

26 December 2013

Mr. David L. Means
Director of Administrative Services
Juneau School District
10014 Crazy Horse Drive
Juneau, Alaska 99801

Re: Enrollment Forecast Report

Dear Mr. Means:

Introduction

This letter completes my enrollment forecast report for 2013, incorporating my short-term forecast delivered Nov. 28, my long-term forecast delivered Dec. 11, and additional explanatory material.

As in last year's report, we provide a *High*, *Mid*, and *Low* case forecast. The *Mid* forecast reflects the 50th percentile of all possible enrollment outcomes. I recommend the *Mid* forecast for most fiscal and facility planning purposes. The *High* and *Low* forecasts represent our estimates of the 90th and 10th percentiles, respectively, of all possible enrollment outcomes.

Summary

Last year we predicted that Juneau school district enrollment would stabilize in 2013, ending a long downward trend. Instead, 2013 enrollment took a 2.4 percent drop, the largest percentage decline in nine years.

This unexpected contraction was the direct result of a Juneau mini-recession that began in January 2013, which was itself the result of local government and federal government job losses.

Between January and June, 2013,

- local government lost 175 jobs, and
- federal employment declined by 62 jobs.¹

By June the economic downturn had cost the Juneau economy 317 jobs.² Data for the third quarter of 2013 are not yet available.

¹ These are average job losses, January to June, compared with the same months in 2012.

² On average, there is one Juneau student for every four Juneau jobs; relatively higher-paid government jobs likely account for a lower ratio of jobs to students.

Figure 1 summarizes the forecast. (Figures are attached.)

Figure 2 presents the forecast in a broader context, showing historical enrollment since 2005 and the current forecast in terms of percentage differences from the Oct. 2013 enrollment. Enrollment is now 9 percent lower than it was in 2005.

I forecast this trend to continue for the next two years, with 2014 *Mid*-case enrollment down 1 percent from 2013, and 2015 enrollment down a further 0.5 percent. *Mid*-case enrollment starts growing again after 2015, but does not regain its Oct. 2013 level until 2019.

Figure 2 also shows the significant uncertainty surrounding the forecast. A future of enrollment increases or even steeper decline remain well within the range of reasonable possibility.

The long-term forecast showing projected grade-level enrollments is found in **Figure 3**.

Methodology

Historical data and prior forecasts

My first step in preparing this forecast was to update the historical grade level enrollment data and prior forecasts. Comparison of historical data with the forecasts reveals that we predicted total enrollment one year ahead with a root mean square error of 1.4 percent, a remarkable level of accuracy. See **Figure 4**, “Accuracy of Total Enrollment Forecasts.”

However, as Figure 4 shows, last year’s forecast overshoot the mark by 2.3 percent, a poorer-than-average performance.

As expected, grade level forecasts are less accurate, particularly in forecasting K, 9, 11, and 12th grade enrollments. See **Figure 5**, “Accuracy of Grade Level Forecasts.”

Factors affecting enrollment

Changes in the Juneau economy affect the demand for Juneau school district services. Enrollment is also affected by the relative competitiveness of the Juneau district in relation to alternatives available from private schools and competing home school programs. Beyond this, if families with children are dissatisfied with the quality of educational services in Juneau, they may move elsewhere, or decide not to accept an otherwise attractive Juneau job offer.³

² On average, there is one Juneau student for every four Juneau jobs; relatively higher-paid government jobs likely account for a lower ratio of jobs to students.

³ For more on effect of Juneau’s educational service quality on white collar and professional migration decisions, see my March 9, 2008 essay, “The recession and Juneau’s economic prospects,” http://juneauempire.com/stories/030908/opi_255333519.shtml.

The economy and educational competitiveness, though important in the longer run, tend not to shift much from one year to the next; in rare cases where they do shift that quickly (such as in 2013), the shift is usually not predicted, and probably not predictable.

Cohort component ratios

Analysis shows that the biggest driver of enrollment in any grade in any year is the prior year's enrollment in the next lower grade. My forecasting model is based on this relationship, namely, the historical ratios between the numbers of students in each cohort as they move through the grades. For example, ratio of 1.00 means the enrollment was exactly equal to last year's enrollment in the prior grade. I calculated these ratios for each grade, for each of the last nine years. The nine-year averages cluster around 1.00, but range from a low of 0.975 (grade 6 to prior year's grade 5), to a high of 1.070 (grade 11 to prior year's grade 10).

I show these ratios graphically in **Figure 6**. Vertical bars represent the range of the ratios for that grade over the nine-year history. The small tick located near the center of the bar reflects the nine-year average. (The square markers show the ratios for 2013.)

Should the ratios to be used in the model be the nine-year averages? Using the averages is intuitively appealing, but theory suggests that a more accurate forecast might be achieved by giving more weight to ratios from recent years. To test this I made "backcasts" for the seven prior years for which I had ratios for two or more prior years. In one set of runs I used the averages, which gave equal forecasting weight to all ratios, old and new. In other runs I variously reduced the weight given to older data.

For forecasts one-year ahead the results were clear: best accuracy was achieved by giving the most recent ratio 100 percent weight, the second oldest 50 percent weight, the third oldest 25 percent weight, and so forth.⁴

For forecasts two-years ahead best accuracy was achieved by giving the second oldest ratio a 70 percent weight, the third oldest 49 percent weight, and so on.⁵

For forecasts more than two years ahead, the results were not so clear, mostly because fewer historical data points were available the further out I took the analysis. For forecasts beyond two years ahead I gave the second oldest ratio a 90 percent weight, the third oldest 81 percent, fourth oldest 73 percent, etc.⁶

⁴ For the statistically inclined, this reflects a discount factor, ρ (rho), of 0.5.

⁵ A discount factor, ρ (rho), of 0.7.

⁶ A discount factor, ρ (rho), of 0.9.

Forecasting kindergarten enrollment

There is no grade before kindergarten, so another procedure is needed to forecast kindergarten enrollment. I estimate incoming kindergarten enrollment in 2014-2018 based on Juneau resident live births five and six years earlier.

For 2019 and years after, the forecast for incoming kindergarten enrollment is based on the projections published by the Alaska Department of Labor and Workforce Development demographic section.⁷

Comparison with last year's forecast

As **Figure 7** shows, this year's forecast is significantly different from the one submitted last year. Enrollment in 2014 is now expected to be 3.2 percent lower than we forecast last year. Mid-case enrollment in 2017 is 5.0 percent lower.

Lower October 2013 enrollment

These reductions chiefly result from the 2.3 percent lower-than-forecast overall enrollment in October 2013. The shortfalls extend across all but one of the 12 grades. With the exception of the 11th grade cohort, the component ratios for 2013, shown by red squares, are all lower than the nine-year average.

Plugging these 2013 enrollment results into the model reduces the forecast in two ways:

- it lowers the starting point by 112 pupils (see Figure 4).
- it lowers the transition ratios used to calculate future enrollments as each cohort advances in grade.

Drop in birth rate

Entirely apart from the drop in 2013 enrollment, a sharply lower 2012 birthrate has also depressed the long-term forecast. In 2011, there were 410 resident births in Juneau. In 2012 births fell to 363. That was an 11.5 percent decline, the largest percentage decline in 26 years. This reduction enters the forecast calculations by reducing the cohorts entering kindergarten in October 2017 and beyond.

Part of the drop in birth rate may be the result of random variations or from errors in data collection, editing and compilation. However, the deviation appears too large to be dismissed on these grounds.

It is also unlikely that the decline could be largely a result of the same factors that caused the 2.3 percent decline in 2013 enrollment. The most likely cause is a real decline in the Juneau birth rate.

⁷ I escalate the 2019 forecast value by the annual growth rate calculated from the Department's projected five-year growth in the 0-4 years age cohort.

Other underlying factors

Was the decline in 2013 enrollment the result of factors at work across Alaska? Enrollment data from Ketchikan, Sitka, Anchorage and Fairbanks, and interviews with administrators for those districts do not suggest a common factor. As **Figure 8** shows, enrollment in Sitka and Ketchikan increased, while Fairbanks and Anchorage saw declines.

The administrators interviewed said the changes in their district appeared to be from economic factors. Mike Fisher, the CFO of the Fairbanks district, for example, said the drop there was clearly the result of military deployments and reductions.⁸

My initial analysis of the most current Juneau economic data, monthly employment and unemployment—derived from a sample of employers—shown here in **Figure 9**, did not suggest an underlying economic cause for the enrollment decline. The figure shows three years of monthly Juneau jobs data ending in October 2013. The three-year trend, shown by the straight black line, is clearly upward. The trend for the first ten months of 2013 (not shown) is lower, but still upward.

Student exit data

Could the decline be the result of parents shifting students to alternative providers of education services? To test this, I obtained from the district and analyzed student exit reports required by the state Department of Education and Early Development. For the years 2010-2013, from the beginning of the school year through November 14 (the latest date for which I had 2013 reports) an average of 600 exit reports were generated in that 2.5-month period. The reports classify students who departed school in more than 12 categories. I reclassified each report into one of four meta-categories, depending on whether the student:

- Moved out of Juneau,
- Remains in Juneau,
- Graduated, or
- Exited for unknown reasons.

If the decline 2013 in enrollment resulted from more students choosing non-district correspondence programs or private schools, we would see an increased share of exiting students remaining in Juneau. That was not the case. From 2012 to 2013 the number of exiting students remaining in Juneau was almost constant, rising from 246 to 251. By contrast, the number of students moving out of Juneau increased from 172 to 306. See **Figure 10**. These data suggest that the 2013 enrollment decline was chiefly the result of family

⁸ Mark Foster, CFO of the Anchorage district, believes federal budget stress contributed to the decline there. The administrators in Ketchikan and Sitka suggest growth in the visitor industry played a role in their districts.

outmigration, and unrelated to competition from non-district correspondence programs or private schools.

Looking further at the Juneau economy

Having developed the evidence from the student exit reports, it seemed reasonable to take another, more a detailed look at the Juneau economy. The most reliable data on Juneau employment is found in the official quarterly reports of employment and earnings (“E & E reports”). These reports, based on a census of employers, lag several months behind the monthly reports of employment and unemployment. The annual series of E & E reports show Juneau employment growing from 18,057 jobs in 2011, to 18,327 in 2012. Quarterly data for the first half of 2013 shows the typical seasonal pattern, with employment increasing from 17,074 in January 2013 to 19,069 in June.

But a comparison of the first six months of 2013 with the first six months of 2012 revealed that the Juneau economy was contracting. See **Figure 11**. Juneau employment from January 2013 through June averaged 198 (1.1 percent) fewer jobs than in the same month a year earlier. Employment in June was down by 317 (1.6 percent) from a year earlier.

Almost the entire decline was the result of job losses in the local government sector, with losses in federal jobs a distant second. State government and private sector jobs were largely unchanged.

Writing in the January 2013 issue of *Alaska Economic Trends*, Mali Abrahamson, an economist with the Alaska Department of Labor and Workforce Development had this to say about Juneau’s economy:

Government, which represents about 37 percent of jobs in Southeast ... is expected to lose 50 jobs in 2013, as it did in 2012. The losses in 2012 were in local government, but in 2013 they’ll likely be federal. Federal employment in Southeast has declined by roughly 50 jobs each year since 2005.

Local government has had a more complicated few years, with 2011 stable in most areas except the typically volatile tribal governments, which shrank abruptly while other school districts and municipalities maintained a predictable pace.

In 2012, schools cut back while tribal government employment rebounded, for a net loss of only 50, jobs in local government.

Education cutbacks were absorbed during the 2011-2012 school year, so the drag on school employment will be negligible in 2013.

From the perspective of a year later, it appears that the local government decline, at least in Juneau, was larger than expected, and that this was the main cause of the 2013 enrollment decline.

I appreciate the opportunity to assist the district in developing this forecast.

Sincerely

Gregg Erickson

ERICKSON & ASSOCIATES

Attachment: Figures 1-11

Figure 1
 Juneau School District
Enrollment, Actual and Forecast
 2012 to 2024

Year	Low	Mid	High
<i>Actual</i>			
2012		4885	
2013		4766	
<i>Forecast</i>			
2014	4601	4719	4837
2015	4546	4696	4847
2016	4520	4704	4887
2017	4493	4710	4927
2018	4498	4750	5001
2019	4481	4767	5053
2020	4491	4818	5146
2021	4490	4859	5228
2022	4462	4871	5281
2023	4475	4928	5382
2024	4463	4959	5455

Note: Data do not include preschool enrollment.

Figure 2
Historical and future enrollment shown as
a percentage of Oct. 2013

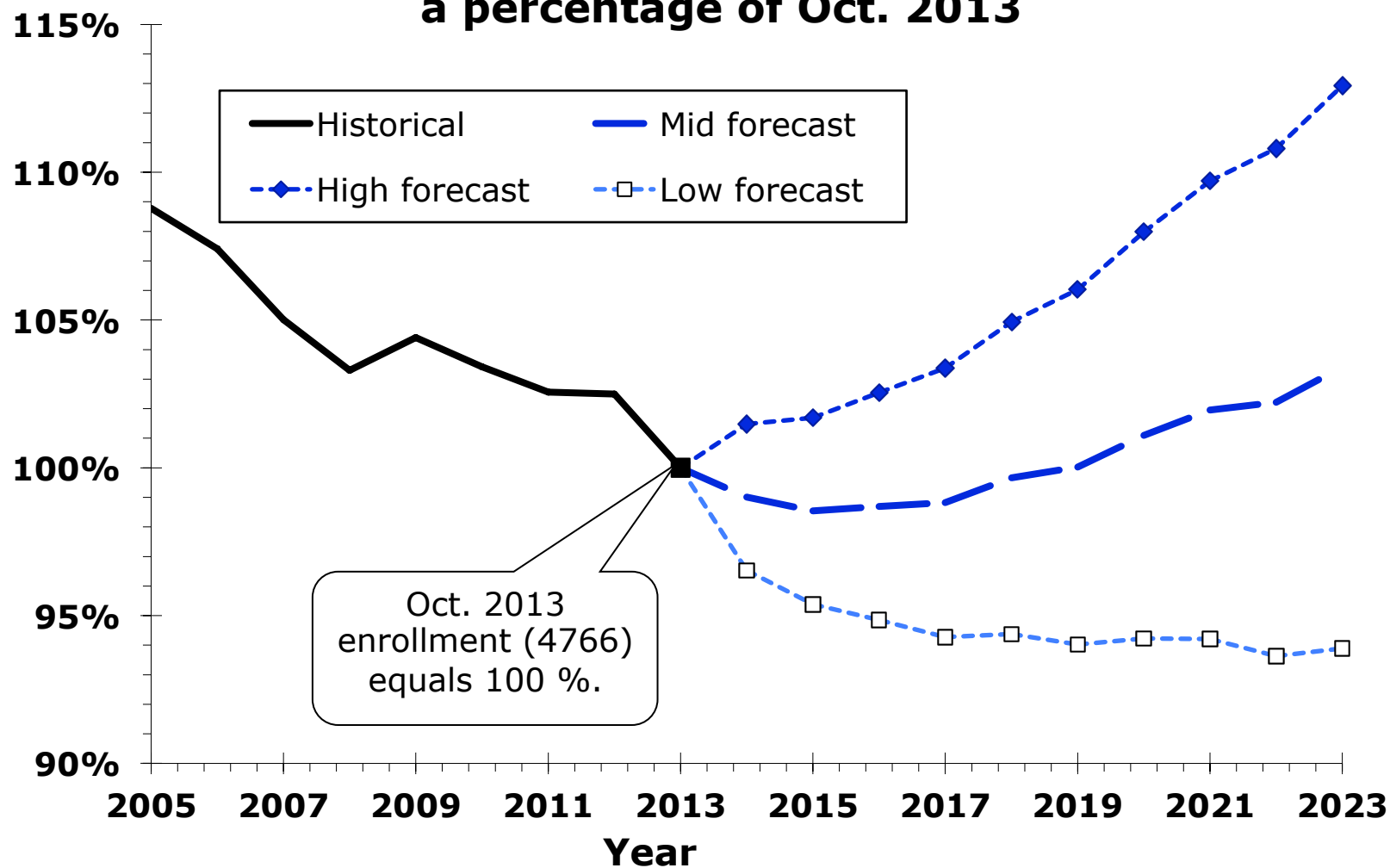


Figure 3
October Enrollment, Actual and Forecast, by Grade
2011 - 2024

	Actual			Forecast										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Kindergarten	354	367	364	358	331	365	367	368	370	372	370	369	367	366
Grade 1	343	373	372	378	375	350	386	388	390	392	394	392	391	389
Grade 2	390	342	358	363	370	367	343	378	380	382	383	385	384	382
Grade 3	358	389	331	353	361	371	368	344	380	381	383	385	387	385
Grade 4	347	347	381	329	354	365	376	373	348	384	386	388	390	392
Grade 5	381	359	341	382	330	355	366	377	374	349	385	387	389	391
Grade 6	366	390	347	338	378	324	348	359	370	367	343	378	380	382
Grade 7	374	366	379	344	337	382	327	351	362	373	370	346	381	383
Grade 8	366	375	348	374	343	336	380	326	350	361	372	369	345	380
Grade 9	380	382	387	360	389	363	356	403	345	371	383	394	391	365
Grade 10	394	377	371	382	355	382	357	350	396	339	364	376	387	384
Grade 11	483	464	427	431	437	390	420	392	385	435	373	401	413	426
Grade 12	352	354	360	328	337	354	316	340	317	312	352	302	324	334
Total	4888	4885	4766	4719	4696	4704	4710	4750	4767	4818	4859	4871	4928	4959

Note: These data do not include preschool enrollment.

Figure 4
Accuracy of Total Enrollment Forecasts

Forecast for...	Source	Mid-case forecast issued 12 months earlier	Actual enrollment	Absolute Error	Percentage Error
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%)

Figure 5

Accuracy of Grade Level Forecasts

	K	1	2	3	4	5	6	7	8	9	10	11	12
Oct-09	-13%	5%	2%	-5%	-4%	-1%	0%	0%	1%	4%	-3%	-7%	-7%
Oct-10	13%	4%	4%	3%	-2%	-3%	-2%	-2%	-6%	9%	1%	-15%	7%
Oct-11	3%	-5%	0%	-1%	-7%	0%	1%	-2%	-4%	11%	-6%	-10%	25%
Oct-12	-11%	0%	0%	0%	3%	-4%	-3%	0%	-1%	-2%	-1%	0%	10%
Oct-13	-8%	5%	3%	4%	3%	4%	4%	4%	7%	0%	3%	5%	-2%
Root Mean Square (RMS) Error	10%	4%	2%	3%	4%	3%	3%	2%	4%	7%	3%	9%	13%

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

Figure 6

Enrollment as a ratio of prior year-prior grade enrollment.
Error bars show range of ratio since 2005.
Squares show the ratio this year (2013);
Solid square shows the only 2013 ratio higher than the average.

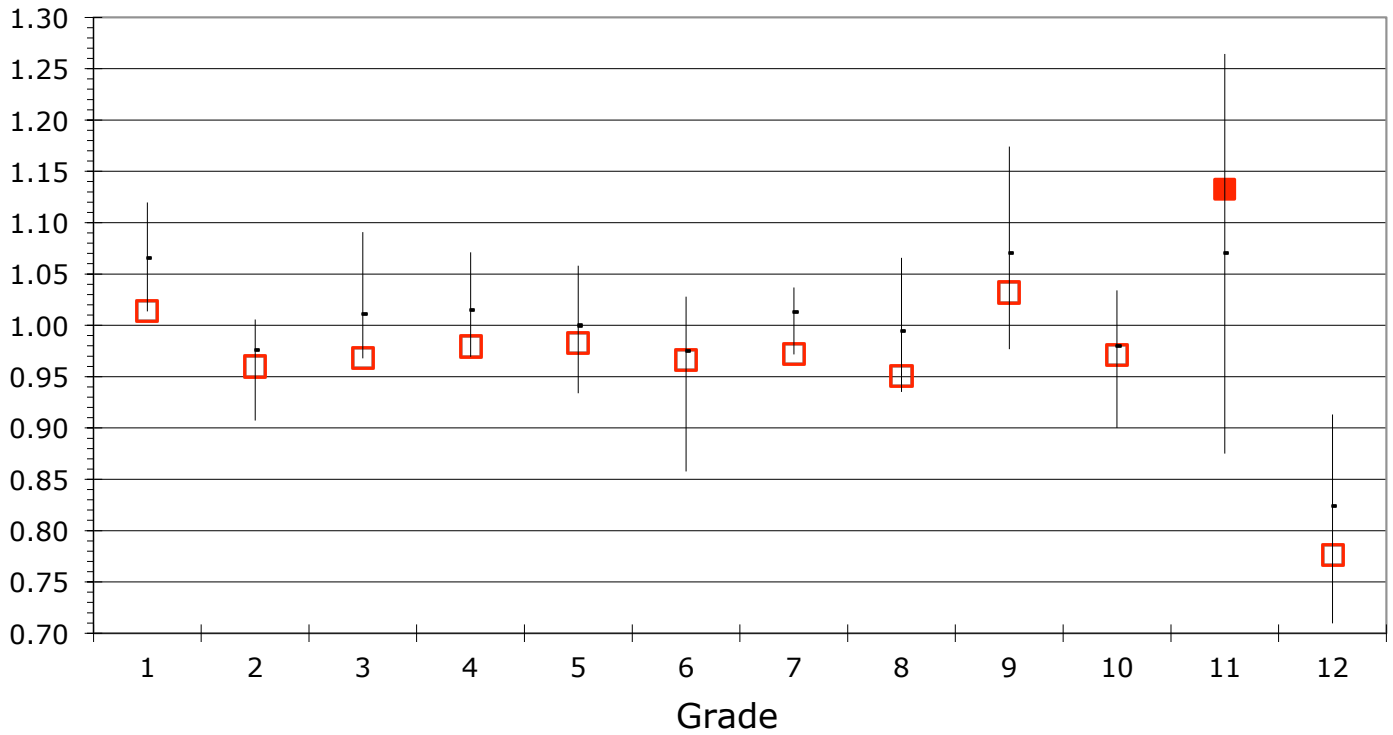


Figure 7

Current (2013) Forecast Compared with Last Year's Forecast

Year:	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Percent Change from last year:	(3.2%)	(4.2%)	(4.6%)	(5.0%)	(4.5%)	(4.2%)	(3.9%)	(3.5%)	(3.2%)	(2.8%)

Figure 8

		Students			
		regular	intensive	correspon- dence	TOTAL
<u>Ketchikan</u>					
	Oct. 2012	2101	46	72	2,219
	Oct. 2013	2124	57	85	2,266
	% change	1.1%	23.9%	18.1%	2.1%
<u>Fairbanks</u>					
	Oct. 2012	13565	432	269	14,266
	Oct. 2013	13332	449	269	14,050
	% change	-1.7%	3.9%	0.0%	-1.5%
<u>Sitka</u>					
	Oct. 2012	1276	42	37	1,355
	Oct. 2013	1303	42	35	1,380
	% change	2.1%	0.0%	-5.3%	1.9%
<u>Anchorage</u>					
	Oct. 2012	n/a	n/a	n/a	48,792
	Oct. 2013	n/a	n/a	n/a	48,004
	% change	n/a	n/a	n/a	-1.6%

Figure 9
Juneau Monthly Employment

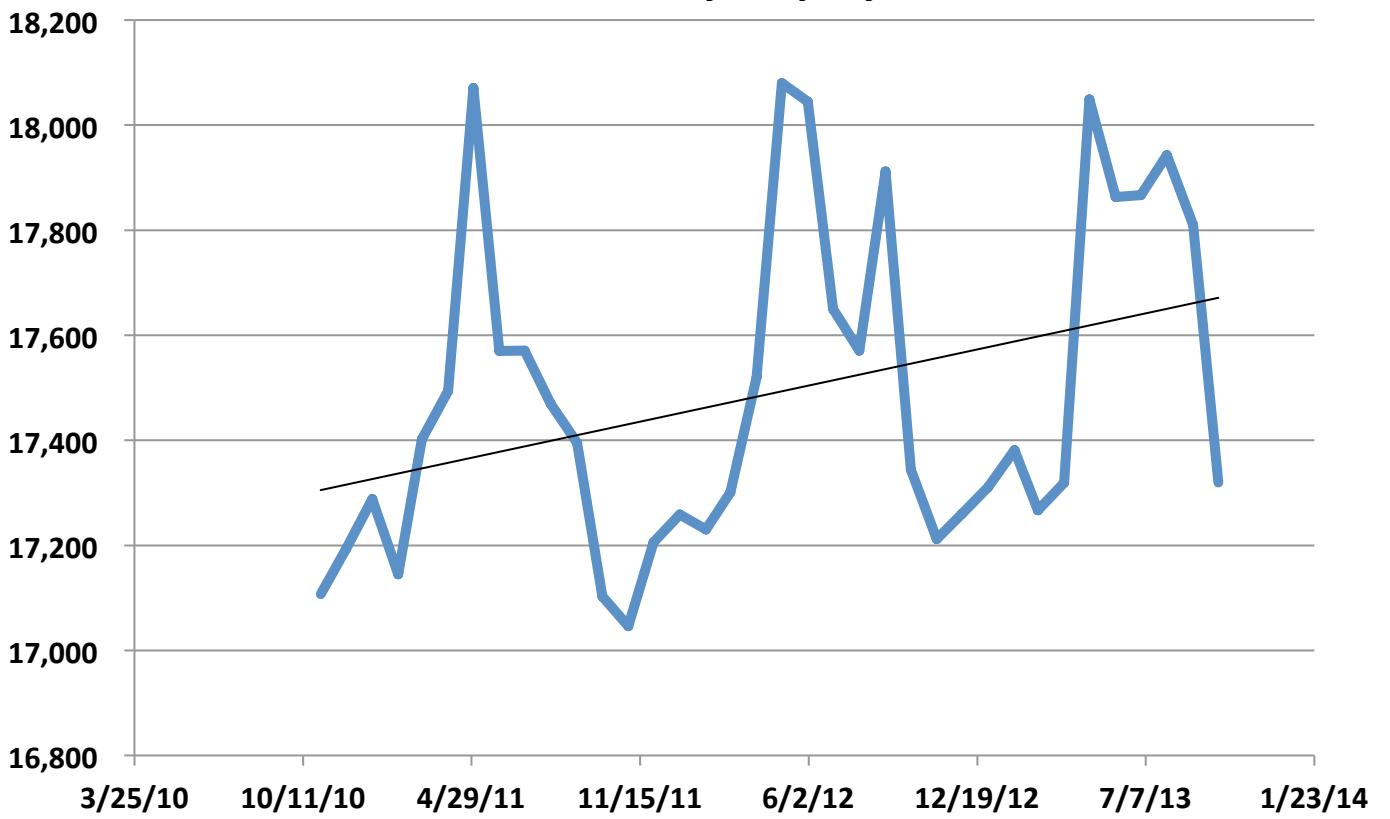


Figure 10
Student Exit Reports
August through November 15
2010 through 2013

Year	Moved out of Juneau	Remains in Juneau	Graduated	Unknown
2010	228	218	21	64
2011	216	450	12	67
2012	172	246	9	103
2013	306	251	4	97

Figure 11
Juneau Employment in 2012 and the first half of 2013

