

**A Review of the Quality of the 2016 Blair County
Property Reassessment**

**Study Conducted by
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Final Ratio Study Results and Conclusions

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Executive Summary – Blair County Reassessment Quality Indicators – Preliminary Results

The goal of this project has been to review the proposed new 2016 assessed values developed for properties throughout Blair County with respect to objective tests of the quality of the reassessment. The review is designed specifically to make observations regarding whether the results of the reassessment conform to nationally recognized standards used to test the quality of such programs. The primary materials used are the Standards and Textbooks of the International Association of Assessing Officers (IAAO), the largest and most recognized professional association for assessors in the United States. IAAO Standards are intended to reflect best practices and are a consensus of professional opinion. They do not have the force of law, so if state statutes conflict, state law prevails in terms of providing direction.

The review reflected in this report consists primarily of a comparison between national standards and statistical analysis of the mathematical ratios between assessed values and sale prices for properties sold during the three year period beginning January 1, 2013 and ending December 31, 2015 in Blair County. Ratio studies conducted in this matter are universally used for this purpose when market value is the goal, the achievement of which is to be tested and confirmed. In addition, assessed value changes on both selling and non-selling properties (or those with older sales activity) and other aspects of the underlying property data were reviewed to confirm, to the extent practical, that the ratio study results are representative of the underlying population of all properties in the categories studied. Among other factors, I independently determined time adjustments so that sale prices reflect probable price as of the January 1, 2016 assessment date. In addition to sales noted as valid, sales invalidated by appraisers for reasons related to assessment model building, rather than specific factors related to the sales, were included initially. To avoid potential distortions, and in keeping with IAAO guidance, ratio outlier trimming processes were then employed. I did not personally investigate or attempt to verify any sale, but relied on the data submitted to me by Evaluator Services and Technology, Inc. (EST), the reassessment contractor. This report was requested by and is performed on behalf of Blair County.

In addition to doing ratio studies using the new assessed values, comparative studies were performed using the original 1958 base year assessed values. These are submitted to analyze the equity of assessed values as they existed prior to the reassessment and to determine if the new assessments substantially improve underlying level and uniformity, thereby enhancing taxpayer equity. Similar analytic procedures have been employed and the sales data base is the same, except that a somewhat different set of outliers to be trimmed often was identified because of the different distribution of ratios; this in turn lead to somewhat different numbers of sales in the studies based on original vs. those based on proposed new assessments.

Conclusions

My major conclusion is that, to the extent measurable by ratio studies based on the available assessment and sales information provided to me, the current reassessment meets the goal of establishing current (2016) market value as the level of assessment on an overall basis for properties throughout Blair County. This does not mean that every assessment necessarily is market value, as ratio study results are statistical in nature and provide measurements that apply to groups of properties rather than individual

properties. However, it does mean that the overall quality standards for assessment level, as measured by the available sales, have been achieved. In addition, assessment equity, in terms of disparity between categories has generally been improved, with original assessments showing up to a 9 fold (900%) disparity between median levels of the different categories, while post-reassessment results show no more than 1% difference between category medians. In other words, there are much smaller differences in level of assessment between properties in different categories than was true with the original assessments. The new assessments meet IAAO standards for level of assessment in each category tested and overall.

Uniformity within categories measures the variability between the ratios, with lower variability indicating better uniformity and being preferred. There are two types of uniformity measures – between properties in general (horizontal equity) and between high and low priced properties (vertical equity).

In comparison to uniformity measures using original 1958 base year assessments, at the category level, general (horizontal) uniformity as measured by the Coefficient of Dispersion (COD) is much better for each category. Using 1958 base year assessments, no category meets general uniformity standards. In contrast, each category meets uniformity standards using new assessments.

The second type of uniformity, vertical equity, is also substantially improved given the new assessments, with only the Vacant lots over 10 acres category (V) failing by a slight margin using one statistical measure that is not corroborated with alternate, more precise statistics. Using the original 1958 base year assessments, Commercial / Industrial (C/I), Agricultural (A), Vacant lots over 10 acres (V), and Land (vacant lots under 10 acres) (L) categories all fail vertical equity standards; all but the Agricultural category by large margins.

There are two remaining issues, both of which are related to verifying that ratio analysis on sales is likely to be representative of the underlying population of all properties in the tested categories:

1. Many of the final analysis results on the new assessments show extremely good general uniformity. These extremely good results are called to the analyst's attention by use of the term "questionable" on the statistical reports. This is because the results may indicate admirable performance in terms of the reassessment, but are highly unusual and call for additional tests to determine whether sales samples truly represent underlying populations. One of the main verification tests is to review proposed new assessments on all properties (not just the sales). I did that and am satisfied that adjustments have quite properly been applied broadly.

Additional sales occurring after January 1, 2016 corroborate findings regarding assessment level overall and for each category. However, analysis of just these newer 2016 sales shows slightly worse uniformity. Regardless, even using this more limited sample of newer sales, for all categories except vacant lots under 10 acres (L), uniformity is still well within standard. Even in this category (L), and again, using only the limited sample consisting exclusively of 2016 sales, general uniformity cannot be proven to be out of compliance and is much improved in comparison to uniformity given the original base year assessments. If based exclusively on the small number of available valid post January 1, 2016 sales, vertical equity in category L appears to be below standard, indicating a possibility that low priced properties are somewhat undervalued with respect to high priced properties in this category.

This could also mean that the reassessment process has recognized market trends through December 31, 2015, but that a new trend, at least for this category (L) has emerged since that date. Only limited conclusions are possible, given the short additional time frame and small number of sales. Therefore, I stand by my general conclusion that general uniformity achieved by the reassessment is well within IAAO standards, even if the uniformity in the underlying population of properties being reassessed (not just those with recent valid sales) may not be quite as extremely good as shown by the sales in the main analysis.

2. In reviewing assessed value changes on the three years of sales used in the analysis and on the population of all other properties subject to reassessment, I found that the assessed values on the recent (last three years) sales increased somewhat less than did the assessed values on the general population of all parcels subject to reassessment. The main reason for this review was to determine if adjustments to recent sales exceeded those to the general population. That was not the case, but, had it been, it could have seriously compromised the representativeness of the samples.

A Review of the Quality of the 2016 Blair County Property Reassessment – Preliminary Ratio Study Results

Introduction

The goal of this project is to review the proposed new 2016 assessed values developed for properties throughout Blair County with respect to objective tests of the quality of the reassessment. The review is designed specifically to make observations regarding whether the results of the reassessment conform to nationally recognized standards used to test the quality of such programs. The primary materials used are the Standards and Textbooks of the International Association of Assessing Officers (IAAO), the largest and most recognized professional association for assessors in the United States.

The primary means for establishing the underlying equity in the assessments is by a statistical comparison of assessed values and sale prices. This comparison is known as a ratio study, the basis for which is the mathematical ratio between each assessed value and that property's corresponding sale price, provided timely sales have taken place and provided that the sale is considered an "arm's length transaction" in which the selling price is expected to reflect the market value of the real property. Such studies are the pre-eminent tools of the trade to be used in evaluating the quality and equity achieved by any assessment of large numbers of properties for which adequate and representative sales data is available. For this project, ratio studies were reviewed for several categories of property throughout Blair County.

In order to use ratio studies to evaluate assessment performance, it is important to review and understand the representativeness of the sales used in the study. To the extent that ratio studies are based on arm's length transactions in which physical characteristics have not changed dramatically since the sale, such studies should provide valid indicators of the quality of the reassessment. Representativeness also requires that the appraisal or reassessment methods used are consistent between selling and non-selling parcels. For this reason, a secondary goal is to verify the validity of the ratio study used to test the 2016 assessments by determining whether assessments on selling and non-selling parcels were determined independently or whether possible distortion due to "sales chasing" exists. Finally, to the extent practical, an additional ratio study has been conducted using otherwise valid sales occurring subsequent to the assessment date and not used in developing the appraisal models. Although limited, these sales add a corroborative element to the analysis.

All statistical measures and sales chasing tests used in this study are based on the IAAO 2013 *Standard on Ratio Studies*, the most current edition available at the time of this report. Throughout this report, the terms "reassessment" and "reappraisal" are used interchangeably.

Scope of Project

To accomplish this project, it has been necessary to analyze changes in assessments on selling and non-selling parcels throughout Blair County. In addition to reviewing the new assessments, I reviewed the pre-existing (base year 1958) assessments to determine whether selling and non-selling parcels were treated similarly in the reassessment. I also reviewed ratio studies prepared using the same sales data base, but with statistics based alternately on original (pre-reassessment) assessed values and new (post-reassessment) assessed values. This is an important step in evaluating whether the reassessment

produced better equity and results more in compliance with IAAO standards. Accordingly, the appraisal company provided the following information:

- 1) Real property sales occurring between 2013 and December, 2015 by category for the following categories of property in Blair County:
 - i) (A) Agricultural – generally 10 acres or more with residential buildings present;
 - ii) (C / I) Commercial and Industrial;
 - iii) (L) Vacant lots under 10 acres in size;
 - iv) (V) Vacant lots over 10 acres in size;
 - v) (R) Residential.
- 2) Listings of both selling and non-selling property parcels from throughout the county. These listings included the original assessments and post-reassessment proposed market values for 2016. Except as provided in Appendix A3 (January, 2016 through May 31, 2016 sales), assessed values of sales occurring after December 31, 2015 were not used.
- 3) Validity codes, counts, and explanations for the sales considered invalid for ratio study purposes (ie: not arm's length, market value indicators).
- 4) It should be noted that data files that were reviewed have been summarized in various tables and discussions throughout this report. In many cases representative examples of analyses have been reproduced and are provided in appendices for illustration. However, the universe of all actual files that I received has not been included.

In reviewing the data, I discussed information needs with and received data, explanations, and assistance from Tim Barr with EST.

Analysis consisted of the following:

- 1.) Compare assessment changes for non-selling property against changes indicated on selling parcels. This was done to check for sales chasing, a situation in which non-selling parcels have far lower assessment adjustments than selling parcels.
- 2.) Calculate and review ratio study results for valid sales in each category. Results are shown in Appendix A1 using original base year assessments and Appendix A2 using new assessments that reflect January 1, 2016 market value. In addition, sales not clearly invalid, but with alternate, atypical validation codes, were reviewed to help further corroborate results based on sales used directly in developing the reassessment model.
- 3.) Analysis was conducted for each indicated grouping, provided that there were at least 5 usable valid sales following application of trimming procedures. Trimming generally followed the recommendations in the IAAO *Standard on Ratio Studies* and relied on 1.5 or 3 times the interquartile range (IQR). The application of the trim resulted in elimination of more than 10% of the sales sample in only in one case, the Agricultural category (A), in which a very small sample of 15 was available. In this case, two outliers were removed; this amount of adjustment is permitted by the IAAO *Standard* "...in the most extreme cases..."¹ and was considered applicable in this sample.

¹ IAAO. *Standard on Ratio Studies*. Appendix B, Section B.4. April, 2013.

- 4.) Compare results on ratio studies to quality indicators in the IAAO *Standard on Ratio Studies* and other recognized assessment literature and provide a general analysis of assessment conditions as indicated by the ratio studies. Much descriptive and explanatory material on the meaning of ratio study statistics has been extracted from professional sources and is provided in Appendix B to illustrate the principles discussed.
- 5.) Review before and after results using original 1958 base year, as well as proposed 2016, assessed values. This report is based on proposed new assessments established as of June 22, 2016 and does not purport to reflect any changes subsequent to that date. The author's understanding is that this data reflects the assessed values shown on the notices mailed on or before July 1, 2016.

Inherent Assumptions

To facilitate analysis, I am assuming the following:

- 1.) With the exception of sales eliminated appropriately as invalid or probably non-market value type transactions, all timely sales (1,761 were retained and analyzed in the main study and 247 were analyzed in the post 1/1/2016 study) in the categories being studied have been included as provided by EST, with the following exceptions and notes:
 - 4 sales originally marked valid were eliminated after I requested additional review by EST; this reflected determinations that these sales should have been considered invalid.
 - 108 sales considered invalid by EST in developing its appraisal models, but otherwise meeting validation criteria, were included.
 - Sales with prices of \$1,000 or less were excluded.
 - Sales occurring prior to January 1, 2013 were excluded.
- 2.) The database of non-selling parcels is complete.
- 3.) Valuation information provided are accurate and complete.
- 4.) The goal of the reassessment was to have all properties' assessed values as close to January 1, 2016 market value as possible. No attempt has been made to adjust for or further analyze properties for which market value may not have been sought. (Many states employ use value and other specialized valuation techniques for a variety of property categories, including agricultural and timber land. In these cases, resulting assessed values are not designed to be market value and can not be tested using traditional ratio studies. It is my understanding that this is not a consideration with regard to any of the properties subject to this review.)

Analysis and Findings

Background

Pennsylvania is one of only six to eight states without a statutorily specified reappraisal cycle.² A recent Pennsylvania court case found extremely poor equity in terms of large differences between comparisons

² Some discrepancies exist, for instance, some states annually reassess public utilities and railroads at the state level, but have no such requirement for locally assessed properties of the type being reassessed in Blair County. See: Dornfest, Alan S., Steve Van Sant, Rick Anderson, and Ronald Brown. *State and Provincial Property Tax Policies and Administrative*

of assessed values and sale prices on similarly situated properties in 18 of Pennsylvania's 67 counties, none of which had conducted comprehensive reassessments for at least the past 20 years.³ Similarly, Blair County, Pennsylvania, had not previously reappraised since 1958 and prior values reflected that level of assessment. My understanding is that the goal of this reappraisal is to assess properties at market value as of January 1, 2016.

Determining whether market value has been achieved

The primary tool in use throughout the assessment profession for determining whether groups of properties have been assessed at market value is the ratio study. For such a study, sales of arm's length transactions for which sale prices are deemed to reflect market value are compared with (have sale prices divided into) assessed values. The resulting mathematical ratio is subjected to statistical analysis and the results of that analysis may be compared with national or state standards as an objective means for evaluating the quality of any reappraisal. Because assessments are intended to reflect market value as of a particular date, while sales occur over a period of time, often it is necessary to adjust sale prices to properly reflect what the selling price would have been had the sale taken place on the assessment date. I reviewed the linear relationship between the ratios and time over the three year period from which sales were used for the main analysis and independently determined whether time adjustments were necessary on a case by case (category by category) basis. When linearity appeared to be skewed by unusual concentrations of high or low ratios toward the beginning or end of the sales period, time adjustments were not applied. Separate time adjustments were developed for each analysis, including those based on original assessments. An example of a time adjustment analysis graph is included in Appendix C. Actual time adjustments applied are found on each ratio study reported in Appendix A.

General findings and conclusions

Based on the ratio studies I conducted and the lack of any evidence of sales chasing (see section on representativeness), the current reassessment in Blair County achieved the goal of moving assessments to January 1, 2015 market value, as indicated by measures of assessment level, in every category tested and overall. Specific category results are shown in Table 1. Results also show uniformity statistics that meet IAAO quality standards for horizontal equity (as measured by the Coefficient of Dispersion (COD)). One category, Vacant lots over 10 acres (V), shows results that marginally fail to meet vertical equity standards, indicating the possibility of slightly lower assessments on higher value property in this category. Similarly, although not indicated in the general analysis, analysis of subsequent 2016 sales shows the possibility of slightly lower assessments on lower value property (the opposite case) for the Vacant lots under 10 acres (L) category. Both of these results are indicated by the PRD, an accepted but often distorted measuring statistic, especially suspect given the small sample sizes for both of these studies⁴. The more technical PRB (also found in the IAAO *Standard*...) did not corroborate the existence of vertical inequity. Regardless, results show improved level of assessment and decreased differences in level of assessment between categories. Uniformity statistics are considerably better than those based on original (pre-reappraisal) assessments. Indicators used to develop this determination will

Practices (PTAPP): Compilation and Report. Journal of Property Tax Assessment & Administration. Volume 7, Issue 4, 2010. Pp. 85 – 86.

³ Clifton, James C. et al. v. Allegheny County [2007]; as cited in Chapter 4, *Challenging the Conventional Wisdom on the Property Tax*, edited by Roy Bahl, Jorge Martinez-Vazquez, and Joan Youngman. 2010. The Lincoln Institute of Land Policy. Cambridge, Massachusetts.

⁴ Note: Part 1, Section 9.2.7 of the IAAO *Standard on Ratio Studies* comments: "When samples are small...the PRD may not provide an accurate indication of assessment regressivity or progressivity. When relying on the PRD...it is good practice to perform an appropriate statistical test for price-related biases before concluding that they exist...."

be presented throughout this report, which will also provide general information derived from IAAO textbooks and standards to explain the nature and meaning of these indicators.

Conclusion 1: Overall and at the category level, results indicate that the new assessments satisfy the IAAO Standard for level of assessment, requiring level of assessment to be within $\pm 10\%$ of the goal (market value) and requiring each category to be assessed within $\pm 5\%$ of each other category. As recommended in the *IAAO Standard on Ratio Studies*, the median was the primary measure of level used for this determination. Neither of these criteria would be met if the original values were retained.

Conclusion 2: Both overall and at the category level, horizontal equity (general uniformity) standards have been met based on the proposed new assessments. Using original assessed values, no category meets typically recommended horizontal equity standards based on a COD of 20% or less.

Conclusion 3: Vertical equity standards based on the PRD were met everywhere except for the vacant lots over 10 acres (V) category based on a very small number of sales. Although subsequent 2016 sales show a questionable vertical equity result for the L category, this may be an indication of market direction since January 1, 2016 and therefore is not pertinent to a conclusion regarding equity as of January 1, 2016. Regardless, in both cases PRB guidelines were met and this statistic is considered less prone to false positives than the PRD.

Conclusion 4: Assessment equity, in terms of disparity of level of assessment between categories has generally improved, with original assessments showing a 9 fold (900%) disparity between median levels of the different categories, while post-reassessment results show no more than 1% difference between category medians, well within IAAO standards.

Analysis and Specific Results

I developed ratio study statistics for each category based primarily on sales occurring between January 1, 2013 and December 31, 2015, with sale prices time adjusted as necessary to reflect price as of January 1, 2016. Categories studied were:

1. (A) Agricultural property, usually with residential buildings;
2. (C / I) Commercial and Industrial property;
3. (V) Vacant lots over 10 acres;
4. (L) Lots under 10 acres;
5. (R) Residential property – generally with improvements.

In addition, I used sales previously found to be valid, but appraiser trimmed during the development of reassessment models, and performed before and after reassessment ratio studies for all property categories and overall. As indicated previously, level using proposed new assessments is acceptable in each case as is general (horizontal) uniformity. Table 1 shows summary level statistics, while Table 2 shows general uniformity statistics before and after reassessment for each category and overall. For level and uniformity, **bold** indicates results in relation to new assessments that may not be in compliance with IAAO Standards. However, there were no level results out of compliance. In the case of non-compliance based on PRB advisory standards, confidence intervals provided in detailed analysis in the appendices must be reviewed to draw conclusions. Confidence intervals around CODs should also be reviewed before drawing definitive conclusions about compliance with general (horizontal equity)

uniformity standards. However, there were no CODs that were out of compliance based on proposed new assessments, using either point estimates or confidence intervals. Very low CODs often are indicators of sales chasing; however, an examination of assessment changes on all parcels in the county eliminates that possibility, so notations of “questionable” CODs found on detailed statistical analysis reports should be disregarded. That is reflected by the comment “verified ok” found following the “questionable” notation on the statistical analysis pages found in Appendix A.

When PRBs were outside of a $\pm .05$ range, these results were placed in **bold** to signify point estimates that appeared in questionable ranges. Such designation should be reviewed by observing whether confidence intervals around the PRB also fell outside this range. **Bold** emphasis was not used to designate original assessments that were questionable or did not meet standards, as this was the case for most original assessment based ratio study results.

Detailed statistical results and information about outlier trims used, including specific numbers of sales trimmed using statistical techniques can be found on detailed analysis reports found in Appendix A.

There were insufficient industrial property category sales to analyze this category separately. However, industrial property sales were included in the analysis of the commercial property category, so results are reported under the category heading “Commercial and Industrial” or “C / I.”

Table 1 – Level of Assessment Measured by the Sample Median⁵

Category	Area studied	Pre-reassessment Median (%)	Post- reassessment Median (%)
All	All	8.89	100.26
All	All – Post 1/1/2016 sales	8.88	100.57
Residential (R)	All	8.95	100.28
Commercial and Industrial (C / I)	All	10.13	99.81
Agricultural (A)	All	5.19	99.72
Vacant (V)	All	1.12	99.77
Land (L)	All	3.25	99.47

Table 2 - Uniformity of Assessments

Category	Area studied	Pre-reassessment COD (%)	Post-reassessment COD (%)	Pre-reassessment PRD / PRB	Post-reassessment PRD/PRB
All	All	25.39	4.10	1.02/.078	1.01/-.004
All	All – Post 1/1/2016 sales	24.60	4.90	1.01/.083	1.00/-.007
Residential (R)	All	23.63	4.11	1.00/.086	1.00/-.006

⁵ Note: Although the median confidence interval, not the sample median should be used for determining compliance with standards, sample medians between 90% and 110% will invariably be in compliance. In these cases, the confidence interval is more useful in determining whether any groupings vary by more than 5%.

Table 2 (continued)

Category	Area studied	Pre-reassessment COD (%)	Post-reassessment COD (%)	Pre-reassessment PRD / PRB	Post-reassessment PRD/PRB
Commercial and Industrial (C / I)	All	43.94	2.31	1.12/.061	1.01/.0001
Agricultural (A)	All	39.47	6.20	1.04/.183	1.02/-.026
Vacant (V)	All	53.02	7.71	1.12/.172	1.05 /-.014
Land (L)	All	79.79	7.86	1.12/ .069	1.02/-.009

Comments on Analytical Techniques

Representativeness

A major concern is developing ratio studies that are representative of the area or category being analyzed. Nominally this is achieved when types of property: “...appear with approximately the same relative frequency in both the sample and the population.”⁶

This principle is further elaborated in the IAAO *Standard on Ratio Studies*, which comments:

*“A ratio study sample is considered sufficiently representative for direct equalization and mass appraisal performance evaluation when the distribution of ratios of properties in the sample reflects the distribution of ratios of properties in the population.”*⁷

The *Standard* further comments:

“...representativeness is improved when the follow occur:

- 1. Appraisal procedures used to value the sample parcels are similar to procedures used to value the corresponding population*
- 2. Accuracy of recorded property characteristics data for sold property does not differ substantially from that of unsold property,*
- 3. Sample properties are not unduly concentrated in certain areas of types of property whose appraisal levels differ from the general level of appraisal in the population*
- 4. Sales have been appropriately screened and validated....”*⁸

While I did not test the representativeness of the ratio study samples or independently validate any of the sales, I was assured that proper validation techniques were used. EST submitted a list of validation codes and numbers of sales found to be invalid under each code. The main reasons for invalidating sales are shown in Table 3 (following page):

⁶ IAAO. *Property Appraisal and Assessment Administration*. P. 526. Chicago, IL. 1990

⁷ IAAO. *Standard on Ratio Studies*. Part 2, Section 4.2. April, 2013.

⁸ IAAO. *Standard on Ratio Studies*. Part 1, Section 4.5. April, 2013

Table 3: Major Reasons for invalidating sales

Reason	Number of Sales Found to be Invalid
Multiple parcel sale	649
Atypical time on market	582
Estate Sale	511
Building or improvement added since sale	440
Forced Sale – adverse pressure	278
Family Transfer	257
Sale involving financial institution	257
Corporate transfer	192
Forced sale such as foreclosure related sale	160
Purchase of adjacent land	118

Similar validation issues and reasons for invalidating sales are addressed in the IAAO Standard on Ratio Studies and the IAAO Standard on Verification and Adjustment of Sales⁹.

I did conduct a review of assessment changes on selling and non-selling parcels to understand whether both groups received similar treatment. If this were not true, it could indicate sales-chasing, a practice in which selling parcels are adjusted to a greater extent, hence distorting representativeness of results. However, I found no indication of any sales-chasing. Instead, I found the following:

- 56,848 parcels with no sale, a sale price of \$1,000 or less, or a sale with a date older than 1/1/2013 had an average assessed value increase of 1,293%.
- 4,391 parcels with sales prices greater than \$1,000, some of which were considered invalid sales, but all of which sold on or after 1/1/2013, had an average assessed value increase of 1,221%.
- The 1,761 valid sales during 2013 – 2015 used in the main ratio studies had an average assessed value increase of 1,147%.

The goal of any ratio study is to analyze representative samples that, by inference, provide a window into the probable quality of assessments throughout the underlying population of properties; hence, the importance of representativeness in these sales samples. While sales chasing could damage representativeness, it clearly is not a factor with respect to the Blair County reassessment. The additional increases in assessments of parcels other than recent valid sales is unusual, but could be explained if, for example, physical characteristics of selling parcels were reviewed and their assessments updated periodically to reflect remodeling and other physical changes, regardless of the base year used for these values. In that case, lower reassessment increases on recent sales would be expected. Similarly, if such changes have been made, improving the accuracy of property characteristics for recent sales, reassessment models would be more likely to produce low CODs¹⁰, as shown in the studies. In such a case, if older sales and parcels without sales have not been scrutinized to the same degree, there would be some representativeness issues and the probable population uniformity statistics would be somewhat worse than those shown using the 2013 – 2015 sales. Such a likelihood is borne out, to an extent, by the slightly higher COD in the overall ratio study based on sales occurring on or after January 1, 2016. Similar slippage of uniformity statistics is demonstrated when sales deemed invalid by reason of atypical time on market are included in the analysis. Although these additional sales are suspect with respect to being arm’s length transactions, they do tend to corroborate these overall findings.

⁹ IAAO. *Standard on Ratio Studies*. Appendix A, pp. 47 – 50. 2013.

IAAO. *Standard on Verification and Adjustment of Sales*. Sections 4.8 and 5.3, p.8 and p. 10. 2010.

¹⁰ See additional discussion of low CODs in the section of the report on uniformity of assessments.

Outliers, Trimming, and Data Distributions

Related to the problem of ensuring representativeness of the ratio study samples, is the issue of when to trim samples based on unusual ratios that may be occurring with greater frequency in the sample than their likely frequency in the population. Such outliers may reflect data or reporting errors, mismatch between the property sold and the property appraised, unusual market variability, and other unidentified issues. If retained for analysis, outliers may distort level and uniformity statistics in a disproportionate way. The optimal approach is to use statistical techniques to identify possible outliers. This would be followed by additional review and verification. In the Blair County analysis, I reviewed 10 sales with ratios greater than 260% and 2 sales with ratios less than 20% with EST. Physical changes appeared to be the cause in some of these sales and 5 were deleted prior to completing analysis. Other sales with extremely high ratios were retained for initial analysis. However, trimming techniques outlined in Appendix B of the IAAO *Standard on Ratio Studies*¹¹, based on the interquartile range (IQR), were employed and tended to flag these unusual ratios for trimming.

The IQR method is recommended primarily because it develops trim points without regard to the underlying distribution of the ratios. In other words, many texts report that ratio distributions most likely do not follow a standardized “normal” or bell-shaped distribution.¹² This in turn leads to the conclusion that the most pertinent ratio study statistics are “distribution-free” or “non-parametric” statistics¹³. In fact, many of the ratio studies conducted as part of this report do not conform to a normal distribution. This conclusion in no way criticizes the reassessment; it merely guides the user to the most applicable statistical measures. If there were a normal distribution, increased meaning and precision could be ascribed to the mean based statistics, including the standard deviation and coefficient of variation. Median based statistics are recommended by the IAAO *Standard* and, regardless, in any case when the underlying distribution of the data (ie: expected ratios in the population, based on the sample) does not match the normal curve.

The IAAO *Standard* does provide a cautionary note regarding the use of the IQR (and other trimming procedures).

*“It is appropriate to set maximum trimming limits. For small samples, no more than 10 percent (20 percent in the most extreme cases) of the ratios should be removed. For larger samples, this threshold can be lowered to 5 to 10 percent depending on the distribution of the ratios and the degree to which sales have been screened or validated. Trim limits should be developed in consideration of the extent of sales verification.”*¹⁴

I was informed that the sales data for Blair County was reviewed to ensure validity. However, atypical values were often excluded in the process of developing the appraisal model, without necessarily reflecting invalid sales. After discussion with EST, these sales were included for my analysis, but may later have been trimmed, depending on outlier review outcomes. All trimming is noted in the reports in Appendix A. The only case in which the IQR based trim exceeded the 10% guideline was with regard to the very small Agricultural category (A) sample of 15 sales, from which 2 were trimmed using the 3 X IQR procedure. The IQR multiplier used in each case and number of sales trimmed is also reported.

¹¹ Ibid. Appendix B, p. 53.

¹² See discussion in IAAO. *Standard on Ratio Studies*. Part 1. Section 5.8. April, 2013

¹³ IAAO. *Property Appraisal and Assessment Administration*. Appendix 20-7. P. 617. Chicago, IL. 1990

¹⁴ IAAO. *Standard on Ratio Studies*. Appendix B.5. April, 2013

Comment on trimming, range of ratios in data, and possible effects

After eliminating the 5 questionable sales and those with prices of \$1,000 or less, the remaining data base consisted of 1,761 sales presumed valid. Ratios on these sales, using new assessments, ranged from 71% to 2,395%. On the new assessed value based studies, a maximum of 61 sales (3.5%) were trimmed in the overall combined category study. Had no sales been trimmed, the COD would have changed from 4.10% to 9.22%. Other statistical measures, such as the median, would have been minimally affected. My conclusion is that, while it is possible that some of the very low CODs are a result of trimming, this process does not provide a complete explanation of the low CODs. The main concern with low CODs, however, is that they may be an indication of sales chasing. This possibility has been examined and is not occurring.

Sales Time Period

The main ratio studies included three years of sales. The period began January 2, 2013 and ended with sales occurring as late as December 31, 2015. This period is somewhat longer than is typically recommended in the IAAO *Standard*. However, it is acceptable, provided proper adjustments are made to sales prices for time, if necessary.¹⁵ The use of a longer sales period also helps ensure more representative samples for the categories other than residential, for which limited samples are available due to fewer sales occurring.

I analyzed the ratios in each category and overall to determine whether the change in ratios over time warranted use of a time adjustment. Many times I did use a linear adjustment based on regression analysis of the ratios over time. If it appeared however, that the results were distorted by a few high or low ratios occurring early or late in the period, I rejected the time adjustment. Also, if application of the time adjustment increased the COD, the adjustment was not used.

An additional sales period extended through May 31, 2016 and the results of ratio studies using these additional sales are included in Appendix A3 and labeled accordingly.

Statistical Measurements

In general, all standard ratio study statistical measurements were calculated and are reported in Appendix A for each analysis conducted. These include measurements of level, uniformity, reliability, and normality of the data distribution, as well as general information about the samples, such as average sale price, category studied, number of sales in the study, type of trim used, and number of ratios trimmed.

Level of Assessment

Four measures of level of assessment are calculated and reported. These are:

- Mean
- Median
- Weighted Mean
- Geometric Mean

¹⁵ Ibid. Part 1. Section 4.4.

For evaluation of appraisal performance (at issue here), the median is recommended. See the following table found in the IAAO *Standard*.¹⁶

**Table 2-2
Preferred Estimators**

	<u>Indirect Equalization</u>	<u>Direct Equalization</u>	<u>Monitoring Performance</u>
Median	—	X	X
Mean	—	—	—
Weighted Mean	X*	—	—

* Caution should be exercised when the sample contains value outliers or indicates value bias based on the PRD

For demonstrations and illustrations of the other measures of level and general discussion of ratio studies, see Appendix B. (Note that the illustrations and examples provided in Appendix B are generic and do not reflect any analysis using data from Blair County or the reassessment.)

Level of assessment meets IAAO standards when it complies with the following rule:

1. For any category of property, the median must be between 90% and 110%, assuming 100% of market value is the goal.
2. Each “class” of property should be within $\pm 5\%$ “...of the overall level of appraisal of the jurisdiction....”¹⁷

Using proposed new assessed values, Blair County assessments comport with these standards in every ratio study testing overall and category assessment level.

Uniformity of Assessment

Uniformity statistics measure the variability of the ratios and are important in determining whether similarly situated properties are assessed similarly with respect to market value (or some alternate goal). The IAAO *Standard* comments about measuring uniformity with the Coefficient of Dispersion (COD):

*“The most generally useful measure of variability or uniformity is the COD.”*¹⁸

See the following table found in the IAAO *Standard*:¹⁹

¹⁶ Ibid. Part 2. Section 6.2. (Note: table is numbered as found in the IAAO *Standard*.)

¹⁷ Ibid. Part 2. Section 11.1.2

¹⁸ Ibid. Part 1. Section 5.4.1.

¹⁹ Adapted from Part 2. Page 34 of the 2013 *Standard on Ratio Studies*. Specifically found as Table 2-3 in the 2007 edition; the only substantive modification in the 2013 edition is to include a cautionary note about using the PRB to verify vertical inequity indications based solely on the PRD. There is further discussion of this table in Appendix B.

Ratio study uniformity standards indicating acceptable general quality*

General Property Class	Jurisdiction Size /Profile /Market Activity	COD
Residential improved (single family dwellings, condominiums, manuf. housing, 2-4 family units)	Very large jurisdictions / densely populated / newer properties / active markets	10.0
	Large to mid-sized jurisdictions / older & newer properties / less active markets	15.0
	Rural or small jurisdictions / older properties / depressed market areas	20.0
Income-producing properties (commercial, industrial, apartments,)	Very large jurisdictions / densely populated / newer properties / active markets	15.0
	Large to mid-sized jurisdictions / older & newer properties / less active markets	20.0
	Rural or small jurisdictions / older properties / depressed market areas	25.0
Residential vacant land	Very large jurisdictions / rapid developing / active markets	15.0
	Large to mid-sized jurisdictions / slower development / less active markets	20.0
	Rural or small jurisdictions / little development / depressed markets	25.0
Other (non-agricultural) vacant land	Very large jurisdictions / rapid development / active markets	20.0
	Large to mid-sized jurisdictions / slower development / less active markets	25.0
	Rural or small jurisdictions / little development / depressed markets	30.0

These types of property are provided for general guidance only and may not represent jurisdictional requirements.

- * The COD performance recommendations are based upon representative and adequate sample sizes, with outliers trimmed and a 95% level of confidence.
- * Appraisal level recommendation for each type of property shown should be between 0.90 and 1.10.
- * PRD's for each type of property should be between 0.98 and 1.03 to demonstrate vertical equity.
PRD standards are not absolute and may be less meaningful when samples are small or when wide variation in prices exist. In such cases, statistical tests of vertical equity hypotheses should be substituted.
- * CODs lower than 5.0 may indicate sales chasing or non-representative samples.

As a rule of thumb, since I do not have sufficient information to evaluate the homogeneity of the properties being analyzed, I would suggest, and have employed, application of a 20% COD standard for all except vacant lots over 10 acres (V), for which 25% would be acceptable. Lower CODs generally indicate better general uniformity. However, there is a caveat. Although analysis of non-selling properties convinces me that there is no sales chasing or any reassessment process similar to sales chasing, several of the CODs are below 5%, a result that is considered highly unlikely except in:

“... (1) subdivisions in which lot prices are strictly controlled by the developer; (2) extremely homogeneous property groups, such as condominium units all located in the same complex; (3) appraisal ratio studies in which the assessor’s values and the independent appraisals reflect the same appraisal manuals and procedures; or (4) appraisals that have been adjusted to match sales prices.”²⁰

The same low COD result can also be attributed to over-trimming. Additional analyses using later sales and sales ruled invalid because of time on market issues show findings of higher CODs, as anticipated given the probable invalid nature of many of these sales.

While the COD is effective in measuring general uniformity, it does not measure whether high and low priced properties are being treated similarly (ie: have similar ratios). For this it is necessary to measure vertical equity, for which there are two measures presented in the IAAO *Standard* and computed in the ratio studies done for this report. These measures are the Price-related Differential (PRD) and the Price-related Bias (PRB). To be considered in compliance with the IAAO *Standard*, the PRD must be

²⁰ Gloudemans, Robert J. *Mass Appraisal of Real Property*. IAAO. Chicago, IL. P. 237.

between 0.98 and 1.03. More typical higher PRDs ostensibly indicate lower ratios (level of assessment) on higher priced properties; however, a caution is indicated based on recent analytical studies. The PRD has been shown to provide a significant number of false “positive” conclusions of non-compliance. It is therefore suggested that such pre-conclusions be confirmed by using the more precise PRB. The advisory guidelines provided with regard to the PRB suggest caution (meaning possible vertical inequity) beyond ± 0.05 and “*unacceptable inequity*” beyond ± 0.10 .²¹ For reference, a PRB of -0.10 indicates that, as values double, assessment ratios tend to fall by 10%. The opposite is true of positive PRB results, unusual, but noted widely in the ratio studies based on the original 1958 base value assessments. A caution with respect to the PRB is that one should not conclude that there is vertical inequity unless the confidence interval around this statistic fails to include .05 or .10 (or the negative counterparts). For example, in the ratio study of vacant lots under 10 acres (L) category, using sales occurring after January 1, 2016, the PRB was 0.135. However, the confidence interval around this statistic had a lower limit of .0017. This indicates that, although the positive direction (ie: since the first of this year, assessment ratios tend to rise as values rise) holds true, the results are not provably in the IAAO recommended caution range, based on the PRB. Further, due to small sample size for this category, results cannot be corroborated with other statistical tests, such as the Mann-Whitney test that looks for differences between the ranks of ratios of properties above or below the mean sale price.

In many cases, it is possible to corroborate vertical equity issues using the Mann-Whitney test, even though this test does not have an IAAO recognized specified standard. It is a recognized technique for looking for differences between two groups²². In large samples, however, the test recognizes small differences as significant and this significance is noted on statistical analysis reports, such as the overall report based on the new assessments and found in Appendix A2. When, as in that case, the Mann-Whitney result is not supported by vertical inequity findings using either the PRD or the PRB, the Mann-Whitney test conclusion should be disregarded. This has been noted throughout Appendix A on the analysis pages with regard to the overall new assessment statistical analysis and in other appropriate cases.

In the analysis of the new assessments, no category failed standards based on the COD. Only the vacant lots over 10 acres category (V) failed the PRD standard for vertical equity and this result was refuted by the PRB. That means that, while there may be a slight tendency in this category to undervalue higher priced properties, this result cannot be proven and is suspect given the small sample size.

Reliability Measures

Statistics calculated from samples are considered point estimates, meaning that they are presumed accurate for that sample, but are not necessarily indicative of population measurements. Samples have innate error, known as sampling error, which must first be taken into account. For that reason, IAAO standards for level and uniformity are predicated on understanding the likely ranges for level and uniformity of the population. In other words, the standards advise taking into account sampling error. While there are various ways of doing this, statistical analyses accompanying this report include confidence intervals around three of the four measures of level provided and around the COD and PRB. Conclusions of non-compliance should be based on confidence intervals that fail to include the goal. For example, if 100% $\pm 10\%$ is the goal and accepted range for level of assessment, then a sample median of 87% with a confidence interval from 85% to 89% would be considered out of compliance, while a sample with the same median, but a less reliable result with a wider confidence interval

²¹ Ibid. Part 1. Section 9.2.7.

²² Gloudemans, Robert J., *Mass Appraisal of Real Property*. IAAO. 1999. p. 295.

extending from 82% to 94% could not be found out of compliance with the indicated level of assessment standard.

Similar tests and results are provided for the COD and PRB, both of which often have large margins of error.

Follow up Analysis

Although there are no known additional valid sales during the period used to develop and then test the initial assessments, sales have occurred subsequent to this period during 2016. Use of these sales to develop an additional ratio study provides good corroboration of results, at least at the overall jurisdiction level and, to an extent, mitigates representativeness concerns related to low CODs. Accordingly, additional sales from January, 2016 through May 31, 2016 were also analyzed to corroborate results based on older sales. Ratio study results based on this additional information are labeled accordingly and included in Appendix A3. Overall, Residential category (R), and Commercial category (C) results show excellent level of assessment and excellent uniformity. The very small additional sample for the vacant lots under 10 acres (L) category shows adequate assessment level with some slippage in general assessment uniformity based on the COD and slightly low, but questionable, PRD, with a slightly high, but not conclusive, PRB.

In analyzing the results of appraisal models, it is important both to review before and after ratio study statistics and to develop additional ratio studies based on sales not included in the appraisal model. IAAO comments:

“Modeling procedures that use sales data will probably produce biased statistics if the sales used in making the measurement were included in the analysis. Many modelers will set aside some sales as a control group, excluding them from the modeling process so they are available as an unbiased measurement of model performance.”²³

By including sales originally excluded by appraisers developing the appraisal models, this condition has been partly met with respect to analyzing results of the reassessment. Analysis of just these sales, with alternate validation codes, but no finding of clear invalidity supports the general overall conclusion that the final level of assessment is probably well within standards for assessment level with expected somewhat poorer uniformity. Uniformity measures using these alternate and somewhat questionable sales cannot be viewed in isolation as they are not expected to be an independent representative sample; they were reviewed only to test overall premises about the reassessment and add some independent data to the general database. A similar additional test was conducted by including sales deemed invalid because of atypical time on market. Given widely disparate ratios on some of these sales, inclusion may be more distortive than informative. Nevertheless, larger categories, such as R (residential) and C / I (commercial and industrial) show little change in level or general uniformity. Level and uniformity shown is worse in the other categories, but this reflects the large number of atypical time on market sales added, especially to the L (vacant lots under 10 acres in size) category, where sample size more than doubled due to inclusion of these questionable sales. Such a result should not be taken as refutation of the original results as sample representativeness is in doubt.

Additional testing could have been done, possibly without the previously mentioned outlier effect, had “holdout” samples of clearly valid sales been removed from the database of sales actually used in

²³ IAAO. 1990. *Property Appraisal and Assessment Administration*. P. 553. Chicago, IL

developing the appraisal models. Regardless, I am satisfied that adjustments to assessments of non-selling properties were of similar magnitude to those made with respect to selling properties. Furthermore, the additional samples incorporating some sales previously considered invalid and therefore not used in the appraisal model, serve to strengthen the likelihood that the overall results are representative of the population of properties. I would recommend additional testing as new sales become available (these should be time adjusted backward to January 1, 2016) and I would further recommend that “holdout” samples be considered in future reappraisals. Another IAAO source describes such a procedure as the “...preeminent method employed to review values when sales data are adequate....”²⁴

In addition to concerns about the application of the reassessment model to all properties, it is important to recognize that it is difficult in any model based on sales to ensure that the model completely represents all property types and geo-economic influences that affect the value of property throughout any jurisdiction. For this reason, it is important to review cases of unusual magnitude assessed value adjustments resulting from the application of the model. The Quality Control chapter of the IAAO textbook, *Assessment Administration* contains a section entitled “Valuation Review” which includes the following commentary:

“Scanning a list for unusual or unexpected values (outliers) seems to be second nature for assessors. This process first is performed as part of the valuation review by analysts, usually with some initial guidance from appraisers, and is accomplished as a matter of course by using a variety of data. Lists of properties with estimated market values, their addresses, and other identifying information are commonly reviewed. ...Lists that prioritize properties for review by characterizing them as having small, medium, or large changes from prior value estimates, in terms of both percentage changes and dollar changes...are useful as well.”²⁵

Such a step is beyond the direct scope of this project, but worthy of note.

Overall Conclusions

My major conclusion is that, to the extent measurable by ratio studies based on the assessment and sales information provided to me, the reassessment values established for 2016 meet the goal of establishing market value as of January 1, 2016 as the level of assessment on an overall basis for properties throughout Blair County. This does not mean that every assessment necessarily is market value, as ratio study results are statistical in nature and provide measurements that apply to groups of properties rather than individual properties. However, it does mean that the overall industry accepted quality standards for assessment level, as measured by these sales, have been achieved. In addition, assessment equity, in terms of disparity between categories is markedly improved and is far better than if the original 1958 base year assessments were to be retained. IAAO standards for level of assessment have been met for each category tested.

Uniformity within categories measures the variability between the ratios, with lower variability indicating better uniformity and being preferred. There are two types of uniformity measures – between properties in general (horizontal equity) and between high and low priced properties (vertical equity).

²⁴ IAAO. 2003. *Assessment Administration*. Pp. 343-344. Chicago, IL.

²⁵ IAAO. 2003. *Assessment Administration*. Pp. 342 – 343.

In comparison to uniformity measures using original 1958 base year assessments, overall and at the category level, general (horizontal) uniformity as measured by the Coefficient of Dispersion (COD) is much better.. Using 1958 base year assessments, no category meets general uniformity standards. In contrast, each category meets uniformity standards using new assessments.

The second type of uniformity, vertical equity, is also substantially improved given the new assessments, with only the Vacant lots over 10 acres category (V) failing by a slight margin using one statistical measure that is not corroborated with alternate, more precise statistics. Using the original assessments, Commercial / Industrial, Agricultural, Vacant lots over 10 acres, and Land (vacant lots under 10 acres) categories all fail vertical equity standards by larger margins.

Caution is advised when interpreting the PRD as an indicator of vertical equity because of a tendency to produce false “positives” (indicating vertical inequity when there is none), particularly when sample sizes are small, as in the Vacant lots over 10 acres category (V).

National standards suggest that ratio studies and similar analyses based on sales used to develop an appraisal model need to be supplemented by additional sales that were not used in developing the assessed values. This provides verification proving to a greater extent that the model is applicable to the non-selling properties, which are the main focus of any reassessment. To the extent that otherwise valid sales not used for the assessment model based on appraiser discretion were included in the analyses developed for this report, this condition has been satisfied. Additional sales from January, 2016 through May 31, 2016 were also analyzed and, at least regarding the final level of assessment, corroborate results based on older sales.

Finally, in comparison to the generally disparate levels of assessment between categories and generally poor to very poor uniformity (both horizontal and vertical) evidenced by the ratio studies conducted using the same sales, but the original 1958 base year assessed values, the reassessment shows results that are vastly better – much less disparate in level, much more uniform, and meeting nearly all IAAO standards for assessment quality.

Appendices

Notes on Interpretation of Comments Found on Statistical Analysis Pages in Appendices

Many of the statistical analysis pages have certain measurements highlighted or have added verbiage commenting on the quality of the calculated results. In many cases, there are numerous statistical measures designed to look at various aspects of level and uniformity. Specific measurements may be more or less applicable to individual category or other results and, when multiple measurements are presented, they must be taken in conjunction with other results. Common examples include:

- Level measurements showing one measure that appears out of line with others
- General uniformity measurements showing the term “questionable”
- Vertical equity measurements showing the term “inequity”

The usefulness of these indicators is in providing cautionary notes to the analyst or reviewer. Each of the above issues is discussed in detail throughout the narrative portion of the report. However, in summary, the following notes apply:

- Although multiple level measurements assist in determining the influence and presence of outliers and other distortions, the median is the most useful measure of assessment level.
- When uniformity is deemed “questionable,” this advises that there is a risk of sales chasing or other similar processes that call the representativeness of the samples and the applicability of the results to the population of properties as a whole in question. This issue is dealt with throughout the report and there is no sales chasing. The term does not otherwise comment on the quality of the assessments.
- Although several vertical equity measures are calculated, the most widely used are the PRD and the PRB. In a few cases, an alternate test, the Mann-Whitney test, shows possible vertical inequity, with the incumbent label. This result is considered applicable only if it corroborates similar indications by both the PRD and PRB. In addition, the PRD has been shown to be prone to “false positives,” in which it indicates vertical inequity that cannot be substantiated.

Appendix A

Ratio Study Reports Related to Evaluation of Original
Base Value Assessments and Proposed January 1, 2016
Market Value Reassessments in Blair County

Appendix A1

Before Reassessment

Ratio Studies for Blair County

Overall and by Category

These ratio studies use current “original”

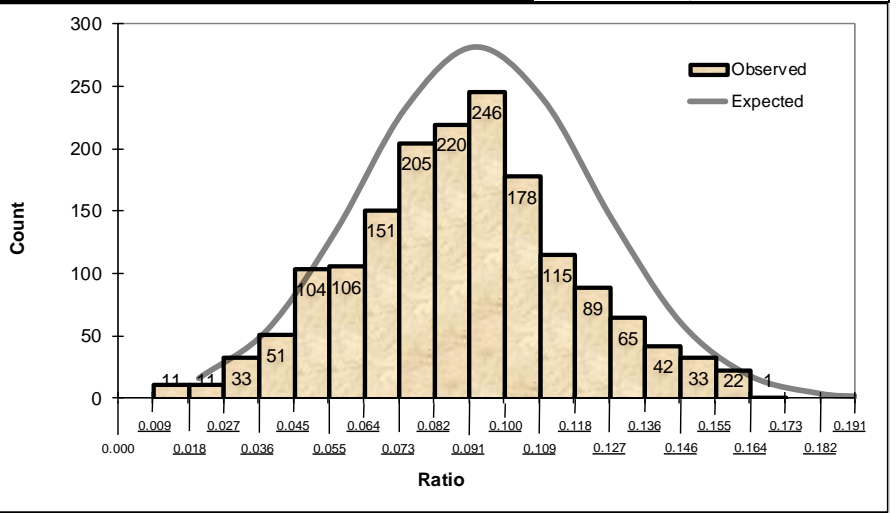
1958 Base assessed values

Sales Period – January 1, 2013 – December

31, 2015

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.105%	

SAMPLE STATISTICS	
Sample size (n)	1,683
Total Assessed Value	\$25,192,060
Total Adjusted Sales Price	\$290,566,552
Mean Assessed Value	\$14,969
Mean Adjusted Sales Price	\$172,648
Standard Deviation AV	\$19,403
Standard Deviation SP	\$271,407
Median Assessed Value	\$11,820
Median Sales Price	\$135,652
ASSESSMENT LEVEL	
Arithmetic Mean Ratio	8.87%
Median Ratio	8.89%
Weighted Mean Ratio	8.67%
Geometric Mean Ratio	8.34%
UNIFORMITY	
<Extreme> Lowest Ratio	1.27%
Highest Ratio	16.37%
Coefficient of Dispersion	25.39%
Standard Deviation	2.86%
Coefficient of Variation	32.24%



Price Related Bias	0.0783	PRB T Score:	9.737	PRB is SIGNIFICANT @ 90%
Price-Related Differential	1.02			

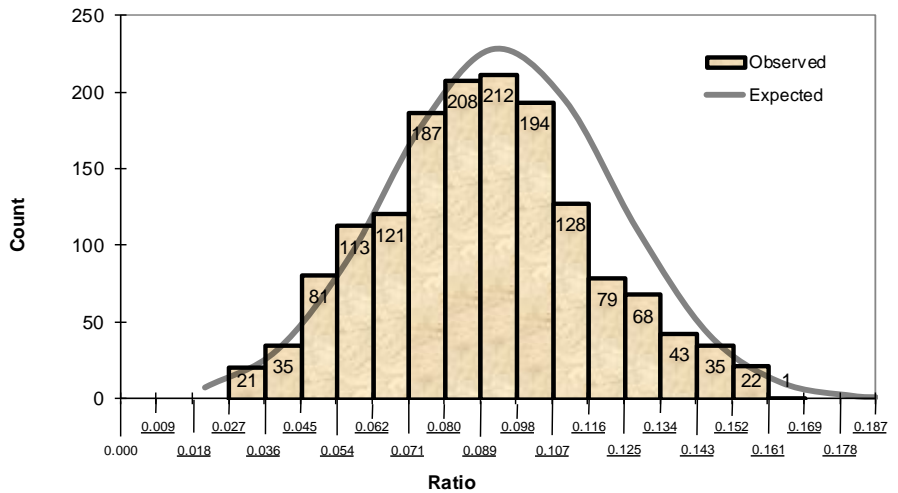
RELIABILITY			Uniformity:		
90% Confidence Intervals:	Lower	Upper		COD:	Poor
Around the Mean	8.76%	8.99%	COV:	Poor	
Around the Median	8.71%	9.01%	PRD:	No Observed Bias	
Around the Weighted Mean	8.50%	8.84%			
Around the COD	24.43%	26.60%			
Around the PRB	0.0625	0.0941	PRB:	Some Bias towards Low Priced	

80% Confidence Intervals:			Outlier Method:	
Around the Mean	8.78%	8.96%	Inner Quartile Fence: 78 Sale(s) Lost to Trimming	
Around the Median	8.74%	8.98%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	8.54%	8.80%		

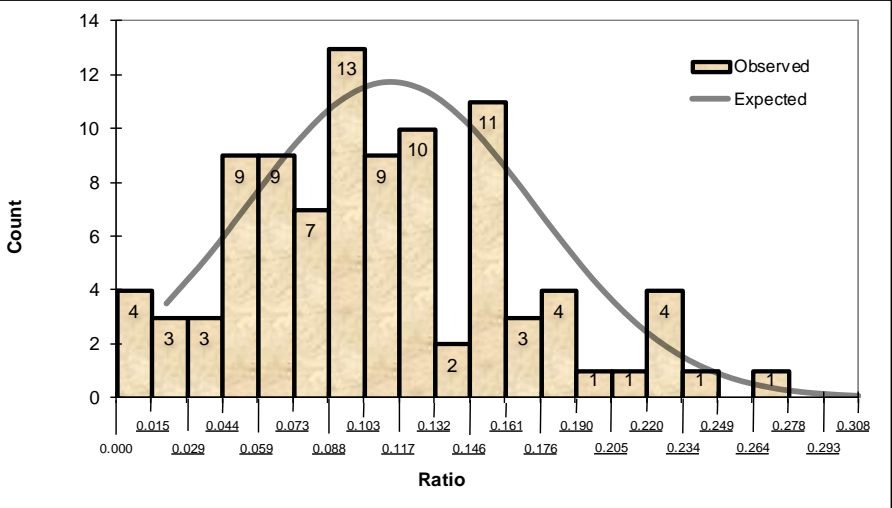
Probability True Mean 0.9 - 1.1	0.00%	Category (ies):	All
NORMALITY Test Results:	Non-Normal	Neighborhoods:	All

Chi Square Test	Non-Normal		
Binomial Test	N/A		
Mann-Whitney Test	2.46974		
Significance of Value Related Inequity - Strong			
D'Agostino-Pearson	Non-Normal		
Shapiro-Wilk W	N/A		
Kurtosis	2.90	Acceptable	
	2.50		
Skew	0.25	Acceptable	
	-0.50		
	1.00		

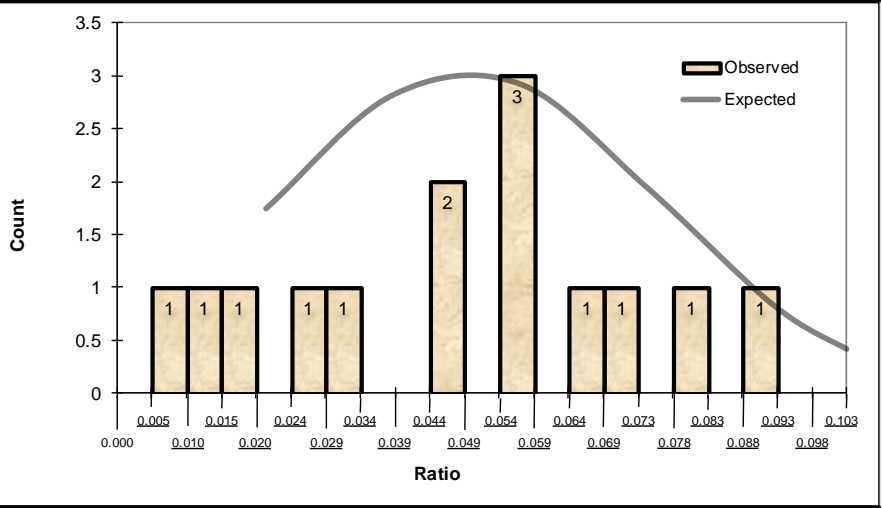
	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016		From: 01/01/2013
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.087%	
SAMPLE STATISTICS				
Sample size (n)	1,548			
Total Assessed Value	\$22,176,470			
Total Adjusted Sales Price	\$246,769,996			
Mean Assessed Value	\$14,326			
Mean Adjusted Sales Price	\$159,412			
Standard Deviation AV	\$9,390			
Standard Deviation SP	\$93,804			
Median Assessed Value	\$11,990			
Median Sales Price	\$135,681			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	8.99%			
Median Ratio	8.95%			
Weighted Mean Ratio	8.99%			
Geometric Mean Ratio	8.57%			
UNIFORMITY				
<Extreme> Lowest Ratio	2.74%			
Highest Ratio	16.06%			
Coefficient of Dispersion	23.63%			
Standard Deviation	2.66%			
Coefficient of Variation	29.59%			
Price Related Bias	0.0858	PRB T Score:	9.3085	PRB is SIGNIFICANT @ 90%
Price-Related Differential	1.00			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	8.88%	9.11%	COD:	Somewhat Poor
Around the Median	8.82%	9.08%	COV:	Somewhat Poor
Around the Weighted Mean	8.88%	9.09%	PRD:	No Observed Bias
Around the COD	22.70%	24.64%		
Around the PRB	0.0678	0.1039	PRB:	Some Bias towards Low Priced
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	8.91%	9.08%	Inner Quartile Fence: 48 Sale(s) Lost to Trimming	
Around the Median	8.85%	9.05%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	8.90%	9.07%		
Probability True Mean 0.9 - 1.1	0.00%			
NORMALITY Test Results:	Non-Normal			
Chi Square Test	Non-Normal			
Binomial Test	N/A			
Mann-Whitney Test	3.26230			
Significance of Value Related Inequity - Strong				
D'Agostino-Pearson	Non-Normal			
Shapiro-Wilk W	N/A			
Kurtosis	2.80	Acceptable		
Skew	0.34	Acceptable		
	-0.50	1.00		



	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		0.129%	
SAMPLE STATISTICS				
Sample size (n)	95			
Total Assessed Value	\$3,759,960			
Total Adjusted Sales Price	\$38,775,659			
Mean Assessed Value	\$39,579			
Mean Adjusted Sales Price	\$408,165			
Standard Deviation AV	\$104,663			
Standard Deviation SP	\$1,052,850			
Median Assessed Value	\$14,600			
Median Sales Price	\$151,178			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	10.85%			
Median Ratio	10.13%			
Weighted Mean Ratio	9.70%			
Geometric Mean Ratio	8.76%			
UNIFORMITY				
<Extreme> Lowest Ratio	0.10%			
Highest Ratio	26.37%			
Coefficient of Dispersion	43.94%			
Standard Deviation	5.69%			
Coefficient of Variation	52.40%			
Price Related Bias	0.0607	PRB T Score:	1.794	PRB is inconclusive
Price-Related Differential	1.12			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	9.89%	11.81%	COD:	Very Poor
Around the Median	9.27%	11.59%	COV:	Very Poor
Around the Weighted Mean	7.17%	12.23%	PRD:	Favors High Priced
Around the COD	35.66%	51.96%		
Around the PRB	-0.0056	0.1271	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	10.10%	11.60%	Inner Quartile Fence: 2 Sale(s) Lost to Trimming	
Around the Median	9.58%	11.39%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	7.72%	11.67%		
Probability True Mean 0.9 - 1.1	0.00%		Category (ies):	C/I
NORMALITY Test Results:	Non-Normal		Neighborhoods:	All
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	-2.12289			
Significance of Value Related Inequity - Strong				
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	N/A			
Kurtosis	2.84	Acceptable		
2.00	5.00			
Skew	0.32	Acceptable		
-0.50	1.00			



	See Parameters Sheet for Category Details	Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013 To: 12/31/2015
Sales Price is Not Time Adjusted	Time Adj. Not Applied		
SAMPLE STATISTICS			
Sample size (n)	14		
Total Assessed Value	\$229,500		
Total Adjusted Sales Price	\$5,070,449		
Mean Assessed Value	\$16,393		
Mean Adjusted Sales Price	\$362,175		
Standard Deviation AV	\$11,319		
Standard Deviation SP	\$245,313		
Median Assessed Value	\$16,050		
Median Sales Price	\$277,000		
ASSESSMENT LEVEL			
Arithmetic Mean Ratio	4.69%		
Median Ratio	5.19%		
Weighted Mean Ratio	4.53%		
Geometric Mean Ratio	3.78%		
UNIFORMITY			
<Extreme> Lowest Ratio	0.65%		
Highest Ratio	8.81%		
Coefficient of Dispersion	39.47%		
Standard Deviation	2.56%		
Coefficient of Variation	54.45%		
Price Related Bias	0.1831	PRB T Score: 1.2373	PRB is inconclusive
Price-Related Differential	1.04		
RELIABILITY			
90% Confidence Intervals:	Lower	Upper	Uniformity:
Around the Mean	3.48%	5.90%	COD: Very Poor
Around the Median	2.71%	6.18%	COV: Very Poor
Around the Weighted Mean	2.99%	6.06%	PRD: Favors High Priced
Around the COD	30.89%	93.67%	
Around the PRB	-0.1350	0.5012	PRB: Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:
Around the Mean	3.77%	5.61%	Inner Quartile Fence: 1 Sale(s) Lost to Trimming
Around the Median	3.13%	5.60%	Please enter the category (ies) and neighborhood(s) used in the study.
Around the Weighted Mean	3.42%	5.63%	
Probability True Mean 0.9 - 1.1	0.00%		Category (ies): A
NORMALITY Test Results:	Normal		Neighborhoods: All
Chi Square Test	N/A		
Binomial Test	Non-Normal		
*i.e., Insufficient evidence of Non-Normality			
Mann-Whitney Test	N/A		
Unable to calculate			
D'Agostino-Pearson	Normal		
Shapiro-Wilk W	Normal		
Kurtosis	1.92	Acceptable	
1.00	6.00		
Skew	-0.11	Acceptable	
-1.50	1.50		



	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Not Time Adjusted	Time Adj. Not Applied			
SAMPLE STATISTICS				
Sample size (n)	12			
Total Assessed Value	\$26,460			
Total Adjusted Sales Price	\$2,598,901			
Mean Assessed Value	\$2,205			
Mean Adjusted Sales Price	\$216,575			
Standard Deviation AV	\$2,323			
Standard Deviation SP	\$160,888			
Median Assessed Value	\$1,475			
Median Sales Price	\$182,500			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	1.14%			
Median Ratio	1.12%			
Weighted Mean Ratio	1.02%			
Geometric Mean Ratio	0.85%			
UNIFORMITY				
<Extreme> Lowest Ratio	0.19%			
Highest Ratio	2.58%			
Coefficient of Dispersion	53.02%			
Standard Deviation	0.78%			
Coefficient of Variation	68.49%			
Price Related Bias	0.1724	PRB T Score: 0.8233	PRB is inconclusive	
Price-Related Differential	1.12			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	0.74%	1.55%	COD: Very Poor	
Around the Median	0.56%	1.49%	COV: Very Poor	
Around the Weighted Mean	0.61%	1.42%	PRD: Favors High Priced	
Around the COD	32.14%	118.84%		
Around the PRB	-0.2840	0.6287	PRB: Meets IAAO Standard, No Significant Bias	
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	0.83%	1.45%	Inner Quartile Fence: 1 Sale(s) Lost to Trimming	
Around the Median	0.78%	1.38%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	0.73%	1.31%		
Probability True Mean 0.9 - 1.1	0.00%		Category (ies): V	
NORMALITY Test Results:	Normal		Neighborhoods: All	
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	N/A			
Unable to calculate				
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	Normal			
Kurtosis	2.39	Acceptable		
	1.00	6.00		
Skew	0.54	Acceptable		
	-1.50	1.50		

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Not Time Adjusted	Time Adj. Not Applied			
SAMPLE STATISTICS				
Sample size (n)	37			
Total Assessed Value	\$46,660			
Total Adjusted Sales Price	\$1,241,535			
Mean Assessed Value	\$1,261			
Mean Adjusted Sales Price	\$33,555			
Standard Deviation AV	\$1,427			
Standard Deviation SP	\$28,931			
Median Assessed Value	\$630			
Median Sales Price	\$27,450			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	4.21%			
Median Ratio	3.25%			
Weighted Mean Ratio	3.76%			
Geometric Mean Ratio	2.78%			
UNIFORMITY				
<Extreme> Lowest Ratio	0.14%			
Highest Ratio	14.00%			
Coefficient of Dispersion	79.79%			
Standard Deviation	3.71%			
Coefficient of Variation	88.10%			
Price Related Bias	0.0691	PRB T Score:	0.4567	PRB is inconclusive
Price-Related Differential	1.12			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	3.21%	5.22%	COD:	Very Poor
Around the Median	2.25%	3.90%	COV:	Very Poor
Around the Weighted Mean	2.91%	4.61%	PRD:	Favors High Priced
Around the COD	58.87%	124.01%		
Around the PRB	-0.2276	0.3659	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	3.43%	5.00%	Inner Quartile Fence: 3 Sale(s) Lost to Trimming	
Around the Median	2.60%	3.80%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	3.10%	4.42%		
Probability True Mean 0.9 - 1.1	0.00%		Category (ies):	L
NORMALITY Test Results:	Non-Normal		Neighborhoods:	All
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	-1.85606			
Significance of Value Related Inequity - Weak				
D'Agostino-Pearson	Non-Normal			
Shapiro-Wilk W	Normal			
Kurtosis	3.78	Acceptable		
	2.00			
Skew	1.31	Possible Outliers		
	-0.50			

Appendix A2

After Reassessment

Ratio Studies for Blair County

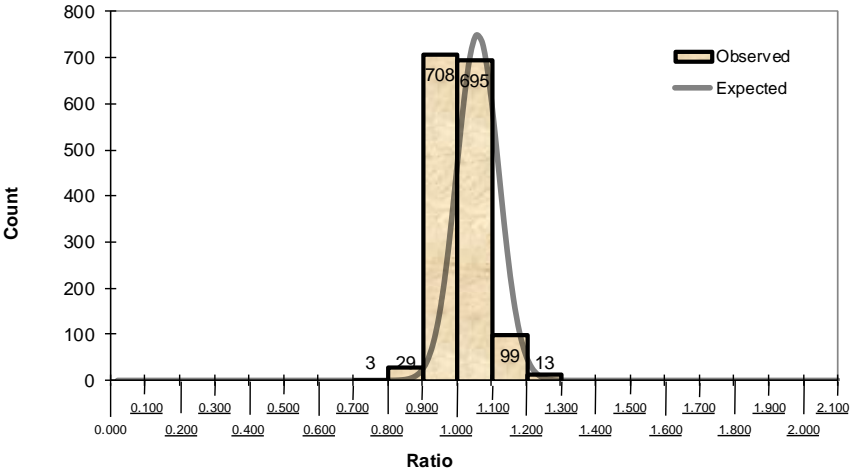
Overall and by Category

These ratio studies use new proposed assessed values as of June 22, 2016, based on January 1, 2016 market value

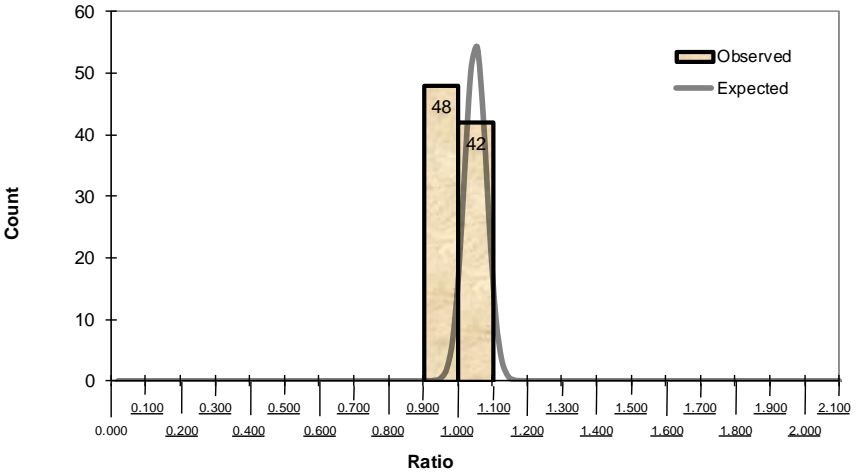
Sales Period – January 1, 2013 – December 31, 2015

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.128%	
SAMPLE STATISTICS				
Sample size (n)	1,700			
Total Assessed Value	\$296,956,300			
Total Adjusted Sales Price	\$295,698,533			
Mean Assessed Value	\$174,680			
Mean Adjusted Sales Price	\$173,940			
Standard Deviation AV	\$281,632			
Standard Deviation SP	\$274,816			
Median Assessed Value	\$136,250			
Median Sales Price	\$135,641			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	100.95%			
Median Ratio	100.26%			
Weighted Mean Ratio	100.43%			
Geometric Mean Ratio	100.79%			
UNIFORMITY				
Lowest Ratio	76.53%			
Highest Ratio	125.86%			
Coefficient of Dispersion	4.10%			
Standard Deviation	5.79%			
Coefficient of Variation	5.73%			
Price Related Bias	-0.0044	PRB T Score: -3.5601	PRB is SIGNIFICANT @ 90%	
Price-Related Differential	1.01			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	100.72%	101.18%	COD:	Questionable verified OK
Around the Median	100.00%	100.43%	COV:	Excellent
Around the Weighted Mean	100.09%	100.76%	PRD:	No Observed Bias
Around the COD	3.91%	4.30%		
Around the PRB	-0.0069	-0.0020	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	100.77%	101.13%	Outer Quartile Fence: 61 Sale(s) Lost to Trimming	
Around the Median	100.06%	100.38%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	100.16%	100.69%		
Probability True Mean 0.9 - 1.1	Approx. 100%		Category (ies):	All
NORMALITY Test Results:	Non-Normal		Neighborhoods:	all
Chi Square Test	Non-Normal			
Binomial Test	N/A			
Mann-Whitney Test	-4.37250			
Significance of Value Related Inequity - Strong			Not applicable given other vertical equity indicators	
D'Agostino-Pearson	Non-Normal			
Shapiro-Wilk W	N/A			
Kurtosis	5.36	Not Trimmed?		
	2.50			
Skew	1.43	Possible Outliers		
	-0.50			
	1.00			

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.129%	
SAMPLE STATISTICS				
Sample size (n)	1,547			
Total Assessed Value	\$248,394,000			
Total Adjusted Sales Price	\$246,822,635			
Mean Assessed Value	\$160,565			
Mean Adjusted Sales Price	\$159,549			
Standard Deviation AV	\$96,989			
Standard Deviation SP	\$93,874			
Median Assessed Value	\$136,700			
Median Sales Price	\$136,054			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	100.99%			
Median Ratio	100.28%			
Weighted Mean Ratio	100.64%			
Geometric Mean Ratio	100.82%			
UNIFORMITY				
Lowest Ratio	76.52%			
Highest Ratio	125.86%			
Coefficient of Dispersion	4.11%			
Standard Deviation	5.79%			
Coefficient of Variation	5.73%			
Price Related Bias	-0.0065	PRB T Score:	-4.1767	PRB is SIGNIFICANT @ 90%
Price-Related Differential	1.00			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	100.74%	101.23%	COD:	Questionable verified OK
Around the Median	100.01%	100.46%	COV:	Excellent
Around the Weighted Mean	100.32%	100.96%	PRD:	No Observed Bias
Around the COD	3.91%	4.32%		
Around the PRB	-0.0096	-0.0035	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	100.80%	101.17%	Outer Quartile Fence: 49 Sale(s) Lost to Trimming	
Around the Median	100.09%	100.42%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	100.39%	100.89%		
Probability True Mean 0.9 - 1.1	Approx. 100%		Category (ies):	R
NORMALITY Test Results:	Non-Normal		Neighborhoods:	all
Chi Square Test	Non-Normal			
Binomial Test	N/A			
Mann-Whitney Test	-4.84225			
Significance of Value Related Inequity - Strong	Not applicable given other vertical equity indicators			
D'Agostino-Pearson	Non-Normal			
Shapiro-Wilk W	N/A			
Kurtosis	5.45	Not Trimmed?		
2.50	4.00			
Skew	1.45	Possible Outliers		
-0.50	1.00			



	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date:	From:	To:
		01/01/2016	01/01/2013	12/31/2015
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate	-0.125%		
SAMPLE STATISTICS				
Sample size (n)	90			
Total Assessed Value	\$39,762,700			
Total Adjusted Sales Price	\$39,910,808			
Mean Assessed Value	\$441,808			
Mean Adjusted Sales Price	\$443,453			
Standard Deviation AV	\$1,117,561			
Standard Deviation SP	\$1,090,126			
Median Assessed Value	\$166,100			
Median Sales Price	\$160,589			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	100.13%			
Median Ratio	99.81%			
Weighted Mean Ratio	99.63%			
Geometric Mean Ratio	100.08%			
UNIFORMITY				
Lowest Ratio	92.11%			
Highest Ratio	109.12%			
Coefficient of Dispersion	2.31%			
Standard Deviation	3.05%			
Coefficient of Variation	3.05%			
Price Related Bias	0.0001	PRB T Score:	0.0632	PRB is inconclusive
Price-Related Differential	1.01			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	99.60%	100.66%	COD:	Questionable verified OK
Around the Median	99.39%	100.58%	COV:	Questionable verified OK
Around the Weighted Mean	97.96%	101.30%	PRD:	No Observed Bias
Around the COD	1.94%	2.79%		
Around the PRB	-0.0035	0.0038	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	99.72%	100.54%	Outer Quartile Fence: 7 Sale(s) Lost to Trimming	
Around the Median	99.44%	100.38%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	98.33%	100.93%		
Probability True Mean 0.9 - 1.1	Approx. 100%		Category (ies):	C / I
NORMALITY Test Results:	Non-Normal		Neighborhoods:	all
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	-0.64095			
Significance of Value Related Inequity - Weak				
D'Agostino-Pearson	Non-Normal			
Shapiro-Wilk W	N/A			
Kurtosis	4.55	Acceptable		
2.00	5.00			
Skew	1.67	Possible Outliers		
-0.50	1.00			



	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Not Time Adjusted	Time Adj. Not Applied			
SAMPLE STATISTICS				
Sample size (n)	13			
Total Assessed Value	\$4,892,900			
Total Adjusted Sales Price	\$4,931,400			
Mean Assessed Value	\$376,377			
Mean Adjusted Sales Price	\$379,338			
Standard Deviation AV	\$237,782			
Standard Deviation SP	\$255,488			
Median Assessed Value	\$315,100			
Median Sales Price	\$277,000			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	101.13%			
Median Ratio	99.72%			
Weighted Mean Ratio	99.22%			
Geometric Mean Ratio	100.80%			
UNIFORMITY				
Lowest Ratio	83.28%			
Highest Ratio	114.69%			
Coefficient of Dispersion	6.20%			
Standard Deviation	8.36%			
Coefficient of Variation	8.27%			
Price Related Bias	-0.0255	PRB T Score: -0.8969	PRB is inconclusive	
Price-Related Differential	1.02			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	97.00%	105.27%	COD:	Excellent
Around the Median	97.80%	106.72%	COV:	Excellent
Around the Weighted Mean	94.26%	104.17%	PRD:	No Observed Bias
Around the COD	4.00%	10.77%		
Around the PRB	-0.0869	0.0359	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	97.99%	104.28%	Outer Quartile Fence: 2 Sale(s) Lost to Trimming	
Around the Median	98.77%	105.57%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	95.65%	102.78%	Category (ies):	A
Probability True Mean 0.9 - 1.1	99.86%		Neighborhoods:	all
NORMALITY Test Results:				
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	N/A			
Unable to calculate				
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	Normal			
Kurtosis	2.97	Acceptable		
1.00	6.00			
Skew	-0.50	Acceptable		
-1.50	1.50			

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.238%	
SAMPLE STATISTICS				
Sample size (n)	12			
Total Assessed Value	\$2,691,900			
Total Adjusted Sales Price	\$2,739,875			
Mean Assessed Value	\$224,325			
Mean Adjusted Sales Price	\$228,323			
Standard Deviation AV	\$159,812			
Standard Deviation SP	\$167,830			
Median Assessed Value	\$183,650			
Median Sales Price	\$160,229			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	102.91%			
Median Ratio	99.77%			
Weighted Mean Ratio	98.25%			
Geometric Mean Ratio	102.32%			
UNIFORMITY				
Lowest Ratio	91.36%			
Highest Ratio	128.09%			
Coefficient of Dispersion	7.71%			
Standard Deviation	11.98%			
Coefficient of Variation	11.64%			
Price Related Bias	-0.0144	PRB T Score:	-0.8592	PRB is inconclusive
Price-Related Differential	1.05			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	96.70%	109.12%	COD:	Excellent
Around the Median	94.35%	103.75%	COV:	Very Good
Around the Weighted Mean	94.25%	102.25%	PRD:	Favors High Priced
Around the COD	4.16%	17.05%		
Around the PRB	-0.0509	0.0221	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	98.19%	107.62%	Outer Quartile Fence: 1 Sale(s) Lost to Trimming	
Around the Median	95.57%	102.15%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	95.39%	101.11%		
Probability True Mean 0.9 - 1.1	96.58%		Category (ies):	V
NORMALITY Test Results:	Non-Normal		Neighborhoods:	all
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	N/A			
Unable to calculate				
D'Agostino-Pearson	Non-Normal			
Shapiro-Wilk W	Normal			
Kurtosis	4.65	Acceptable		
1.00	6.00			
Skew	2.01	Possible Outliers		
-1.50	1.50			

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2013	To: 12/31/2015
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.143%	
SAMPLE STATISTICS				
Sample size (n)	40			
Total Assessed Value	\$1,380,300			
Total Adjusted Sales Price	\$1,367,714			
Mean Assessed Value	\$34,508			
Mean Adjusted Sales Price	\$34,193			
Standard Deviation AV	\$29,141			
Standard Deviation SP	\$28,931			
Median Assessed Value	\$29,250			
Median Sales Price	\$28,219			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	102.51%			
Median Ratio	99.47%			
Weighted Mean Ratio	100.92%			
Geometric Mean Ratio	101.97%			
UNIFORMITY				
Lowest Ratio	84.85%			
Highest Ratio	143.02%			
Coefficient of Dispersion	7.86%			
Standard Deviation	11.02%			
Coefficient of Variation	10.75%			
Price Related Bias	-0.0094	PRBT Score: -0.876	PRB is inconclusive	
Price-Related Differential	1.02			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	99.64%	105.37%	COD:	Excellent
Around the Median	97.74%	102.59%	COV:	Very Good
Around the Weighted Mean	97.75%	104.09%	PRD:	No Observed Bias
Around the COD	5.83%	10.98%		
Around the PRB	-0.0303	0.0116	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	100.27%	104.74%	Outer Quartile Fence: 0 Sale(s) Lost to Trimming	
Around the Median	98.05%	102.00%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	98.45%	103.39%		
Probability True Mean 0.9 - 1.1	Approx. 100%		Category (ies):	L
NORMALITY Test Results:	Non-Normal		Neighborhoods:	all
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., insufficient evidence of Non-Normality				
Mann-Whitney Test	-2.05339			
Significance of Value Related Inequity - Strong	Non-Normal		Not applicable based on other indicators of vertical equity	
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	5.73		Not Trimmed?	
Kurtosis	2.00	5.00		
Skew	1.67	Possible Outliers		
	-0.50	1.00		

Appendix A3

Before and After Reassessment

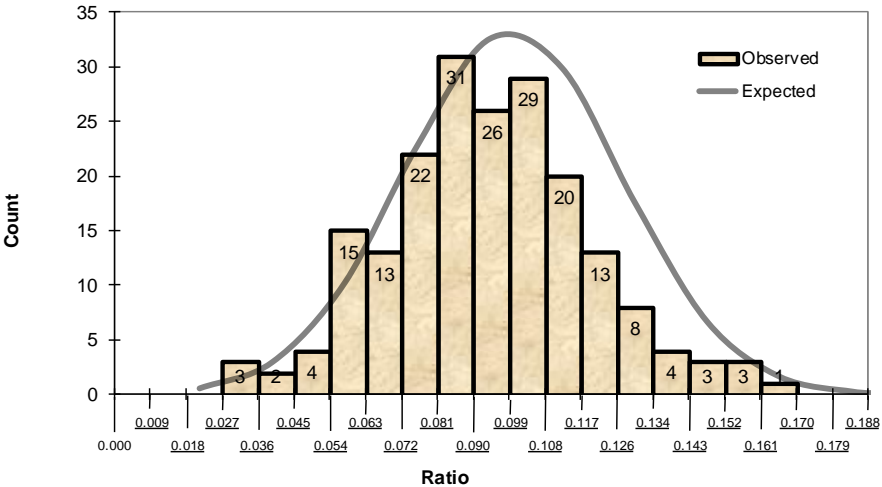
Ratio Studies

Recent Sales – January 1, 2016 – May 31,
2016

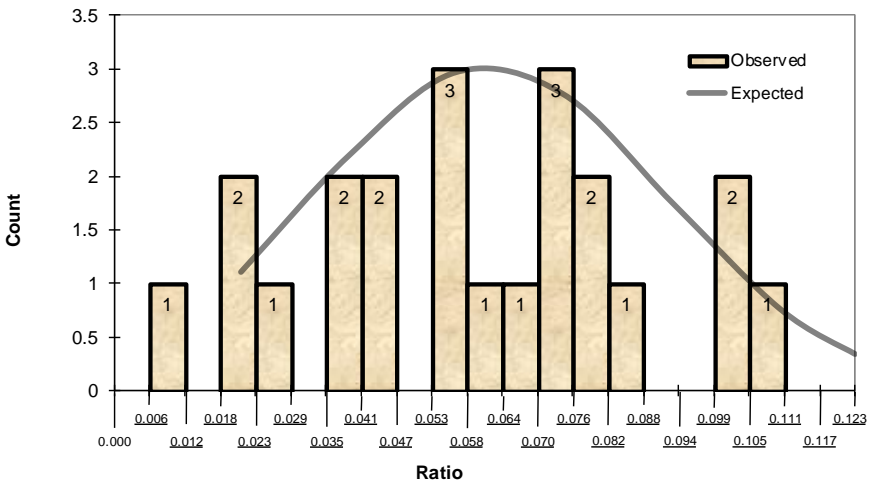
Original 1958 Base Assessed Values

		See Parameters Sheet for Category Details	Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2016	To: 05/31/2016
Sales Price is Not Time Adjusted	Time Adj. Not Applied			
SAMPLE STATISTICS				
Sample size (n)	231			
Total Assessed Value	\$3,174,340			
Total Adjusted Sales Price	\$36,310,570			
Mean Assessed Value	\$13,742			
Mean Adjusted Sales Price	\$157,189			
Standard Deviation AV	\$10,602			
Standard Deviation SP	\$142,053			
Median Assessed Value	\$11,570			
Median Sales Price	\$129,000			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	8.85%			
Median Ratio	8.88%			
Weighted Mean Ratio	8.74%			
Geometric Mean Ratio	8.31%			
UNIFORMITY				
<Extreme> Lowest Ratio	1.44%			
Highest Ratio	15.90%			
Coefficient of Dispersion	24.60%			
Standard Deviation	2.79%			
Coefficient of Variation	31.52%			
Price Related Bias	0.0831	PRB T Score: 4.1501	PRB is SIGNIFICANT @ 90%	
Price-Related Differential	1.01			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	8.55%	9.15%	COD:	Somewhat Poor
Around the Median	8.51%	9.34%	COV:	Poor
Around the Weighted Mean	8.25%	9.24%	PRD:	No Observed Bias
Around the COD	21.94%	27.75%		
Around the PRB	0.0438	0.1223	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	8.61%	9.08%	Inner Quartile Fence: 16 Sale(s) Lost to Trimming	
Around the Median	8.60%	9.18%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	8.36%	9.13%		
Probability True Mean 0.9 - 1.1	0.00%		Category (ies):	all
NORMALITY Test Results:	Normal		Neighborhoods:	all
Chi Square Test	Normal*			
Binomial Test	N/A			
Note: Study based on sales from 2016 only.				
Mann-Whitney Test	1.31806			
Significance of Value Related Inequity - Weak				
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	N/A			
Kurtosis	3.01	Acceptable		
2.50	4.00			
Skew	-0.11	Acceptable		
-0.50	1.00			

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016		From: 01/01/2016
				To: 05/31/2016
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.731%	
SAMPLE STATISTICS				
Sample size (n)	197			
Total Assessed Value	\$2,563,650			
Total Adjusted Sales Price	\$27,551,562			
Mean Assessed Value	\$13,013			
Mean Adjusted Sales Price	\$139,856			
Standard Deviation AV	\$7,747			
Standard Deviation SP	\$73,687			
Median Assessed Value	\$11,710			
Median Sales Price	\$129,049			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	9.32%			
Median Ratio	9.32%			
Weighted Mean Ratio	9.30%			
Geometric Mean Ratio	8.94%			
UNIFORMITY				
<Extreme> Lowest Ratio	2.91%			
Highest Ratio	16.14%			
Coefficient of Dispersion	21.51%			
Standard Deviation	2.55%			
Coefficient of Variation	27.36%			
Price Related Bias	0.0726	PRB T Score:	2.9967	PRB is SIGNIFICANT @ 90%
Price-Related Differential	1.00			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	9.02%	9.62%	COD:	Somewhat Poor
Around the Median	8.80%	9.68%	COV:	Somewhat Poor
Around the Weighted Mean	9.01%	9.60%	PRD:	No Observed Bias
Around the COD	19.21%	24.71%	PRB: Meets IAAO Standard, No Significant Bias	
Around the PRB	0.0251	0.1201	Outlier Method:	
80% Confidence Intervals:	Lower	Upper	Inner Quartile Fence: 8 Sale(s) Lost to Trimming	
Around the Mean	9.09%	9.55%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Median	8.93%	9.63%		
Around the Weighted Mean	9.08%	9.53%		
Probability True Mean 0.9 - 1.1	0.00%			
NORMALITY Test Results:	Normal			
Chi Square Test	Normal*			
Binomial Test	N/A			
Mann-Whitney Test	-0.47059			
Significance of Value Related Inequity - Weak				
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	N/A			
Kurtosis	3.10	Acceptable		
2.50	4.00			
Skew	-0.07	Acceptable		
-0.50	1.00			
Note: Study based on sales from 2016 only.				



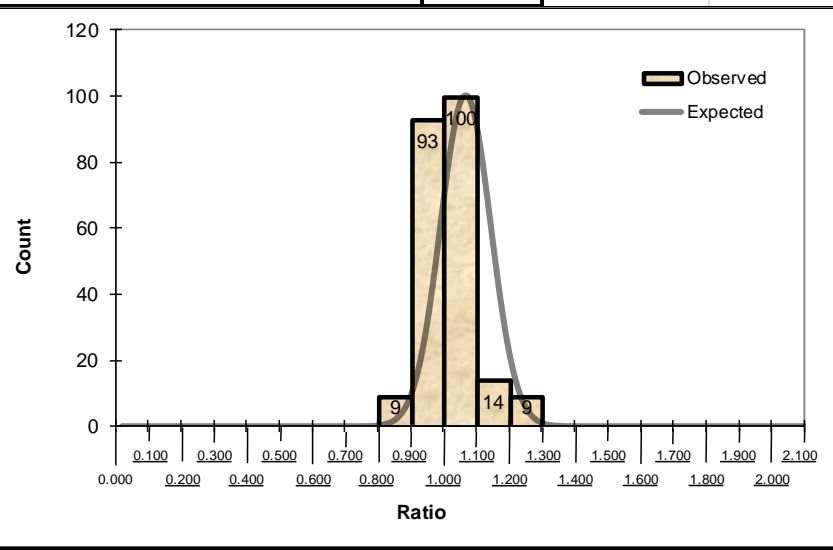
	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016		From: 01/01/2016
				To: 05/31/2016
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		27.792%	
SAMPLE STATISTICS				
Sample size (n)	22			
Total Assessed Value	\$642,090			
Total Adjusted Sales Price	\$11,250,602			
Mean Assessed Value	\$29,186			
Mean Adjusted Sales Price	\$511,391			
Standard Deviation AV	\$29,167			
Standard Deviation SP	\$306,466			
Median Assessed Value	\$18,415			
Median Sales Price	\$377,415			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	5.92%			
Median Ratio	5.81%			
Weighted Mean Ratio	5.71%			
Geometric Mean Ratio	5.12%			
UNIFORMITY				
<Extreme> Lowest Ratio	0.89%			
Highest Ratio	10.52%			
Coefficient of Dispersion	38.91%			
Standard Deviation	2.76%			
Coefficient of Variation	46.71%			
Price Related Bias	0.1996	PRB T Score:	1.5083	PRB is inconclusive
Price-Related Differential	1.04			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	4.90%	6.93%	COD:	Very Poor
Around the Median	4.36%	7.39%	COV:	Very Poor
Around the Weighted Mean	3.94%	7.48%	PRD:	Favors High Priced
Around the COD	26.57%	65.78%		
Around the PRB	-0.0743	0.4736	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	5.14%	6.70%	Inner Quartile Fence: 2 Sale(s) Lost to Trimming	
Around the Median	4.81%	7.24%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	4.39%	7.03%		
Probability True Mean 0.9 - 1.1	0.00%		Category (ies):	C
NORMALITY Test Results:	Non-Normal		Neighborhoods:	all
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	N/A		Note: Study based on sales from 2016 only.	
Unable to calculate				
D'Agostino-Pearson	Non-Normal		No industrial sales available	
Shapiro-Wilk W	Normal			
Kurtosis	4.06	Acceptable		
1.00	6.00			
Skew	1.80	Possible Outliers		
-1.00	1.50			



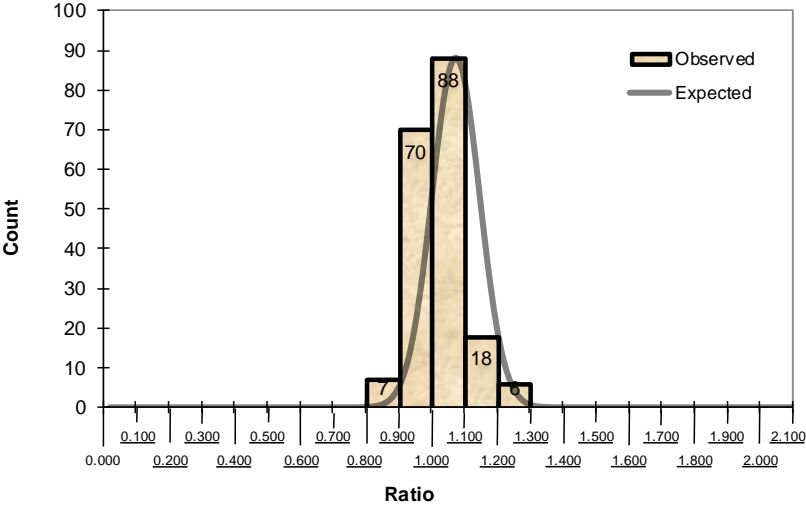
		See Parameters Sheet for Category Details	Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Original Assessed Values	Assessment Date: 01/01/2016		From: 01/01/2016 To: 05/31/2016
	Sales Price is Not Time Adjusted	Time Adj. Not Applied		
SAMPLE STATISTICS				
Sample size (n)	14			
Total Assessed Value	\$23,280			
Total Adjusted Sales Price	\$625,100			
Mean Assessed Value	\$1,663			
Mean Adjusted Sales Price	\$44,650			
Standard Deviation AV	\$1,624			
Standard Deviation SP	\$28,032			
Median Assessed Value	\$855			
Median Sales Price	\$39,000			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	3.72%			
Median Ratio	3.66%			
Weighted Mean Ratio	3.72%			
Geometric Mean Ratio	2.88%			
UNIFORMITY				
<Extreme> Lowest Ratio	0.85%			
Highest Ratio	8.70%			
Coefficient of Dispersion	53.68%			
Standard Deviation	2.54%			
Coefficient of Variation	68.40%			
Price Related Bias	0.1539	PRB T Score:	0.874	PRB is inconclusive
Price-Related Differential	1.00			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	2.52%	4.92%	COD:	Very Poor
Around the Median	1.56%	4.93%	COV:	Very Poor
Around the Weighted Mean	2.73%	4.72%	PRD:	No Observed Bias
Around the COD	32.41%	126.85%	PRB: Meets IAAO Standard, No Significant Bias	
Around the PRB	-0.2246	0.5323	Outlier Method:	
80% Confidence Intervals:	Lower	Upper	None: NO Sale(s) Lost to Trimming	
Around the Mean	2.80%	4.64%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Median	2.28%	4.71%	Category (ies): L	
Around the Weighted Mean	3.00%	4.44%	Neighborhoods: all	
Probability True Mean 0.9 - 1.1	0.00%			
NORMALITY Test Results:	Normal			
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	N/A			
Unable to calculate				
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	Normal			
Kurtosis	2.49	Acceptable		
1.00	6.00			
Skew	0.67	Acceptable		
-1.50	1.50			

New Proposed January 1, 2016 Assessed Values

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2016	To: 05/30/2016
<i>Sales Price is Time Adjusted</i>	Linear Trend Selected - Mo. rate		-0.562%	
SAMPLE STATISTICS				
Sample size (n)	225			
Total Assessed Value	\$36,639,100			
Total Adjusted Sales Price	\$36,207,740			
Mean Assessed Value	\$162,840			
Mean Adjusted Sales Price	\$160,923			
Standard Deviation AV	\$145,056			
Standard Deviation SP	\$144,576			
Median Assessed Value	\$132,200			
Median Sales Price	\$132,724			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	101.69%			
Median Ratio	100.57%			
Weighted Mean Ratio	101.19%			
Geometric Mean Ratio	101.44%			
UNIFORMITY				
Lowest Ratio	81.90%			
Highest Ratio	127.46%			
Coefficient of Dispersion	4.90%			
Standard Deviation	7.30%			
Coefficient of Variation	7.18%			
Price Related Bias	-0.0068	PRB T Score:	-1.733	
Price-Related Differential	1.00	PRB is inconclusive		
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	100.89%	102.49%	COD:	Questionable verified ok
Around the Median	99.94%	101.21%	COV:	Excellent
Around the Weighted Mean	100.36%	102.02%	PRD:	No Observed Bias
Around the COD	4.26%	5.69%	PRB: Meets IAAO Standard, No Significant Bias	
Around the PRB	-0.0145	0.0009	Outlier Method:	
80% Confidence Intervals:	Lower	Upper	Outer Quartile Fence: 22 Sale(s) Lost to Trimming	
Around the Mean	101.06%	102.31%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Median	100.03%	100.96%	Category (ies):	All
Around the Weighted Mean	100.54%	101.84%	Neighborhoods:	all
Probability True Mean 0.9 - 1.1	Approx. 100%		Note: This analysis uses sales from January 1, 2016 to the present	
NORMALITY Test Results:				
Chi Square Test	Non-Normal			
Binomial Test	N/A			
Mann-Whitney Test	-1.51693			
Significance of Value Related Inequity - Weak				
D'Agostino-Pearson	Non-Normal			
Shapiro-Wilk W	N/A			
Kurtosis	4.64	Not Trimmed?		
2.50	4.00			
Skew	0.49	Acceptable		
-0.50	1.00			

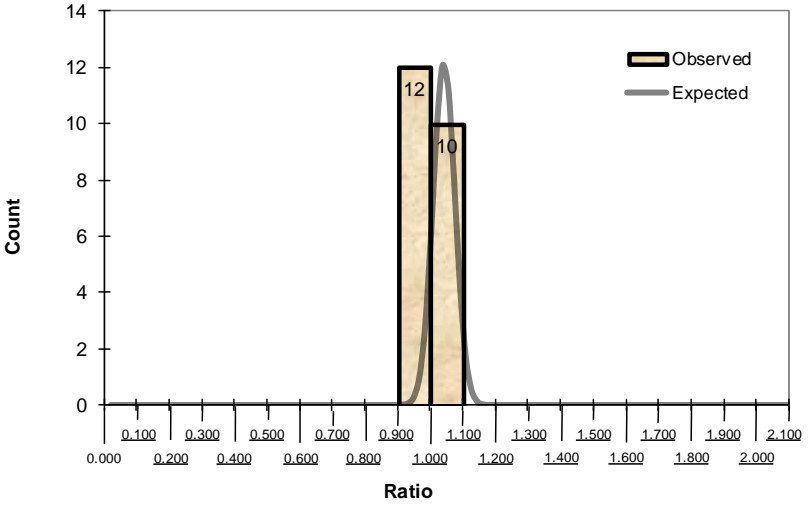


	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2016	To: 05/30/2016
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.845%	
SAMPLE STATISTICS				
Sample size (n)	189			
Total Assessed Value	\$27,471,000			
Total Adjusted Sales Price	\$27,014,343			
Mean Assessed Value	\$145,349			
Mean Adjusted Sales Price	\$142,933			
Standard Deviation AV	\$72,148			
Standard Deviation SP	\$73,331			
Median Assessed Value	\$132,200			
Median Sales Price	\$132,552			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	102.34%			
Median Ratio	100.85%			
Weighted Mean Ratio	101.69%			
Geometric Mean Ratio	102.12%			
UNIFORMITY				
Lowest Ratio	82.86%			
Highest Ratio	126.23%			
Coefficient of Dispersion	4.75%			
Standard Deviation	6.93%			
Coefficient of Variation	6.77%			
Price Related Bias	-0.0126	PRB T Score:	-2.2659	PRB is SIGNIFICANT @ 90%
Price-Related Differential	1.01			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	101.51%	103.17%	COD:	Questionable verified ok
Around the Median	100.23%	101.89%	COV:	Excellent
Around the Weighted Mean	100.80%	102.58%	PRD:	No Observed Bias
Around the COD	4.09%	5.56%	PRB: Meets IAAO Standard, No Significant Bias	
Around the PRB	-0.0236	-0.0017	Outlier Method:	
80% Confidence Intervals:	Lower	Upper	Outer Quartile Fence: 16 Sale(s) Lost to Trimming	
Around the Mean	101.69%	102.99%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Median	100.42%	101.79%	Category (ies):	R
Around the Weighted Mean	100.99%	102.39%	Neighborhoods:	all
Probability True Mean 0.9 - 1.1	Approx. 100%			
NORMALITY Test Results:	Normal			
Chi Square Test	Normal*			
Binomial Test	N/A			
Mann-Whitney Test	-1.70191			
Significance of Value Related Inequity - Weak	Normal			
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	N/A			
Kurtosis	3.96	Acceptable		
2.50	4.00			
Skew	0.08	Acceptable		
-0.50	1.00			



Note: This analysis uses sales from January 1, 2016 to the present

	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016		From: 01/01/2016
				To: 05/30/2016
Sales Price is Time Adjusted	Linear Trend Selected - Mo. rate		-0.090%	
SAMPLE STATISTICS				
Sample size (n)	22			
Total Assessed Value	\$6,826,400			
Total Adjusted Sales Price	\$6,897,292			
Mean Assessed Value	\$310,291			
Mean Adjusted Sales Price	\$313,513			
Standard Deviation AV	\$308,865			
Standard Deviation SP	\$315,027			
Median Assessed Value	\$197,900			
Median Sales Price	\$207,025			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	99.31%			
Median Ratio	99.93%			
Weighted Mean Ratio	98.97%			
Geometric Mean Ratio	99.26%			
UNIFORMITY				
Lowest Ratio	90.84%			
Highest Ratio	104.30%			
Coefficient of Dispersion	2.34%			
Standard Deviation	3.21%			
Coefficient of Variation	3.23%			
Price Related Bias	-0.0032	PRB T Score:	-0.6816	PRB is inconclusive
Price-Related Differential	1.00			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	98.13%	100.49%	COD:	Questionable verified ok
Around the Median	98.61%	100.55%	COV:	Questionable verified ok
Around the Weighted Mean	97.89%	100.06%	PRD:	No Observed Bias
Around the COD	1.65%	3.71%	PRB: Meets IAAO Standard, No Significant Bias	
Around the PRB	-0.0128	0.0064	Outlier Method:	
80% Confidence Intervals:	Lower	Upper	Outer Quartile Fence: 2 Sale(s) Lost to Trimming	
Around the Mean	98.40%	100.21%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Median	99.38%	100.41%	Category (ies):	C
Around the Weighted Mean	98.16%	99.78%	Neighborhoods:	all
Probability True Mean 0.9 - 1.1	Approx. 100%			
NORMALITY Test Results:				
Chi Square Test	Normal			
Binomial Test	N/A			
*i.e., Insufficient evidence of Non-Normality				
Mann-Whitney Test	Non-Normal			
Unable to calculate				
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	Normal			
Kurtosis	3.73	Acceptable		
1.00	6.00			
Skew	-0.95	Acceptable		
-1.00	1.50			



	See Parameters Sheet for Category Details		Time Period Studied	
SIMPLIFIED RATIO STUDY	Using Proposed Assessed Values	Assessment Date: 01/01/2016	From: 01/01/2016	To: 05/30/2016
Sales Price is Not Time Adjusted	Time Adj. Not Applied			
SAMPLE STATISTICS				
Sample size (n)	14			
Total Assessed Value	\$574,400			
Total Adjusted Sales Price	\$625,100			
Mean Assessed Value	\$41,029			
Mean Adjusted Sales Price	\$44,650			
Standard Deviation AV	\$30,627			
Standard Deviation SP	\$28,032			
Median Assessed Value	\$43,000			
Median Sales Price	\$39,000			
ASSESSMENT LEVEL				
Arithmetic Mean Ratio	85.89%			
Median Ratio	92.67%			
Weighted Mean Ratio	91.89%			
Geometric Mean Ratio	81.06%			
UNIFORMITY				
Lowest Ratio	37.50%			
Highest Ratio	124.75%			
Coefficient of Dispersion	22.69%			
Standard Deviation	27.59%			
Coefficient of Variation	32.12%			
Price Related Bias	0.1354	PRB T Score: 2.1774	PRB is SIGNIFICANT @ 90%	
Price-Related Differential	0.93			
RELIABILITY				
90% Confidence Intervals:	Lower	Upper	Uniformity:	
Around the Mean	72.83%	98.95%	COD:	Somewhat Poor
Around the Median	63.96%	103.02%	COV:	Poor
Around the Weighted Mean	82.18%	101.60%	PRD:	Favors Low Priced
Around the COD	16.90%	36.25%		
Around the PRB	0.0017	0.2691	PRB:	Meets IAAO Standard, No Significant Bias
80% Confidence Intervals:	Lower	Upper	Outlier Method:	
Around the Mean	75.94%	95.85%	None: NO Sale(s) Lost to Trimming	
Around the Median	82.92%	100.71%	Please enter the category (ies) and neighborhood(s) used in the study.	
Around the Weighted Mean	84.86%	98.92%		
Probability True Mean 0.9 - 1.1	29.04%		Category (ies):	L
NORMALITY Test Results:	Normal		Neighborhoods:	all
Chi Square Test	N/A			
Binomial Test	Non-Normal			
*i.e., Insufficient evidence of Non-Normality			Note: This analysis uses sales from January 1, 2016 to the present	
Mann-Whitney Test	N/A			
Unable to calculate				
D'Agostino-Pearson	Normal			
Shapiro-Wilk W	Normal			
Kurtosis	2.04	Acceptable		
1.00	6.00			
Skew	-0.36	Acceptable		
-1.50	1.50			

Appendix B: Evaluating Assessment Systems – The IAAO Perspective

Introduction

The information in this Appendix reflects general IAAO commentary on evaluating the quality of assessment and reassessment systems. Although it reflects upon the principle of frequent reappraisal to better capture current market influences and physical property changes, it is intended to provide perspective and background. As such, both commentary and supportive examples and illustrations are not based on analysis of data within Blair County. Examples are generic and are provided for illustration of principles only.

The IAAO and Reappraisal

The International Association of Assessing Officers (IAAO) is an internationally recognized association of assessment professionals which provides, among other things, educational materials, reference publications and standards that are widely recognized throughout the assessment community. The express mission of the IAAO is to provide leadership in mass appraisal, assessment administration, and property tax policy.

IAAO supports the concept of frequent reappraisal or updating of values. Property Appraisal and Assessment Administration²⁵ states:

“In an ideal system, a reappraisal, an updating of values for all properties in a jurisdiction, would be done annually. Frequent reappraisal, especially where property values are changing rapidly, may be essential to fair distribution of the property tax.”

Recognizing that more frequent reappraisals produce better quality assessments, but that jurisdictions generally do not have the resources to permit complete physical inspection and reappraisal each year, the IAAO *Standard on the Mass Appraisal of Real Property*²⁶ recommends “...physical reviews and individual reappraisals, which are required to correct lack of uniformity within strata.” This *Standard* goes on to state: “...properties should be physically reviewed and individually reappraised at least every four to six years.”

In addition, IAAO supports using current market value as a basis for property tax to:

*“...maximize fairness and understandability in a property tax system....”*²⁷

Because there is a risk that increases in assessed value will translate directly into increases in property taxes, IAAO further recommends tax systems in which “higher values force rates downward and offset rising assessments.”²⁸ My understanding is that such a system is in place in Pennsylvania during reassessment periods.

²⁵ IAAO. 1990. *Property Appraisal and Assessment Administration*. P. 9. Chicago, IL

²⁶ IAAO. 2008. *Standard on Mass Appraisal*. Section 4.7, p. 10.

²⁷ IAAO. 2010. *Standard on Property Tax Policy*. Section 4.2, p. 12.

²⁸ *Ibid.* Section 5.2, p. 16.

The following table illustrates the effect of reassessment on properties given budget based systems that force rates to adjust and rate based systems that do not.²⁹ The dates and information shown are for illustration only and are not intended to reflect actual tax rates in Blair County.

Parcel	2007 Assessed Value (\$)	2008 Assessed Value (\$)	2007 Property Tax (\$)	2008 Property Tax \$— rate-driven	2008 Property Tax \$— budget-driven	Change in property tax \$ related to rate-driven budget system
A	100,000	200,000	1,250	2,500	2,222	+ 278
B	100,000	100,000	1,250	1,250	1,111	+ 139
C	100,000	100,000	1,250	1,250	1,111	+ 139
D	100,000	50,000	1,250	625	556	+ 69
Totals:	400,000	450,000	5,000	5,625	5,000	+ 625

Ratio Studies

One of the most important tools available for evaluating the accuracy of appraisals and assessments is the ratio study. In such a study, sales prices are compared with (appraised or) assessed values, by dividing the assessed value of each selling parcel by its sale price. Provided sales are properly screened to identify arm’s length transactions, sale prices are considered to: “...provide the most objective estimates of market values and under normal circumstances should provide good surrogates of market value.”³⁰

Ratio studies are statistical tests and, as such, rely on sufficient numbers of market value sales to produce meaningful results. “While a single sale may provide an indication of the market value of the property in question, it cannot form the basis for a ratio study, which provides information about the market values of groups of properties.”³¹

The ratio study provides information about the level of assessments, by allowing determination of how close to or far from market value a neighborhood or county is on an overall basis. The goal of “market value” is achieved on an overall basis when a representative ratio study indicates a mean or median ratio (these statistics indicate assessment level) of about 100%. The IAAO *Standard on Ratio Studies* suggests that a range of $\pm 10\%$ around this measure should be considered acceptable. This is widely misunderstood as it does not mean that every individual property ratios in a sample may differ from the median by no more than 10%. Instead, the range given is to be applied to the statistical measures of level, such as the median. The occurrence of a small number of ratios that differ significantly from the median is not conclusive, unless these sales represented a particular neighborhood or other stratum under review.

In addition, ratio studies provide valuable information about taxpayer equity within a neighborhood or jurisdiction by providing statistical measures of uniformity or variation. If uniformity is good, few parcels will be found to differ widely from indicated measures of level and taxpayer equity within the tested area will be good. Depending on the homogeneity of properties in a given neighborhood, the

²⁹Almy, Richard, Alan Dornfest, and Daphne Kenyon, PhD. *Fundamentals of Tax Policy*. IAAO. 2008. Kansas City. Table 6-1, p. 173.

³⁰ IAAO. 2010. *Standard on Ratio Studies*. Section 2.1, p. 7.

³¹ Ibid.

IAAO *Standard on Ratio Studies* suggests that good uniformity exists when there is a Coefficient of Dispersion (COD) of 10% or less (for the most homogeneous areas), 15% or less (less homogeneous areas), 20% or less (vacant land and most income producing properties), and sometimes higher amounts for unusual properties or market conditions. A further caveat in the Standard notes that CODs less than 5% indicate unexpectedly good uniformity and may not be representative.

Part of measuring uniformity is determining whether high and low priced properties within a given neighborhood or jurisdiction are being treated similarly, with respect to level of assessment. Vertical inequity is said to exist if, for example, \$200,000 homes were assessed at \$150,000 (75%), while \$80,000 homes were assessed at \$80,000 (100%). In this sample case, if \$2,000 in property taxes were levied by a particular taxing district, and these two properties were the only ones within the boundaries of that taxing district, the more expensive home would pay \$1,304 and the less expensive would pay \$696. If both had been assessed at the same ratio with respect to full value (even if it were not 100%), the more expensive one would have paid \$1,428 and the less expensive one \$571. The degree of this type of inequity is measured in ratio studies with a statistic known as the Price Related Differential (PRD). When the PRD is between 0.98 and 1.03 vertical inequity is considered minimal. More recently, the IAAO *Standard* includes guidelines based on the PRB as well as the PRD. The PRB is considered by many researchers to be more precise and less susceptible to producing false “positive” findings of non-compliance, a troublesome feature of the PRD.

Level and uniformity statistics are illustrated by the following hypothetical examples (not derived from or representing any actual data or conditions within Blair County).

Table B1: Level of assessment

Sale #	Assessed Value	Sale Price	Ratio
1	\$ 20,000	\$ 50,000	40.00%
2	30,000	50,000	60.00%
3	40,000	50,000	80.00%
4	50,000	50,000	100.00%
5	60,000	50,000	120.00%
6	70,000	50,000	140.00%
7	80,000	50,000	160.00%
Totals:	350,000	350,000	700.00%

MEAN = 100.00%
 MEDIAN = 100.00%
 WTD. MEAN = 100.00%

In Table B1, all measures of assessment level equal 100% of market value. This does not require each individual ratio to be 100% or even within any specified range of 100%.

Table B2: Level of assessment may be affected by asymmetrical distribution of ratios.

Sale #	Assessed Value	Sale Price	Ratio
1	\$ 80,000	\$ 50,000	160.00%
2	75,000	60,000	125.00%
3	70,000	70,000	100.00%
4	65,000	80,000	81.25%
5	60,000	90,000	66.67%
6	55,000	100,000	55.00%
7	50,000	110,000	45.45%
Totals:	455,000	560,000	633.37%

MEAN = 90.48%
 MEDIAN = 81.25%
 WTD. MEAN = 81.25%

Because it is common for ratio study statistics to be influenced by high ratios to a greater extent than low ratios, the median is considered the most appropriate measure of assessment level for general purposes.

Table B3 provides a ratio study that indicates good level of assessment, but poor uniformity. Table B4 shows similar assessment level with good uniformity and both results are shown graphically in Table B5.

Table B3: Good level, poor uniformity

Sale #	Assessed Value	Sale Price	Ratio
1	\$ 10,000	\$ 25,000	40.00%
2	30,000	50,000	60.00%
3	22,500	30,000	75.00%
4	60,000	60,000	100.00%
5	37,500	30,000	125.00%
6	70,000	50,000	140.00%
7	40,000	25,000	160.00%
Totals:	270,000	270,000	700.00%

MEAN = 100.00% *
 * MEASURES
 MEDIAN = 100.00% *
 * OF
 * ASSESSMENT
 WTD. MEAN = 100.00% *
 * LEVEL

(COD) COEFFICIENT OF DISPERSION = 35.71% * MEASURES
 * OF
 (COV) COEFFICIENT OF VARIATION = 44.06% * UNIFORMITY

Table B4: Good level, good uniformity

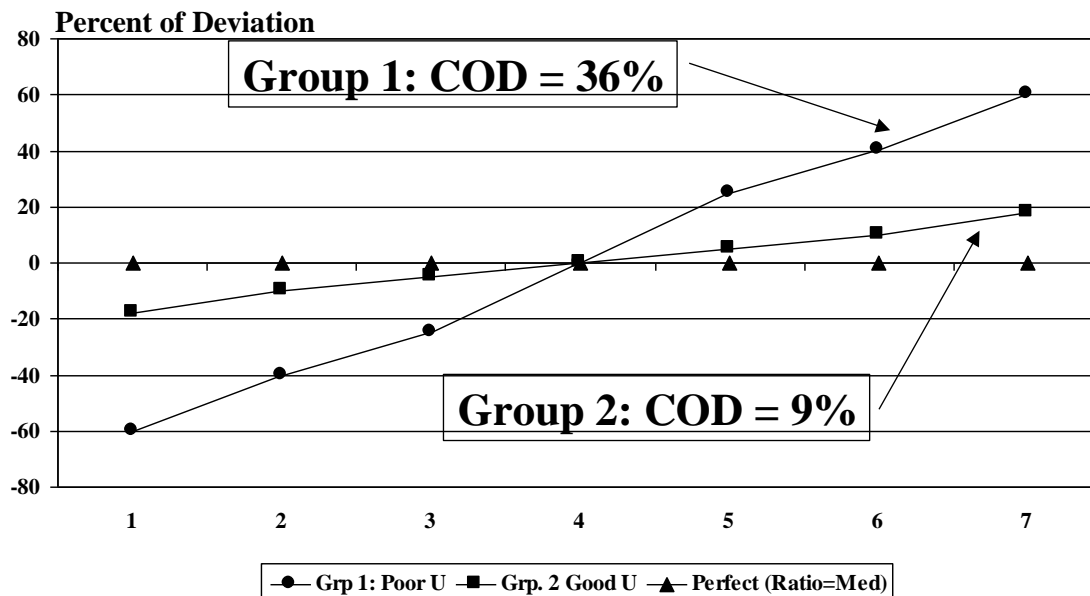
Sale #	Assessed Value	Sale Price	Ratio
1	\$ 21,000	\$ 25,000	84.00%
2	44,000	50,000	88.00%
3	28,000	30,000	93.33%
4	60,000	60,000	100.00%
5	32,000	30,000	106.67%
6	56,000	50,000	112.00%
7	29,000	25,000	116.00%
Totals:	\$ 270,000	\$ 270,000	700.00%

MEAN = 100.00% *
 * MEASURES
 MEDIAN = 100.00% * OF
 * ASSESSMENT
 WTD. MEAN = 100.00% * LEVEL
 *
 GEOMETRIC MEAN = 99.36% *

 (COD) COEFFICIENT OF DISPERSION = 9.90% * MEASURES
 * OF
 (COV) COEFFICIENT OF VARIATION = 12.17% * UNIFORMITY

Chart B1: Graphic depiction of uniformity as measured by the hypothetical CODs in tables B3 and B4.

Level vs. Uniformity Deviation from Median



Compares 2 groups of 7 sales

If Deviation = 0, uniformity is perfect

Tables B5 and B6 provide examples of good vertical equity (Table B5), in which there is no discernable difference in the ratio of assessment of high and low priced properties, and assessment regressivity, in which high priced properties are under-assessed relative to low priced properties (Table B6).

Table B5: Good vertical equity

Sale #	Assessed Value	Sale Price	Ratio
1	\$ 25,000	\$ 20,000	125.00%
2	24,000	30,000	80.00%
3	31,000	40,000	77.50%
4	40,000	50,000	80.00%
5	60,000	60,000	100.00%
6	79,000	70,000	112.86%
Totals:	259,000	270,000	575.36%

WEIGHTED MEAN = 95.93%

MEAN = 95.89%

PRD = 1.00*

*DOES NOT FAVOR LOW OR HIGH PRICED

Table B6: Higher ratios on low priced properties

Sale #	Assessed Value	Sale Price	Ratio
1	\$ 30,000	\$ 20,000	150.00%
2	40,000	30,000	133.33%
3	45,000	40,000	112.50%
4	50,000	50,000	100.00%
5	40,000	60,000	66.67%
6	45,000	70,000	64.29%
Totals:	250,000	270,000	626.79%

WEIGHTED MEAN = 92.59%
 MEAN = 104.46%
 PRD = 1.13**

**FAVORS HIGH PRICED

The IAAO *Standard on Ratio Studies* has established varying standards for level and uniformity, depending partly on the type of property. Larger CODs mean worse uniformity, but it is difficult to achieve better uniformity when property is in heterogenous areas or of heterogenous types. General uniformity standards are found in Table 2-3 of the IAAO *Standard on Ratio Studies*³²: This same table also footnotes the IAAO standards for vertical equity (using the PRD) and for appraisal level.

³² IAAO. *Standard on Ratio Studies*. 2013. p. 34. (adapted from)

Ratio study uniformity standards indicating acceptable general quality*

General Property Class	Jurisdiction Size /Profile /Market Activity	COD
Residential improved (single family dwellings, condominiums, manuf. housing, 2-4 family units)	Very large jurisdictions / densely populated / newer properties / active markets	10.0
	Large to mid-sized jurisdictions / older & newer properties / less active markets	15.0
	Rural or small jurisdictions / older properties / depressed market areas	20.0
Income-producing properties (commercial, industrial, apartments,)	Very large jurisdictions / densely populated / newer properties / active markets	15.0
	Large to mid-sized jurisdictions / older & newer properties / less active markets	20.0
	Rural or small jurisdictions / older properties / depressed market areas	25.0
Residential vacant land	Very large jurisdictions / rapid developing / active markets	15.0
	Large to mid-sized jurisdictions / slower development / less active markets	20.0
	Rural or small jurisdictions/ little development / depressed markets	25.0
Other (non-agricultural) vacant land	Very large jurisdictions / rapid development / active markets	20.0
	Large to mid-sized jurisdictions / slower development / less active markets	25.0
	Rural or small jurisdictions/ little development / depressed markets	30.0

These types of property are provided for general guidance only and may not represent jurisdictional requirements.

- * The COD performance recommendations are based upon representative and adequate sample sizes, with outliers trimmed and a 95% level of confidence.
- * Appraisal level recommendation for each type of property shown should be between 0.90 and 1.10.
- * PRD's for each type of property should be between 0.98 and 1.03 to demonstrate vertical equity.
PRD standards are not absolute and may be less meaningful when samples are small or when wide variation in prices exist. In such cases, statistical tests of vertical equity hypotheses should be substituted.
- * CODs lower than 5.0 may indicate sales chasing or non-representative samples.

Appendix C

Sample Time Adjustment

Example of Linear Time Adjustment based on Blair County Ratio Study Data

The following chart is an example of a time adjustment chart, taken from the Category R ratio study analysis of the reassessment value.

The time adjustment for this sample shows on the analysis page found in Appendix A2 as:

<i>Linear Trend Selected - Mo. rate</i>	-0.129%
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This reduction in ratios reflects a corresponding increase in sale prices through the period. Sale prices were adjusted accordingly to reflect price as of January 1, 2016 and the ratio study was run on the adjusted sale prices.

