perhaps the optimum scenario, offering two Matsu origin stations and a faster travel time versus either Case 1 or Case 2, each with many more station stops.

Table 7: Weekday Ridership Summary Case 5

	Wkdy. Psgr. Trips	
Year	2RT	3RT
2005	600	900
2012	700	1,000
2020	1,000	1,500

Note: RT stands for rail round trips

Missing from these forecasts is any adjustment for non-work trips. Since the service would be focused during the peak period, the potential for non-work trips is small. Per the Metrolink survey of riders in 2002, 87 percent of Metrolink trips were work trips, with 92 percent of riders employed. At the same time, Metrolink does offer mid-day and later evening service.

It is reasonable to assume that some of the peak period trains could make trips during the off-peak period as well, providing more opportunities for non-work trips. If such off-peak period service were offered, it would be reasonable to add 10 percent to the figures stated in the Tables 3 through 7 to account for non-work trips. For example, in 2012 for Case 2 (7 stations), assuming 3 peak period round trips and limited off-peak service, weekday ridership would be 1,100. The results would be the same for Case 5.

APPENDIX: Illustrative Schedules for Anchorage Commuter Rail Service

Table A-1
Case 1: Two Peak Period Round Trips with Mid-day Option

Read Down *Read Down*

C1	C3	C5	Den. Star	Location	Den. Star	C2	C4	C8
6:00	6:45	13:00	18:15	Wasilla	9:35	12:18	18:18	19:03
6:13	6:58	13:13		Matanuska		12:05	18:05	18:50
6:27	7:12	13:27		Eklutna		11:51	17:51	18:36
6:36	7:21	13:36		Birchwood		11:42	17:42	18:27
6:48	7:33	13:48		Eagle River		11:30	17:30	18:15
6:59	7:44	13:59		Elmendorf		11:19	17:19	18:04
7:08	7:53	14:08	20:00	Anchorage	8:15	11:10	17:10	17:55
7:13	7:58	14:13		Spenard		11:05	17:05	17:50
7:18	8:03	14:18		Airport		11:00	17:00	17:45

Table A-2
Case 1: Three Peak Period Round Trips with Mid-Day Option

Read Down *Read Down*

C1	C3	C5	C7	Den. Star	Location	Den. Star	C2	C4	C6	C8
6:00	6:30	7:00	13:00	18:15	Wasilla	9:35	12:18	18:18	18:48	19:18
6:13	6:43	7:13	13:13		Matanuska		12:05	18:05	18:35	19:05
6:27	6:57	7:27	13:27		Eklutna		11:51	17:51	18:21	18:51
6:36	7:06	7:36	13:36		Birchwood		11:42	17:42	18:12	18:42
6:48	7:18	7:48	13:48		Eagle River		11:30	17:30	18:00	18:30
6:59	7:29	7:59	13:59		Elmendorf		11:19	17:19	17:49	18:19
7:08	7:38	8:08	14:08	20:00	Anchorage	8:15	11:10	17:10	17:40	18:10
7:13	7:43	8:13	14:13		Spenard		11:05	17:05	17:35	18:05
7:18	7:48	8:18	14:18		Airport		11:00	17:00	17:30	18:00

Notes:
Run time Wasilla-Airport is 78 minutes.
Run time Wasilla-Anchorage is 68 minues.
Schedule assumes an average commuter train speed of 40 mph, which is consistent with commuter operations elsewhere in the U.S.
Denali Star is ARRC's long distance train, whose schedule has significant padding.
Wasilla Station is Downtown Wasilla.
Matanuska Station is near the Glenn Highway / Parks Highway Interchange.

Table A-3
Case 5: Two Peak Period Round Trips with Mid-day Option

Read Down *Read Down*

C1	C3	C5	Den. Star	Location	Den. Star	C2	C4	C8
6:00	6:45	13:00	18:15	Wasilla	9:35	11:58	17:58	18:43
6:13	6:58	13:13		Matanuska		11:45	17:45	18:30
6:58	7:43	13:58	20:00	Anchorage	8:15	11:00	17:00	17:45

Table A-4
Case 5: Three Peak Period Round Trips with Mid-Day Option

Read Down *Read Down*

C1	C3	C5	C7	Den. Star	Location	Den. Star	C2	C4	C6	C8
6:00	6:30	7:00	13:00	18:15	Wasilla	9:35	11:58	17:58	18:28	18:58
6:13	6:43	7:13	13:13		Matanuska		11:45	17:45	18:15	18:45
6:58	7:28	7:58	13:58	20:00	Anchorage	8:15	11:00	17:00	17:30	18:00

Notes:
Run time Wasilla-Anchorage is 58 minutes.
Schedule assumes an average commuter train speed of 47 mph, a result of only one intermediate station.
Denali Star is ARRC's long distance train, whose schedule has significant padding.
Wasilla Station is Downtown Wasilla.
Matanuska Station is near the Glenn Highway / Parks Highway Interchange.