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22 February 2022

Ms. Cassee Olin
Director of Administrative Services
Juneau School District
10014 Crazy Horse Drive
Juneau, Alaska 99801

BY EMAIL TO: cassee.olin@juneauschools.org
Copy by U.S. Mail

Re: Enrollment Forecast for Oct. 2022
Dear Ms. Olin:

This letter constitutes the *ERICKSON & ASSOCIATES* Juneau School District (JSD) enrollment forecast for 2022 and beyond.

Summary

Our *Mid-case* forecast issued in early 2021 projected that JSD would see 4,186 students enrolled in October 2021, an increase of 5.6 percent from the prior year. Actual enrollment increased 5.4 percent, to 4,178. The forecast error was 0.2 percent, making it the third smallest forecasting error in the 13 years for which we have forecast records. This contrasts with the 13 percent error in our forecast for October 2020, which was confounded by the COVID-19 pandemic and resulting social disruption, including closing classrooms and the shift of most pupils to remote learning.

JSD enrollment declined in 14 of the last 17 years; the district now has 20 percent fewer students than in 2004 (see **Figure 1** on the following page). The enrollment decline has been driven by demographic factors – principally declining births. We believe this trend is likely to persist.[1]

As in previous reports, we applied the ERICKSON & ASSOCIATES cohort-component model to the prior year's grade-level enrollments to produce the ***Mid-Case*** forecast.

The principal uncertainty in last year's forecast was whether, when, and how much of the pandemic-related enrollment loss would be recovered. We believe the majority of

[1]Juneau births declined 12 percent from 2018 to 2019, and dropped a further 6 percent in 2020. National data show that births and birth rates have been declining for more than a decade (see https://www.cdc.gov/nchs/data/vsrr/vsrr012-508.pdf).

the pandemic's direct effect on enrollment was recovered in 2021, with most of the remainder to be regained in 2022.

The ***High-Case*** forecast is our estimate of the 90th percentile below which all possible enrollment outcomes would fall. The ***Low-Case*** estimates the 10th percentile of possible enrollment outcomes.

We recommend the *Mid-Case* forecast for most fiscal and facility planning purposes. Compared with Oct. 2021 enrollment, the *Mid-Case* forecast projects an increase of 45 students at the Oct. 2022 counting period.

Figure 1 shows the *High*, *Mid*, and *Low* projection in the context of historical enrollments since 2004. Enrollments are expressed in terms of percentage differences from the Oct. 2021 enrollment. The chart includes the *High*- and *Low-Case* forecasts, showing the uncertainty surrounding future enrollment.

Figure 1

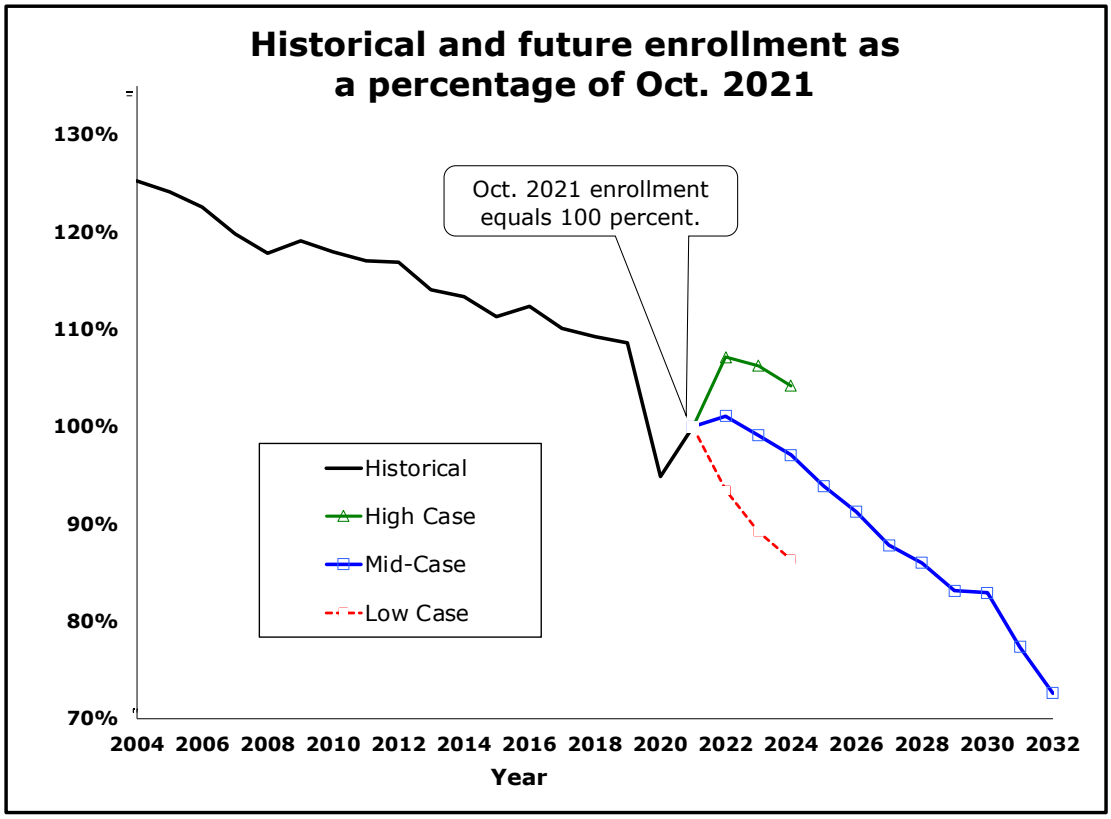

Figure 2 (next page, along with **Figure 3**) tabulates actual enrollment in 2020-21, and the projections for 2022-32. **Figure 3** shows grade-level enrollments under the *Mid* forecast.

Figure 2

JSD Enrollment

2019 to 2031

Year	Low	Mid	High
Actual			
2020		3,964	
2021		4,178	
Forecast			
2022	3,906	4,223	4,476
2023	3,727	4,141	4,439
2024	3,611	4,057	4,353
2025	*	3,923	*
2026	*	3,813	*
2027	*	3,670	*
2028	*	3,594	*
2029	*	3,475	*
2030	*	3,465	*
2031	*	3,234	*
2032	*	3,036	*

* Not forecasted.
Note: Does not include preschool enrollment.

Figure 3

Grade Level Oct. Enrollment
2020-21 Actual
and
2022-2032 **Mid-Case** Projection

	Actual		Projection										
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Kindergarten	229	288	296	288	275	249	238	238	229	201	188	181	181
Grade 1	310	279	297	293	288	272	247	236	237	230	207	183	178
Grade 2	299	335	287	293	292	285	269	245	235	238	236	202	180
Grade 3	280	325	345	284	292	289	282	267	243	236	245	230	198
Grade 4	318	293	334	341	283	290	286	280	266	244	243	238	226
Grade 5	284	337	301	330	340	280	287	284	278	267	251	236	234
Grade 6	318	292	347	298	329	337	277	284	282	279	274	244	232
Grade 7	301	353	301	343	297	326	334	275	283	283	287	267	240
Grade 8	318	311	364	297	342	294	323	331	274	284	291	280	262
Grade 9	337	342	321	360	297	339	291	320	329	274	292	284	275
Grade 10	310	342	352	317	359	294	336	289	319	330	282	284	279
Grade 11	339	319	352	348	316	355	291	333	287	320	340	275	280
Grade 12	321	362	328	348	347	313	352	288	331	288	329	331	270
Total	**3,964**	**4,178**	**4,223**	**4,141**	**4,057**	**3,923**	**3,813**	**3,670**	**3,594**	**3,475**	**3,465**	**3,234**	**3,036**

Note: Preschool enrollment not included.

Erickson & Associates **2022**

Methodology

Historical data and prior forecasts

Our first step in preparing this forecast was to update the historical data on enrollments and prior grade level forecasts. **Figure 4** (below) shows the accuracy of *Mid-case* forecasts over the last 12 years. Grade level forecasts have been less accurate, particularly for kindergarten, 10th, 11th, and 12th grades. See **Figure 5** (on page 5).

Figure 4

Accuracy of Mid-case Forecasts

Forecast for...	Source	Forecast issued 1 year earlier (enrollment)	Actual enrollment (enrollment)	Error (enrollment)	Error (percent)
Oct-09	Reaume	4,856	4,976	(120)	(2.4%)
Oct-10	Reaume	4,948	4,929	19	0.4%
Oct-11	Reaume	4,892	4,888	4	0.1%
Oct-12	Reaume	4,855	4,885	(30)	(0.6%)
Oct-13	Erickson	4,878	4,766	112	2.3%
Oct-14	Erickson	4,719	4,736	(17)	(0.4%)
Oct-15	Erickson	4,657	4,651	6	0.1%
Oct-16	Erickson	4,527	4,695	(168)	(3.6%)
Oct-17	Erickson	4,643	4,601	42	0.9%
Oct-18	Erickson	4,491	4,564	(73)	(1.6%)
Oct-19	Erickson	4,503	4,537	(33)	(0.7%)
Oct-20	Erickson	4,498	3,964	534	13.5%
Oct-21	Erickson	4,186	4,178	8	0.2%

Figure 5

Percentage Errors in Mid-Case Grade Level Forecasts

=[(mid-forecast) - (actual)] / (actual)

Forecast for ...	K	1	2	3	4	5	6	7	8	9	10	11	12	Error in total enrollment
Oct-09	-13%	5%	2%	-5%	-4%	-1%	0%	0%	1%	4%	-3%	-7%	-7%	(2.4%)
Oct-10	13%	4%	4%	3%	-2%	-3%	-2%	-2%	-6%	9%	1%	-15%	7%	0.4%
Oct-11	3%	-5%	0%	-1%	-7%	0%	1%	-2%	-4%	11%	-6%	-10%	25%	0.1%
Oct-12	-11%	0%	0%	0%	3%	-4%	-3%	0%	-1%	-2%	-1%	0%	10%	(0.6%)
Oct-13	-8%	5%	3%	4%	3%	4%	4%	4%	7%	0%	3%	5%	-2%	2.3%
Oct-14	-3%	2%	-3%	-4%	-2%	4%	0%	0%	-1%	0%	2%	15%	-13%	(0.4%)
Oct-15	5%	-2%	-1%	2%	3%	0%	2%	-2%	-3%	4%	1%	-1%	-7%	0.1%
Oct-16	-5%	-2%	1%	0%	-2%	-5%	-3%	-2%	-1%	-1%	-6%	3%	-22%	(3.6%)
Oct-17	10%	1%	1%	-3%	3%	-1%	-5%	2%	-3%	-1%	5%	4%	0%	0.9%
Oct-18	-10%	-3%	-4%	3%	-2%	6%	4%	-1%	-3%	-6%	0%	2%	-4%	(1.6%)
Oct-19	-3%	1%	-3%	-4%	-2%	-2%	-2%	-2%	4%	4%	1%	-1%	-3%	(0.7%)
Oct-20	49%	20%	15%	16%	12%	11%	14%	11%	13%	11%	3%	7%	4%	13.5%
Oct-21	-6%	6%	1%	0%	3%	-1%	2%	-4%	2%	2%	1%	-1%	-3%	0.2%
Average Absolute Error, Oct-09 to Oct-21	**11%**	**4%**	**3%**	**3%**	**4%**	**3%**	**3%**	**2%**	**4%**	**4%**	**3%**	**5%**	**12%**	**2.1%**

Dark pink indicates absolute errors over 10 percent; **light pink** indicates absolute errors of between 5 and 10 percent.

Cohort component ratios

The single best predictor of enrollment in any grade in any year has been the prior year's enrollment in the next lower grade. Despite the disruptions of the pandemic, the ERICKSON & ASSOCIATES forecasting model has been and remains based on these cohort-component relationships, namely, the historical ratios between the numbers of students in each cohort as they transition through the grades. A transition ratio of 1.00 means the enrollment was 100 percent of last year's enrollment in the prior grade.

We calculated transition ratios for each grade, in each of the 17 years, 2005 to 2021. Apart from outliers in 2020 and 2021, the pandemic years, annual averages for all grades clustered around 1.00, ranging from a low of 0.975 in 2013, to a high of 1.019 in 2010.[2]

Each year in preparing a new forecast we recalibrated the cohort-component model to include the latest year's transition ratios. Including 2020's unusually low ratios would introduce a downward bias to the projections. This bias is only partially offset by the high ratios in 2021.[3]

Forecasting future kindergarten enrollments

Because there is no grade before kindergarten, a different procedure is needed for forecasting kindergarten enrollments. In developing this procedure, we first calculated the ratios between annual Juneau births and kindergarten enrollments four,

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[2] In 2020, the pandemic outlier year, the average grade-level transition ratio was 0.896, that is, the average grade level enrollment was 89.6 percent of prior-grade enrollment in 2019. In 2021 the average transition ratio was 1.071.

[3] To evaluate this bias, we ran the cohort-component model twice, first with the 2015-2021 ratios, and then with the 2015-2019 ratios (excluding 2020 and 2021). In the Technical Appendix we show the parameters and outcomes of these modeling runs, and the outcomes using other plausible forecasting models.

five, and six years later. Each year we update our historical birth and kindergarten enrollment data before applying statistical tests to determine the best predictor of future kindergarten enrollment. As in past years, the average of births five and six years earlier continues to be the best predictor.

For 2026 and beyond, births five and more years earlier either haven't been compiled or haven't yet occurred. For these years we use a forecast of births based on Alaska Dept. of Labor and Workforce Development projections.[4]

Forecasting economic factors

Pandemic-related factors

In forecasts issued before 2020 the principal uncertainties were the future of the Juneau economy and the linkage between the economy and enrollment. In our forecast for Oct. 2021, those uncertainties were overwhelmed by the issue of whether, when, and how much of the pandemic-related enrollment loss would be recovered.

We defined the pandemic-related enrollment loss as the difference between the actual Oct. 2020 grade level enrollment and the *Mid-Case* enrollment we predicted for that year in our prior forecast. Following Bayesian statistical theory, we set the *Mid-Case* forecast for Oct. 2021 enrollment at 50 percent of what we calculated to be the pandemic-related enrollment loss.[5] This proved a propitious approach: actual JSD Oct. 2021 enrollment differed from the forecast by less than 0.2 percent.

To help in understanding the effects the pandemic may have on future enrollment we tabulated the enrollment history over the last ten years in Anchorage, Fairbanks and Juneau, and in three smaller districts, Ketchikan, Sitka and Nome. All six districts experienced declines in 2020, the first year of the pandemic, but Fairbanks and Juneau suffered the biggest percentage losses.

Figure 6 (on the following page) shows the enrollment loss in 2020 as a percentage of 2019 enrollment. It is unclear why Juneau's loss was so much larger in percentage terms than experienced in Ketchikan and Sitka, the two other Southeast Alaska communities with significant cruise ship tourism.

As indicated in **Figure 7** (also on the following page), all but Nome had regained some of these losses by the time of the Oct. 2021 enrollment count. But the recovery, like the declines, was uneven, with Juneau lagging far behind Sitka, Fairbanks, Ketchikan and even Anchorage. Juneau's greater loss and smaller recovery is likely important, but identifying the underlying causes requires analysis of the economy and demographics of the other communities, an analysis beyond the scope of this report.

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[4] The Alaska Dept. of Labor and Workforce Development doesn't forecast births by individual years but predicts an annual average in five-year increments. See http://live.laborstats.alaska.gov/pop/projections.cfm .

[5] This follows a method of statistical inference first described by Thomas Bayes in which a degree of belief is rooted on prior knowledge of conditions that might be related to the event. In the absence of prior knowledge, contending hypotheses are given equal probability.

Figure 6

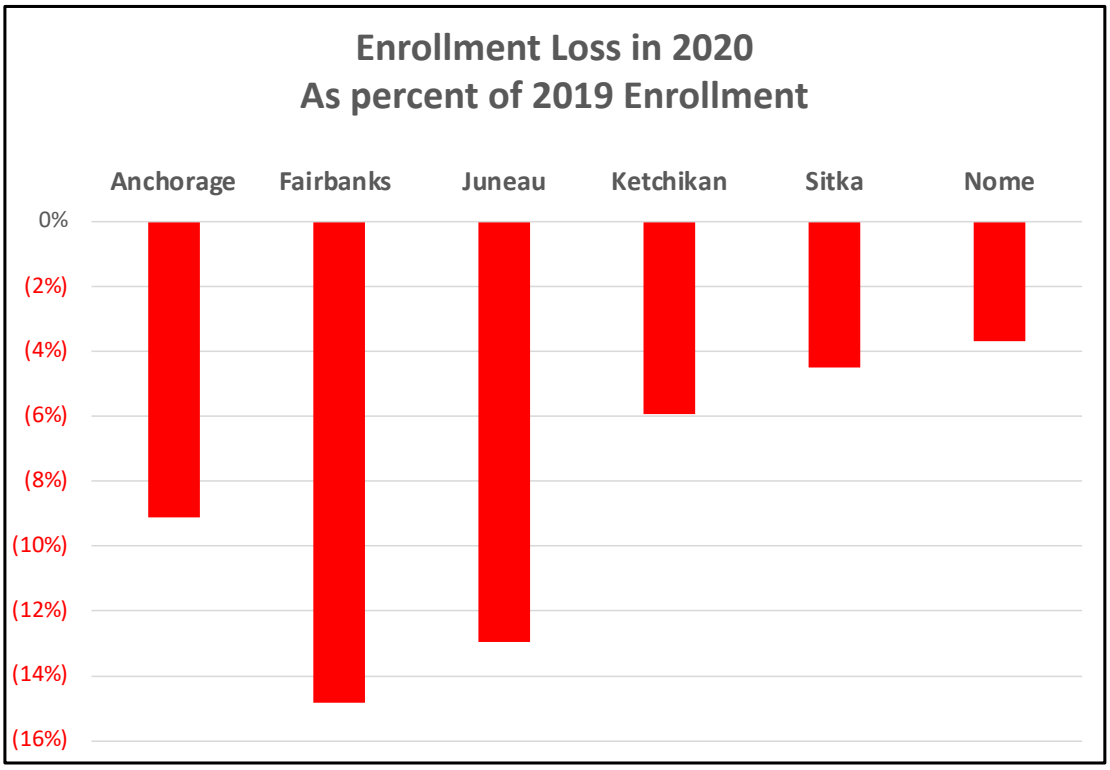
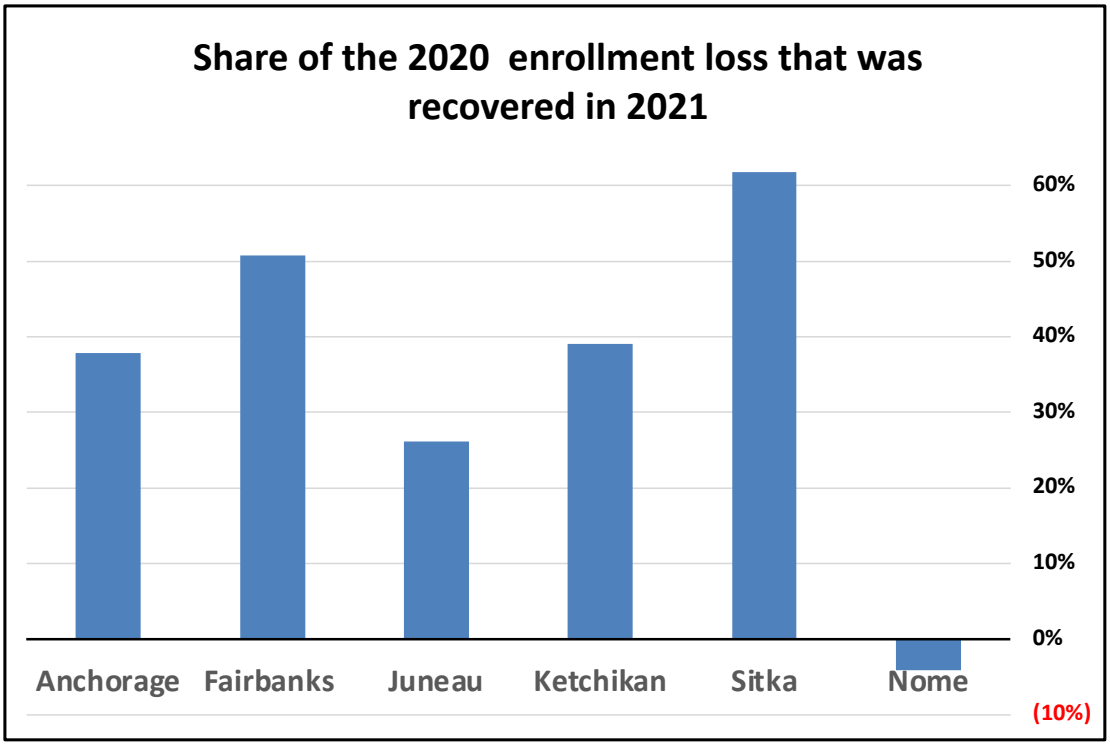


Figure 7

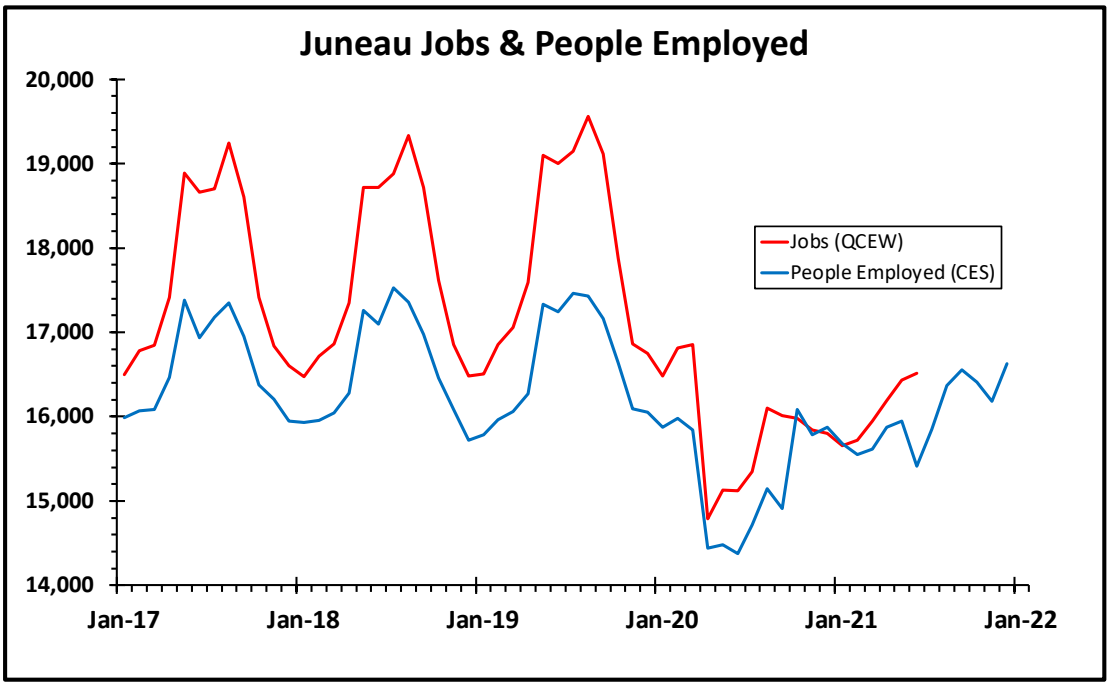


Employment trends

In the last full year before the pandemic Juneau's economy was growing, albeit slowly. Jobs as measured by the Quarterly Census of Employment and Wages (QCEW) grew 1.3 percent, year-over-year. The number of people working as measured by Current Employment Statistics (CES) grew 0.4 percent.[6]

As **Figure 8,** below, shows, economic data continue to reflect pandemic-related disruptions, including interruption of the usual seasonal employment pattern. In summer of 2019, Juneau counted 10 percent more jobs being worked than there were people working. In summer of 2021, the number of jobs and people at work were almost equal, likely due to the cut back in cruise ship visits, and reduced opportunity for residents to find second seasonal jobs in the visitor industry.

Figure 8



Notwithstanding the loss of summer cruise ship trade, the Juneau economy in 2020 and 2021 held up quite well. According to CES data, more Juneauites were working during November and December 2021 than the average for those months in 2017 - 2019 (see **Figure 9**, on page 9.

The apparent strength of the Juneau economy outside of the tourism sector is likely related to the influx of federal aid. As commentator Tim Bradner noted in 2020,

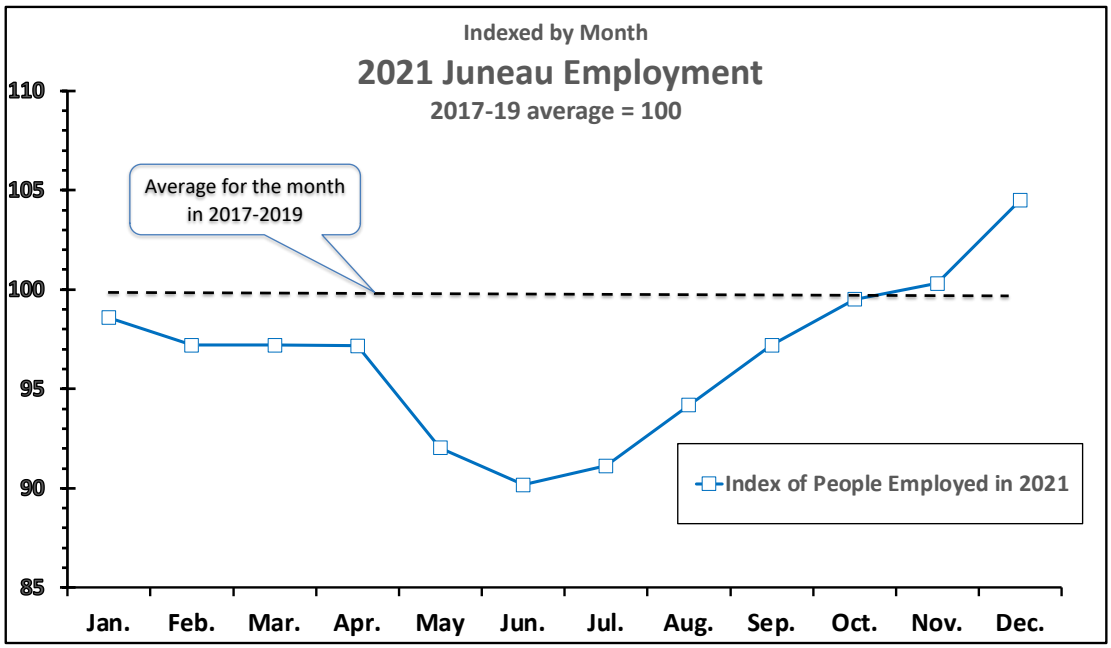
> Federal aid to businesses and individuals in the second and third quarters of 2020, which were affected by the pandemic, more than offset losses in personal income, according to recent data

[6] Because people can hold more than one job, the number of jobs in the QCEW census usually exceeds the number of people at work. CES estimates of people at work are based on a sample, are vulnerable to sampling errors, and are often revised. The advantage of the CES data is its timeliness – preliminary numbers are available by the end of the following month. QCEW monthly data is not available for three to nine months after the month ends.

> from the U.S. Bureau of Labor Statistics. This is likely to continue into 2021 with the arrival of more federal money in the pandemic relief bill agreed on by Congress in late December [2020].[7]

Bradner's prediction for 2021 appears to have been borne out. In November 2021 Congress passed and the president signed the $1.2 trillion infrastructure bill that will provide further economic stimulus. How long federal support will continue and its impact on the Alaska and Juneau economies remains an important question.

Figure 9



Economic effects on enrollment

Other things equal, if the economy waxes or wanes, so does enrollment, but the relationship can be complex and changes from year to year. **Figure 10** (on the following page) shows the historical linkage between JSD enrollment and Juneau employment in the months preceding the October count period.[8]

The ratio of Juneau students to Juneau employment has generally declined, from 27.1 students per hundred jobs in 2008, to 23.3 per hundred in 2019. However, the enrollment-employment ratio swung dramatically during the pandemic. If Juneau's cruise ship sector revives in 2022, as we think probable, we expect the people employed numbers to grow faster than enrollment, pushing future ratios back toward their long-term trend.

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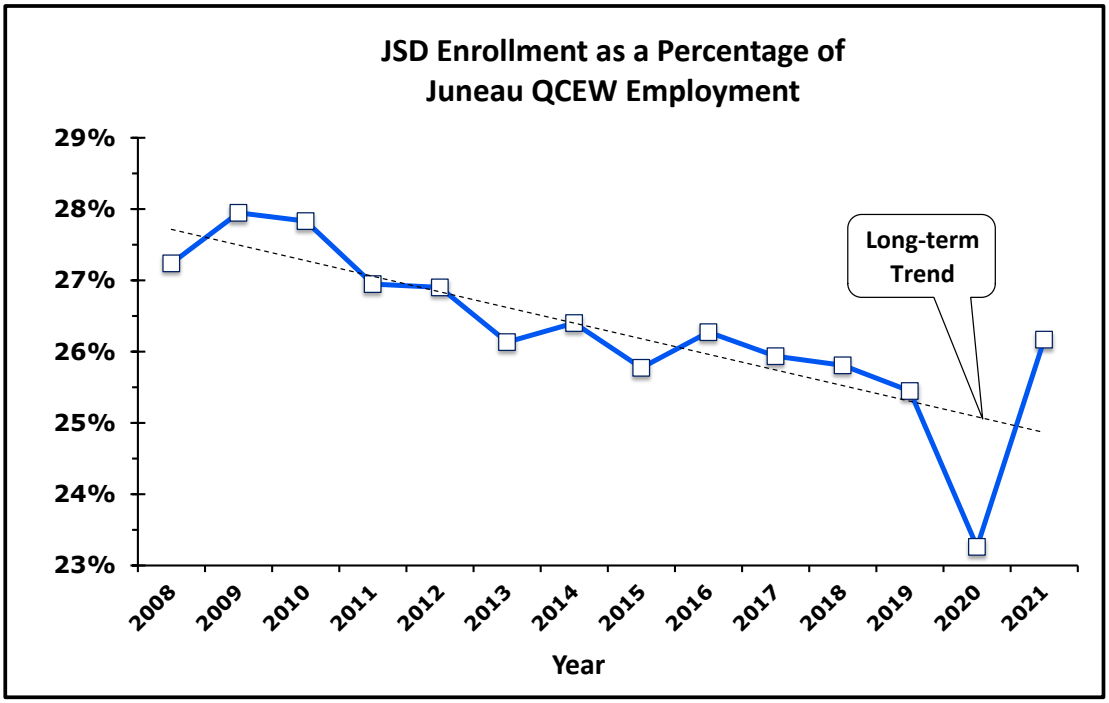
[7] Tim Bradner, "Analysis, 2020 was tough, 2021 will be better, maybe," *Mat-Su Frontiersman*, Dec. 30, 2020.

[8] Employment data are from QCEW (see *http://live.laborstats.alaska.gov/qcew*). QCEW data is available through June 2021. The datum for each year is the average monthly employment in the 12 months ending on June 30 of the named year. For example, the datum for 2021 represents the average number of jobs between July 1, 2020, and June 30, 2021. The enrollment datum is the Oct. enrollment in the named year.

Figure 10



In some previous forecasts we applied a subjective economic adjustment factor but we did not do that in this forecast. A subjective component nevertheless remains in even the most carefully prepared economic forecast. Others looking at the same data could reasonably reach different conclusions about the future of Juneau's economy and its effect on enrollment.

I once again appreciate the opportunity to assist the district in developing its enrollment forecast. I can be available to provide a briefing on the forecast to district officials or the Board of Education.

Sincerely,

Gregg Erickson

ERICKSON & ASSOCIATES

Attachment: Technical Appendix

Technical Appendix

Alternative forecasting models compared with 2021 actual and our *Mid-Case* forecast

Forecasting Model	Independent Variable(s)	Dependent Variable	Forecasted Oct. 2022 Enrollment	r^2	Difference between forecasted 2022 enrollment and 2021 actual	Difference from our Mid-Case forecast
First difference lagged; CES annual employment data using all available years **including** COVID impact years, 2020 and 2021.	% change in annual CES employment, t=-1 to t=0	% change in Oct. Enrollment, t=0 to t=+1	3,908	0.34	(270)	(315)
First difference lagged; CES annual employment data using all available years **except** COVID impact years, 2020 and 2021.	% change in annual CES employment, t=-1 to t=0	% change in Oct. enrollment, t=0 to t=+1	4,086	0.17	(91)	(137)
Baysian - Split difference betwwen Cohort-component and Oct. 2021 enrollment	Oct. 2021 enrollment; Oct. 2021 grade-level enrollments	Oct. 2022 enrollment	4200	n.a.	23	(23)
Mid-Case Forecast Cohort Component ("Demographics only") model using 2015-2019 transition factors	Oct. 2021 grade-level enrollments	Oct. 2022 grade-level enrollments	**4223**	n.a.	45	0
Trend of 2004 to 2021 enrollments	2004 to 2021 Oct. enrollments	2022 enrollment	4225	0.86	47	2
Cohort Component ("Demographics only") model using 2015-2021 transition factors	Oct. 2021 enrollment	Oct. 2022 enrollment	4227	n.a.	49	4
First difference lagged; QCEW annual jobs data (July to June) using all available years EXCEPT COVID impact years.	% change in June to July QCEW jobs, t=-1.5 to t=-0.5]	% change in Oct. Enrollment, t=0 to t=+1	4,313	0.68	135	90
Trend of 2004 to 2019 enrollments	2004 to 2019 Oct. enrollments	Oct. 2022 enrollment	4384	0.87	206	161

ERICKSON & ASSOCIATES Feb. 2022