2021
ARAPAHOE COUNTY PROPERTY ASSESSMENT STUDY

WILDROSE
APPRAISAL, INCORPORATED
Audit Division

WILDROSE
APPRAISAL, INCORPORATED
Audit Division

September 15, 2021

Ms. Natalie Mullis
Director of Research
Colorado Legislative Council
Room 029, State Capitol Building
Denver, Colorado 80203

RE: Final Report for the 2021 Colorado Property Assessment Study

Dear Ms. Mullis:

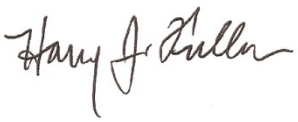
Wildrose Appraisal Inc.-Audit Division is pleased to submit the Final Reports for the 2021 Colorado Property Assessment Study.

These reports are the result of two analyses: A procedural audit and a statistical audit.

The procedural audit examines all classes of property. It specifically looks at how the assessor develops economic areas, confirms and qualifies sales, develops time adjustments and performs periodic physical property inspections. The audit reviews the procedures for determining subdivision absorption and subdivision discounting. Valuation methodology is examined for residential properties and commercial properties. Procedures are reviewed for producing mines, oil and gas leaseholds and lands producing, producing coal mines, producing earth and stone products, severed mineral interests, and non-producing patented mining claims.

Statistical audits are performed on vacant land, residential properties, commercial/industrial properties and agricultural land. A statistical analysis is performed for personal property compliance on the eleven largest counties: Adams, Arapahoe, Boulder, Denver, Douglas, El Paso, Jefferson, Larimer, Mesa, Pueblo and Weld. The remaining counties receive a personal property procedural study.

Wildrose Appraisal Inc. – Audit Division appreciates the opportunity to be of service to the State of Colorado. Please contact us with any questions or concerns.



Harry J. Fuller
Project Manager
Wildrose Appraisal Inc. – Audit Division

TABLE OF CONTENTS

INTRODUCTION

Colorado

The State Board of Equalization (SBOE) reviews assessments for conformance to the Constitution. The SBOE will order revaluations for counties whose valuations do not reflect the proper valuation period level of value.

The statutory basis for the audit is found in C.R.S. 39-1-104 (16)(a)(b) and (c).

The legislative council sets forth two criteria that are the focus of the audit group:

To determine whether each county assessor is applying correctly the constitutional and statutory provisions, compliance requirements of the State Board of Equalization, and the manuals published by the State Property Tax Administrator to arrive at the actual value of each class of property.

To determine if each assessor is applying correctly the provisions of law to the actual values when arriving at valuations for assessment of all locally valued properties subject to the property tax.

The property assessment audit conducts a two-part analysis: A procedural analysis and a statistical analysis.

The procedural analysis includes all classes of property and specifically looks at how the assessor develops economic areas, confirms and qualifies sales, and develops time adjustments. The audit also examines the procedures for adequately discovering, classifying and valuing agricultural outbuildings, discovering subdivision build-out and subdivision discounting procedures. Valuation methodology for vacant land, improved residential properties and commercial properties is examined. Procedures for producing mines, oil and gas leaseholds and lands producing, producing coal mines, producing earth and stone products, severed mineral interests and non-producing patented mining claims are also reviewed.

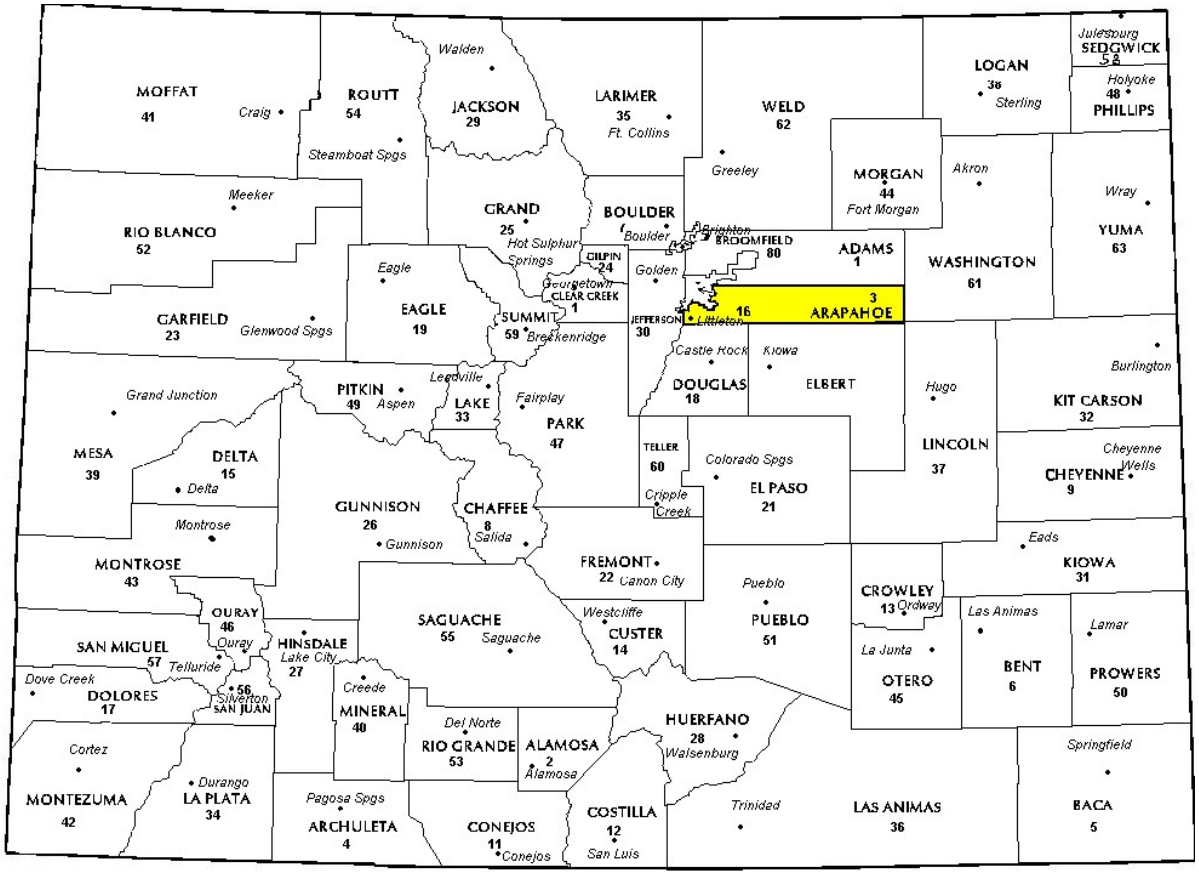
Statistical analysis is performed on vacant land, residential properties, commercial industrial properties, agricultural land, and personal property. The statistical study results are compared with State Board of Equalization compliance requirements and the manuals published by the State Property Tax Administrator.

Wildrose Audit has completed the Property Assessment Study for 2021 and is pleased to report its findings for Arapahoe County in the following report.

REGIONAL / HISTORICAL SKETCH OF ARAPAHOE COUNTY

Regional Information

Arapahoe County is located in the Front Range region of Colorado. The Colorado Front Range is a colloquial geographic term for the populated areas of the State that are just east of the foothills of the Front Range. It includes Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, El Paso, Jefferson, Larimer, Pueblo, and Weld counties.



Historical Information

Arapahoe County has approximately 798.1 square miles and an estimated population of approximately 656,590 people with 716.7 people per square mile, according to the U.S. Census Bureau's 2020 estimated census data. This represents a 14.8 percent change from April 1, 2010 to July 1, 2019.

Arapahoe County is the third most populous of the 64 Colorado counties. The county seat is Littleton and the most populous city is Aurora. Arapahoe County is part of the Denver-Aurora Metropolitan Statistical Area and the Denver-Aurora-Boulder Combined Statistical Area. Arapahoe County calls itself "Colorado's First County" since its origins predate the Pike's Peak Gold Rush.

On August 25, 1855, the Kansas Territorial Legislature created a huge Arapahoe County to govern the entire western portion of the Territory of Kansas. The county was named for the Arapaho Nation of Native Americans that lived in the region.

In July 1858, gold was discovered along the South Platte River in Arapahoe County (in present day Englewood). This discovery precipitated the Pike's Peak Gold Rush. Many residents of the mining region felt disconnected from the remote territorial governments of Kansas and Nebraska, so they voted to form their own Territory of Jefferson on October 24, 1859. The following month, the Jefferson Territorial Legislature organized 12 counties for the new territory, including a new Arapahoe County. Denver City served as the county seat of Arapahoe County.

The Jefferson Territory never received federal sanction, but on February 28, 1861, U.S. President James Buchanan signed an act organizing the Territory of Colorado. On November 1, 1861, the Colorado General Assembly organized the 17 original counties of Colorado including a new Arapahoe County. Arapahoe County originally stretched from the line of present-day Sheridan Boulevard 160 miles east to the Kansas state border, and from the line of present-day County Line Road 30 miles north to the Parallel 40° North (168th Avenue). Denver City served as the county seat of Arapahoe County until 1902.

In 1901, the Colorado General Assembly voted to split Arapahoe County into three parts: a new consolidated City and County of Denver, a new Adams County, and the remainder of the Arapahoe County to be renamed South Arapahoe County. A ruling by the Colorado Supreme Court, subsequent legislation, and a referendum delayed the reorganization until November 15, 1902. Governor James Bradley Orman designated Littleton as the temporary county seat of South Arapahoe County. On April 11, 1903, the Colorado General Assembly changed the name of South Arapahoe County back to Arapahoe County. On November 8, 1904, Arapahoe County voters chose Littleton over Englewood by a vote of 1310 to 829 to be the permanent county seat. (Wikipedia.org)

RATIO ANALYSIS

Methodology

All significant classes of property were analyzed. Sales were collected for each property class over the eighteen month period from January 1, 2019 through June 30th, 2020. Property classes with less than thirty sales had the sales period extended in six month increments up to an additional forty-two months. If this extended sales period did not produce the minimum thirty qualified sales, the Audit performed supplemental appraisals to reach the minimum.

Although it was required that we examine the median and coefficient of dispersion for all counties, we also calculated the weighted mean and price-related differential for each class of property. Counties were not passed or failed by these latter measures, but were counseled if there were anomalies noted during our analysis. Qualified sales were based on the qualification code used by each county, which were typically coded as either "Q" or "C." The ratio analysis included all sales. The data was trimmed for counties with obvious outliers using IAAO standards for data analysis. In every case, we examined the loss in data from trimming to ensure that only true outliers were excluded. Any county with a significant portion of sales excluded by this trimming method was examined further. No county was allowed to pass the audit if more than 5% of the sales were "lost" because of trimming.

All sixty-four counties were examined for compliance on the economic area level. Where there were sufficient sales data, the neighborhood and subdivision levels were tested for compliance. Although counties are determined to be in or out of compliance at the class level, non-compliant economic areas, neighborhoods and subdivisions (where applicable) were discussed with the Assessor.

Data on the individual economic areas, neighborhoods and subdivisions are found in the STATISTICAL APPENDIX.

Conclusions

For this final analysis report, the minimum acceptable statistical standards allowed by the State Board of Equalization are:

ALLOWABLE STANDARDS RATIO GRID		
Property Class	**Unweighted Median Ratio**	**Coefficient of Dispersion**
Commercial/Industrial	Between .95-1.05	Less than 20.99
Residential Condominium	Between .95-1.05	Less than 15.99
Residential	Between .95-1.05	Less than 15.99
Vacant Land	Between .95-1.05	Less than 20.99

The results for Arapahoe County are:

Arapahoe County Ratio Grid					
Property Class	Number of Qualified Sales	Unweighted Median Ratio	Price Related Differential	Coefficient of Dispersion	Time Trend Analysis
Commercial/Industrial	351	0.985	1.022	8.2	Compliant
Residential	20,256	1.000	1.002	1.7	Compliant
Vacant Land	194	1.000	1.033	20.1	Compliant

After applying the above described methodologies, it is concluded from the sales ratios that Arapahoe County is in compliance with SBOE, DPT, and Colorado State Statute valuation guidelines.

Recommendations

None

TIME TRENDING VERIFICATION

Methodology

While we recommend that counties use the inverted ratio regression analysis method to account for market (time) trending, some counties have used other IAAO-approved methods, such as the weighted monthly median approach. We are not auditing the methods used, but rather the results of the methods used. Given this range of methodologies used to account for market trending, we concluded that the best validation method was to examine the sale ratios for each class across the appropriate sale period. To be specific, if a county has considered and adjusted correctly for market trending, then the sale ratios should remain stable (i.e. flat) across the sale period. If a residual market trend is detected, then the county may or may not have addressed market trending adequately, and a further examination is warranted. This validation method also considers the number of sales and the length of the sale period. Counties with few sales across the sale period were carefully examined to determine if the statistical results were valid.

Conclusions

After verification and analysis, it has been determined that Arapahoe County has complied with the statutory requirements to analyze the effects of time on value in their county. Arapahoe County has also satisfactorily applied the results of their time trending analysis to arrive at the time adjusted sales price (TASP).

Recommendations

None

SOLD/UNSOLD ANALYSIS

Methodology

Arapahoe County was tested for the equal treatment of sold and unsold properties to ensure that "sales chasing" has not occurred. The auditors employed a multi-step process to determine if sold and unsold properties were valued in a consistent manner.

We test the hypothesis that the assessor has valued unsold properties consistent with what is observed with the sold properties based on several units of comparison and tests. The units of comparison include the actual value per square foot and the change in value from the previous base year period to the current base year. The first test compares the actual value per square foot between sold and unsold properties by class. The median and mean value per square foot is compared and tested for any significant difference. This is tested using non-parametric methods, such as the Mann-Whitney test for differences in the distributions or medians between sold and unsold groups. It is also examined graphically and from an appraisal perspective. Data can be stratified based on location and subclass. The second test compares the difference in the median change in value from the previous base year to the current base year between sold and unsold properties by class. The same combination of non-parametric and appraisal testing is used as with the first test. A third test employing a valuation model testing a sold/unsold binary variable while controlling for property attributes such as location, size, age and other attributes. The model determines if the sold/unsold variable is statistically and empirically significant. If all three tests indicate a significant difference between sold and unsold properties for a given class, the Auditor may meet with the county to determine if sale chasing is actually occurring, or if there are other explanations for the observed difference.

If the unsold properties have a higher median value per square foot than the sold properties, or if the median change in value is greater for the unsold properties than the sold properties, the analysis is stopped and the county is concluded to be in compliance with sold and unsold guidelines. All sold and unsold properties in a given class are first tested, although properties with extreme unit values or percent changes can be trimmed to stabilize the analysis. The median is the primary comparison metric, although the mean can also be used as a comparison metric if the distribution supports that type of measure of central tendency.

The first test (unit value method) is applied to both residential and commercial/industrial sold and unsold properties. The second test is applied to sold and unsold vacant land properties. The second test (change in value method) is also applied to residential or commercial sold and unsold properties if the first test results in a significant difference observed and/or tested between sold and unsold properties. The third test (valuation modeling) is used in instances where the results from the first two tests indicate a significant difference between sold and unsold properties. It can also be used when the number of sold and unsold properties is so large that the non-parametric testing is indicating a false rejection of the hypothesis that there is no difference between the sold and unsold property values.

These tests were supported by both tabular and graphics presentations, along with written documentation explaining the methodology used.

Sold/Unsold Results	
Property Class	**Results**
Commercial/Industrial	Compliant
Residential	Compliant
Vacant Land	Compliant

Conclusions

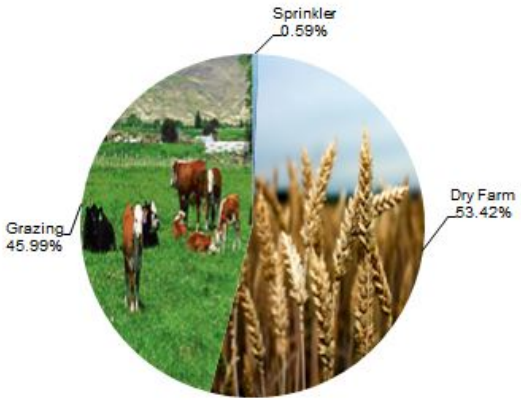
After applying the above described methodologies, it is concluded that Arapahoe County is reasonably treating its sold and unsold properties in the same manner.

Recommendations

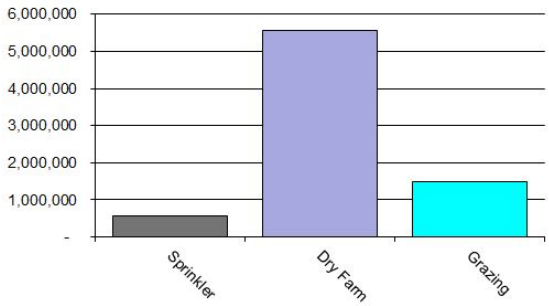
None

AGRICULTURAL LAND STUDY

Acres By Subclass



Value By Subclass



Agricultural Land

County records were reviewed to determine major land categories such as irrigated farm, dry farm, meadow hay, grazing and other lands. In addition, county records were reviewed in order to determine if: Aerial photographs are available and are being used; soil conservation guidelines have been used to classify lands based on productivity; crop rotations have been documented; typical commodities and yields have been determined; orchard lands have been properly classified and valued; expenses reflect a ten year average and are typical landlord expenses; grazing lands have been properly classified and valued; the number of acres in each class and subclass have been determined; the capitalization rate was properly applied. Also, documentation was required for the valuation methods used and any locally developed yields, carrying capacities, and expenses. Records were also checked to ensure that the commodity prices and expenses, furnished by the Property Tax Administrator (PTA), were applied properly. (See Assessor Reference Library Volume 3 Chapter 5.)

Conclusions

An analysis of the agricultural land data indicates an acceptable appraisal of this property type. Directives, commodity prices and expenses provided by the PTA were properly applied. County yields compared favorably to those published by Colorado Agricultural Statistics. Expenses used by the county were allowable expenses and were in an acceptable range. Grazing lands carrying capacities were in an acceptable range. The data analyzed resulted in the following ratios:

Arapahoe County Agricultural Land Ratio Grid						
Abstract Code	Land Class	Number Of Acres	County Value Per Acre	County Assessed Total Value	WRA Total Value	Ratio
4107	Sprinkler	1,799	310.30	558,223	562,863	0.99
4127	Dry Farm	161,692	34.37	5,557,104	5,505,432	1.01
4147	Grazing	139,198	10.72	1,491,582	1,491,582	1.00
Total/Avg		**309,436**	**24.58**	**7,606,909**	**7,559,878**	**1.01**

Recommendations

None

Agricultural Outbuildings

Methodology

Data was collected and reviewed to determine if the guidelines found in the Assessor's Reference Library (ARL) Volume 3, pages 5.74 through 5.77 were being followed.

Conclusions

Arapahoe County has substantially complied with the procedures provided by the Division of Property Taxation for the valuation of agricultural outbuildings.

Recommendations

None

Agricultural Land Under Improvements

Methodology

Data was collected and reviewed to determine if the guidelines found in the Assessor's Reference Library (ARL) Volume 3, pages 5.19 and 5.20 were being followed.

Conclusions

Arapahoe County has used the following methods to discover land under a residential improvement on a farm or ranch that is determined to be not integral under 39-1-102, C.R.S.:

- Questionnaires
- Field Inspections
- Phone Interviews
- In-Person Interviews with Owners/Tenants
- Written Correspondence other than Questionnaire
- Aerial Photography/Pictometry

Arapahoe County has used the following methods to discover the land area under a residential improvement that is determined to be not integral under 39-1-102, C.R.S.:

- Property Record Card Analysis
- Questionnaires
- Field Inspections
- Phone Interviews
- In-Person Interviews with Owners/Tenants
- Written Correspondence other than Questionnaire

Arapahoe County has substantially complied with the procedures provided by the Division of Property Taxation for the valuation of land under residential improvements that may or may not be integral to an agricultural operation.

Recommendations

None

SALES VERIFICATION

According to Colorado Revised Statutes:

A representative body of sales is required when considering the market approach to appraisal.

(8) In any case in which sales prices of comparable properties within any class or subclass are utilized when considering the market approach to appraisal in the determination of actual value of any taxable property, the following limitations and conditions shall apply:

(a)(I) Use of the market approach shall require a representative body of sales, including sales by a lender or government, sufficient to set a pattern, and appraisals shall reflect due consideration of the degree of comparability of sales, including the extent of similarities and dissimilarities among properties that are compared for assessment purposes. In order to obtain a reasonable sample and to reduce sudden price changes or fluctuations, all sales shall be included in the sample that reasonably reflect a true or typical sales price during the period specified in section 39-1-104 (10.2). Sales of personal property exempt pursuant to the provisions of sections 39-3-102, 39-3-103, and 39-3-119 to 39-3-122 shall not be included in any such sample.

(b) Each such sale included in the sample shall be coded to indicate a typical, negotiated sale, as screened and verified by the assessor. (39-1-103, C.R.S.)

The assessor is required to use sales of real property only in the valuation process.

(8)(f) Such true and typical sales shall include only those sales which have been determined on an individual basis to reflect the selling price of the real property only or which have been adjusted on an individual basis to reflect the selling price of the real property only. (39-1-103, C.R.S.)

Part of the Property Assessment Study is the sales verification analysis. WRA has used the above-cited statutes as a guide in our study of the county's procedures and practices for verifying sales.

WRA reviewed the sales verification procedures in 2021 for Arapahoe County. This study was conducted by checking selected sales from the master sales list for the current valuation period. Specifically WRA selected 60 sales listed as unqualified.

All but two of the sales selected in the sample gave reasons that were clear and supportable. Two sales had insufficient reason for disqualification.

For residential, commercial, and vacant land sales with considerations over $100,000, the contractor has examined and reported the ratio of qualified sales to total sales by class and performed the following analyses of unqualified sales:

> The contractor has examined the manner in which sales have been classified as qualified or unqualified, including a listing of each step in the sales verification process, any adjustment procedures, and the county official responsible for making the final decision on qualification.
>
> When less than 50 percent of sales are qualified in any of the three property classes (residential, commercial, and vacant land), the contractor analyzed the reasons for disqualifying sales in any subclass that constitutes at least 20 percent of the class, either by number

of properties or by value, from the prior year. The contractor has reviewed with the assessor any analysis indicating that sales data are inadequate, fail to reflect typical properties, or have been disqualified for insufficient cause. In addition, the contractor has reviewed the disqualified sales by assigned code. If there appears to be any inconsistency in the coding, the contractor has conducted further analysis to determine if the sales included in that code have been assigned appropriately.

If 50 percent or more of the sales are qualified, the contractor has reviewed a statistically significant sample of unqualified sales, excluding sales that were disqualified for obvious reasons.

Arapahoe County did not qualify for in-depth subclass analysis.

Conclusions

Arapahoe County appears to be doing an adequate job of verifying their sales.

Recommendations

None

ECONOMIC AREA REVIEW AND EVALUATION

Methodology

Arapahoe County has submitted a written narrative describing the economic areas that make up the county's market areas. Arapahoe County has also submitted a map illustrating these areas. Each of these narratives have been read and analyzed for logic and appraisal sensibility. The maps were also compared to the narrative for consistency between the written description and the map.

Conclusions

After review and analysis, it has been determined that Arapahoe County has adequately identified homogeneous economic areas comprised of smaller neighborhoods. Each economic area defined is equally subject to a set of economic forces that impact the value of the properties within that geographic area and this has been adequately addressed. Each economic area defined adequately delineates an area that will give "similar values for similar properties in similar areas."

Recommendations

None

NATURAL RESOURCES

Earth and Stone Products

Methodology

Under the guidelines of the Assessor's Reference Library (ARL), Volume 3, Natural Resource Valuation Procedures, the income approach was applied to determine value for production of earth and stone products. The number of tons was multiplied by an economic royalty rate determined by the Division of Property Taxation to determine income. The income was multiplied by a recommended Hoskold factor to determine the actual value. The Hoskold factor is determined by the life of the reserves or the lease. Value is based on two variables: life and tonnage. The operator determines these since there is no other means to obtain production data through any state or private agency.

Conclusions

The County has applied the correct formulas and state guidelines to earth and stone production.

Recommendations

None

Producing Oil and Gas

Methodology

Assessors Reference Library (ARL) Volume 3, Chapter 6: Valuation of Natural Resources

STATUTORY REFERENCES

Section § 39-1-103, C.R.S., specifies that producing oil or gas leaseholds and lands are valued according to article 7 of title 39, C.R.S.

Actual value determined - when.

(2) The valuation for assessment of leaseholds and lands producing oil or gas shall be determined as provided in article 7 of this title.

§ 39-1-103, C.R.S.

Article 7 covers the listing, valuation, and assessment of producing oil and gas leaseholds and lands.

Valuation:

Valuation for assessment.

(1) Except as provided in subsection (2) of this section, on the basis of the information contained in such statement, the assessor shall value such oil and gas leaseholds and lands for assessment, as real property, at an amount equal to eighty-seven and one-half percent of:

(a) The selling price of the oil or gas sold there from during the preceding calendar year, after excluding the selling price of all oil or gas delivered to the United States government or any agency thereof, the state of Colorado or any agency thereof, or any political subdivision of the state as royalty during the preceding calendar year;

(b) The selling price of oil or gas sold in the same field area for oil or gas transported from the premises which is not sold during the preceding calendar year, after excluding the selling price of all oil or gas delivered to the United States government or any agency thereof, the state of Colorado or any agency thereof, or any political subdivision of the state as royalty during the preceding calendar year.

§ 39-7-102, C.R.S.

Conclusions

The county applied approved appraisal procedures in the valuation of oil and gas.

Recommendations

None

VACANT LAND

Subdivision Discounting

Subdivisions were reviewed in 2021 in Arapahoe County. The review showed that subdivisions were discounted pursuant to the Colorado Revised Statutes in Article 39-1-103 (14). Discounting procedures were applied to all subdivisions where less than 80 percent of all sites were sold using the present worth method. The market approach was applied where 80 percent or more of the subdivision sites were sold. An absorption period was estimated for each subdivision that was discounted. An appropriate discount rate was developed using the summation method. Subdivision land with structures was appraised at full market value.

Conclusions

Arapahoe County has implemented proper procedures to adequately estimate absorption periods, discount rates, and lot values for qualifying subdivisions.

Recommendations

None

POSSESSORY INTEREST PROPERTIES

Possessory Interest

Possessory interest property discovery and valuation is described in the Assessor's Reference Library (ARL) Volume 3 section 7 in accordance with the requirements of Chapter 39-1-103 (17)(a) (II) C.R.S. Possessory Interest is defined by the Property Tax Administrator's Publication ARL Volume 3, Chapter 7: A private property interest in government-owned property or the right to the occupancy and use of any benefit in government-owned property that has been granted under lease, permit, license, concession, contract, or other agreement.

Arapahoe County has been reviewed for their procedures and adherence to guidelines when assessing and valuing agricultural and commercial possessory interest properties. The county has also been queried as to their confidence that the possessory interest properties have been discovered and placed on the tax rolls.

Conclusions

Arapahoe County has implemented a discovery process to place possessory interest properties on the roll. They have also correctly and consistently applied the correct procedures and valuation methods in the valuation of possessory interest properties.

Recommendations

None

PERSONAL PROPERTY AUDIT

Arapahoe County was studied for its procedural compliance with the personal property assessment outlined in the Assessor's Reference Library (ARL) Volume 5, and in the State Board of Equalization (SBOE) requirements for the assessment of personal property. The SBOE requires that counties use ARL Volume 5, including current discovery, classification, documentation procedures, current economic lives table, cost factor tables, depreciation table, and level of value adjustment factor table.

The personal property audit standards narrative must be in place and current. A listing of businesses that have been audited by the assessor within the twelve-month period reflected in the plan is given to the auditor. The audited businesses must be in conformity with those described in the plan.

Aggregate ratio will be determined solely from the personal property accounts that have been physically inspected. The minimum assessment sample is one percent or ten schedules, whichever is greater, and the maximum assessment audit sample is 100 schedules.

For the counties having over 100,000 population, WRA selected a sample of all personal property schedules to determine whether the assessor is correctly applying the provisions of law and manuals of the Property Tax Administrator in arriving at the assessment levels of such property. This sample was selected from the personal property schedules audited by the assessor. In no event was the sample selected by the contractor less than 30 schedules. The counties to be included in this study are Adams, Arapahoe, Boulder, Denver, Douglas, El Paso, Jefferson, Larimer, Mesa, Pueblo, and Weld. All other counties received a procedural study.

Arapahoe County is compliant with the guidelines set forth in ARL Volume 5 regarding discovery procedures, using the following methods to discover personal property accounts in the county:

- Public Record Documents
- Chamber of Commerce/Economic Development Contacts
- Personal Observation, Physical Canvassing or Word of Mouth
- All properties in TIF locations
- 1/3 of county annually

The county uses the Division of Property Taxation (DPT) recommended classification and documentation procedures. The DPT's recommended cost factor tables, depreciation tables and level of value adjustment factor tables are also used.

Arapahoe County submitted their personal property written audit plan and was current for the 2021 valuation period. The number and listing of businesses audited was also submitted and was in conformance with the written audit plan. The following audit triggers were used by the county to select accounts to be audited:

- New businesses filing for the first time
- Incomplete or inconsistent declarations
- Businesses with no deletions or additions for 2 or more years
- Non-filing Accounts - Best Information Available
- Accounts protested with substantial disagreement

Arapahoe County's median ratio is 1.00. This is in compliance with the State Board of Equalization (SBOE) compliance requirements

which range from .90 to 1.10 with no COD requirements.

Conclusions

Arapahoe County has employed adequate discovery, classification, documentation, valuation, and auditing procedures for their personal property assessment and is in statistical compliance with SBOE requirements.

Recommendations

None

WILDROSE AUDITOR STAFF

Harry J. Fuller, *Audit Project Manager*

Suzanne Howard, *Audit Administrative Manager*

Steve Kane, *Audit Statistician*

Carl W. Ross, *Agricultural/Natural Resource Analyst*

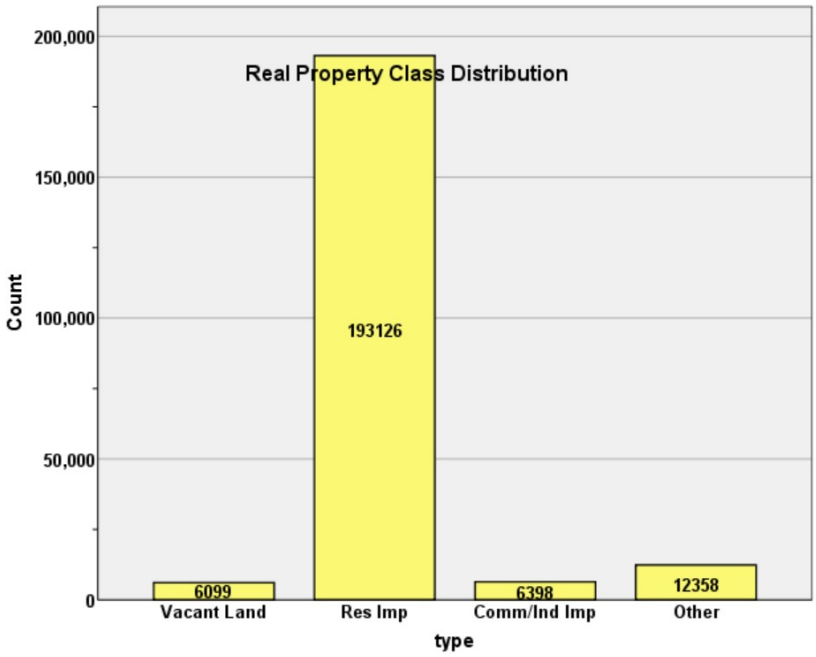
J. Andrew Rodriguez, *Field Analyst*

STATISTICAL APPENDIX

STATISTICAL COMPLIANCE REPORT
FOR ARAPAHOE COUNTY
2021

I. OVERVIEW

Arapahoe County is an urban county that is part of the Denver metropolitan area. The county has a total of 217,981 real property parcels, according to data submitted by the county assessor's office in 2021. The following provides a breakdown of property classes for this county:



The vacant land class of properties was dominated by residential land. Residential and PUD lots (coded 100 and 400) accounted for 78.1% of all vacant land parcels.

For residential improved properties, single family properties accounted 84.6% of all residential properties. The next significant subclass of properties was condominiums (coded 1230), which accounted for 14.3% of all properties.

Commercial and industrial properties represented a much smaller proportion of property classes in comparison. Commercial/industrial sales accounted for 2.85% of all such properties in this county.

Based on the Audit questionnaire filled out by the assessor, the assessor uses economic area, neighborhood and subdivision levels in the valuation of residential properties. For this analysis, we will analyze economic area and neighborhood in the following stratified sales ratio and sold/unsold comparison analyses.

Based on the Audit questionnaire, Arapahoe County residential models are developed by region, not economic area or neighborhood. The model results are further refined by a comparable sale selection process at a local level.

Based on information from the assessor, we will stratify residential properties by economic area and by neighborhood, the latter for neighborhoods with at least 30 sales.

II. DATA FILES

The following sales analyses were based on the requirements of the 2021 Colorado Property Assessment Study. Information was provided by the Arapahoe Assessor's Office in April 2021. The data included all 5 property record files as specified by the Auditor.

III. RESIDENTIAL SALES RESULTS

There were 20,256 qualified residential sales for the 24-month sale period ending June 30, 2020. The sales ratio analysis was as follows:

Ratio Statistics

Median	**1.000**
Price Related Differential	**1.002**
Coefficient of Dispersion	**1.7**

We next stratified the sales ratio analysis by economic area and by neighborhoods, the latter with at least 30 sales:

Case Processing Summary

		Count	Percent
ECONAREA	1.00	9	0.0%
	2.00	85	0.4%
	3.00	285	1.4%
	4.00	565	2.8%
	5.00	777	3.8%
	6.00	229	1.1%
	7.00	633	3.1%
	8.00	3885	19.2%
	10.00	1944	9.6%
	11.00	4445	22.0%
	12.00	282	1.4%
	13.00	472	2.3%
	14.00	1122	5.6%
	15.00	148	0.7%
	16.00	662	3.3%
	18.00	4295	21.3%
	19.00	280	1.4%
	103.00	2	0.0%
	104.00	22	0.1%
	105.00	1	0.0%
	106.00	7	0.0%
	108.00	2	0.0%

	109.00	2	0.0%
	110.00	1	0.0%
	111.00	1	0.0%
	112.00	10	0.0%
	113.00	20	0.1%
	114.00	6	0.0%
	117.00	2	0.0%
Overall		20194	100.0%
Excluded		62	
Total		20256	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion
1.00	1.000	1.001	.007
2.00	1.000	1.001	.013
3.00	1.001	1.002	.015
4.00	1.000	1.001	.019
5.00	1.000	1.001	.014
6.00	.999	1.001	.014
7.00	1.000	1.001	.014
8.00	1.000	1.001	.018
10.00	1.000	1.001	.014
11.00	1.001	1.001	.021
12.00	1.000	1.002	.020
13.00	1.000	1.001	.014
14.00	1.000	1.001	.016
15.00	1.000	1.002	.014
16.00	1.000	1.001	.012
18.00	1.000	1.001	.016
19.00	1.000	1.000	.011
103.00	.961	1.048	.047
104.00	.974	1.001	.043
105.00	.917	1.000	.000
106.00	.962	.996	.026
108.00	1.042	1.001	.002
109.00	1.352	1.321	.268
110.00	.925	1.000	.000
111.00	.792	1.000	.000
112.00	.959	1.015	.045
113.00	.973	.996	.038
114.00	.935	.972	.037
117.00	1.002	1.004	.004
Overall	1.000	1.003	.017

For the 21 economic areas with at least 20 sales, the median sales ratio and coefficient of dispersion metrics were all in compliance. We next stratified residential sales by neighborhoods with at least 30 sales, as follows:

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion
2	1.005	1.001	.020
8	1.001	1.001	.012
11	1.000	1.001	.016
22	.999	1.000	.014
23	.996	1.001	.020
26	1.000	1.000	.010
32	1.002	1.002	.037
36	1.000	1.000	.012
38	1.000	1.000	.011
40	1.001	1.000	.012
87	1.001	1.000	.008
91	1.000	1.002	.039
102	.999	1.001	.022
110	.999	1.001	.011
111	1.001	1.001	.014
112	1.001	1.000	.015
119	1.001	1.000	.009
126	1.001	1.001	.014
148	1.002	1.000	.011
149	1.000	1.001	.013
157	1.003	1.001	.015
164	1.002	1.000	.026
173	.999	1.001	.030
178	.997	1.001	.014
183	1.001	1.000	.017
218	.998	1.002	.033
226	.999	1.002	.020
247	1.001	1.001	.016
248	.999	1.001	.013
262	1.001	1.003	.032
263	1.000	1.001	.015
264	1.000	1.001	.008
271	1.000	1.000	.007
272	1.003	1.001	.015
273	1.000	1.001	.021
277	1.000	1.001	.016
284	1.001	1.001	.014
285	.999	1.001	.014
288	1.000	1.000	.015
304	.999	1.001	.019
324	1.002	1.001	.024
344	1.001	1.003	.047
349	.998	1.000	.016
372	.998	1.001	.018
374	.999	1.000	.012
380	1.000	1.000	.012
387	1.000	1.001	.014
391	.999	1.001	.016
410	1.000	1.000	.018
457	1.000	1.001	.009
458	1.000	1.001	.015
509	1.000	1.000	.009

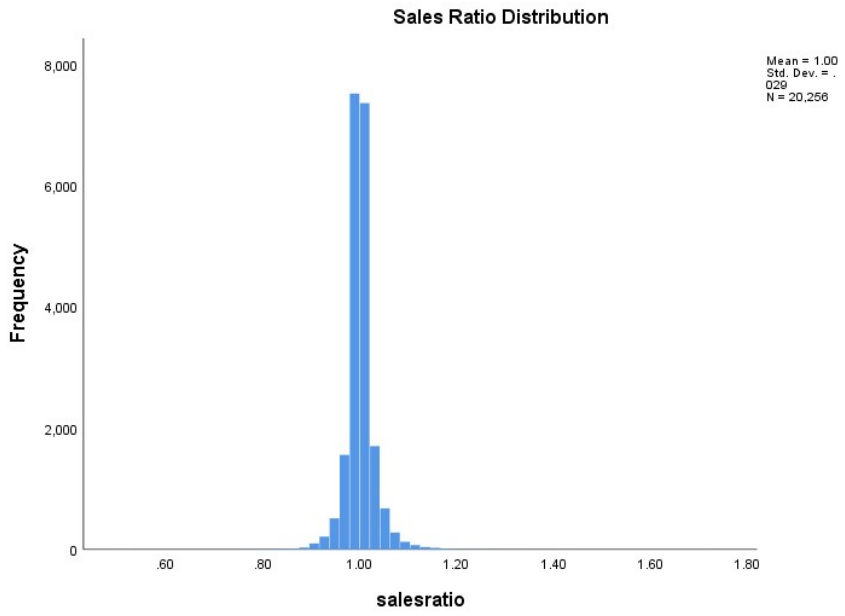
570	1.001	1.000	.011
594	.995	1.003	.041
596	1.000	1.001	.016
601	1.003	1.001	.025
606	1.000	1.002	.030
607	1.001	1.001	.017
608	.999	1.001	.028
609	.998	1.001	.018
613	1.002	1.001	.019
614	1.003	1.002	.022
616	1.013	1.000	.039
619	1.000	1.001	.023
628	1.009	1.001	.025
629	1.004	1.001	.013
630	1.003	1.000	.020
648	.999	1.001	.015
654	1.000	1.000	.014
655	1.002	1.001	.027
661	.999	1.001	.016
683	.999	1.000	.015
701	1.000	1.000	.016
702	.998	1.000	.014
718	1.001	1.002	.024
758	.993	1.000	.019
759	1.011	1.001	.027
761	1.000	1.001	.014
763	1.000	1.001	.011
774	1.002	1.001	.017
790	1.000	1.001	.012
791	1.001	1.000	.012
847	1.001	1.001	.014
866	1.000	1.001	.011
881	.995	1.001	.022
915	1.001	1.000	.013
960	1.000	1.001	.010
961	1.008	1.002	.037
979	1.000	1.001	.015
980	1.001	1.001	.022
1018	1.000	1.000	.009
1021	1.000	1.000	.010
1040	.996	1.002	.026
1041	1.000	1.000	.010
1046	1.000	1.001	.020
1047	.999	1.000	.017
1054	.999	1.001	.013
1172	1.002	1.001	.027
1173	1.000	1.001	.021
1202	1.004	1.002	.018
1210	1.000	1.001	.020
1291	1.000	1.001	.009
1313	1.000	1.000	.009
1324	1.000	1.001	.014
1386	.999	1.000	.013
1394	1.001	1.001	.020
1454	1.000	1.000	.009
1456	1.009	1.002	.042
1476	.999	1.000	.010

1510	1.001	1.001	.017
1526	1.001	1.001	.012
1564	1.000	1.001	.018
1566	1.001	1.001	.008
1583	1.000	1.000	.010
1584	1.003	1.001	.019
1586	1.000	1.000	.009
1588	1.000	1.001	.012
1589	.999	1.000	.012
1590	1.001	1.001	.013
1591	1.000	1.001	.019
1594	.999	1.000	.011
1647	.999	1.001	.016
1654	1.004	1.002	.030
1659	.999	1.001	.024
1725	.999	1.001	.018
1750	.995	1.001	.025
1751	.999	1.001	.010
1753	1.011	1.000	.036
1754	.999	1.000	.008
1763	1.000	1.000	.011
1766	1.001	1.000	.011
1808	1.001	1.001	.013
1811	1.004	1.002	.031
1819	1.000	1.001	.022
1860	1.000	1.001	.017
1863	1.001	1.001	.009
1866	1.000	1.000	.012
1907	1.002	1.001	.013
1913	.999	1.000	.011
1918	.996	1.001	.028
1921	1.001	1.000	.011
1923	1.000	1.001	.016
1936	1.000	1.000	.007
1939	1.000	1.001	.022
1940	1.000	1.000	.011
1943	1.002	1.001	.019
1947	.999	1.002	.032
1956	.999	1.001	.014
1978	1.001	1.001	.016
1982	1.001	1.001	.018
1983	1.003	1.001	.023
1984	1.000	1.001	.023
1987	.995	1.001	.024
2000	1.000	1.000	.008
2007	1.000	1.000	.014
2014	1.003	1.000	.010
2017	.999	1.001	.015
2025	1.001	1.002	.030
2050	.999	1.001	.019
2052	1.001	1.001	.018
2053	1.002	1.001	.022
2060	1.000	1.001	.016
2065	.966	1.007	.071
2074	.999	1.001	.016
2076	1.011	1.003	.036
2083	1.003	1.000	.015

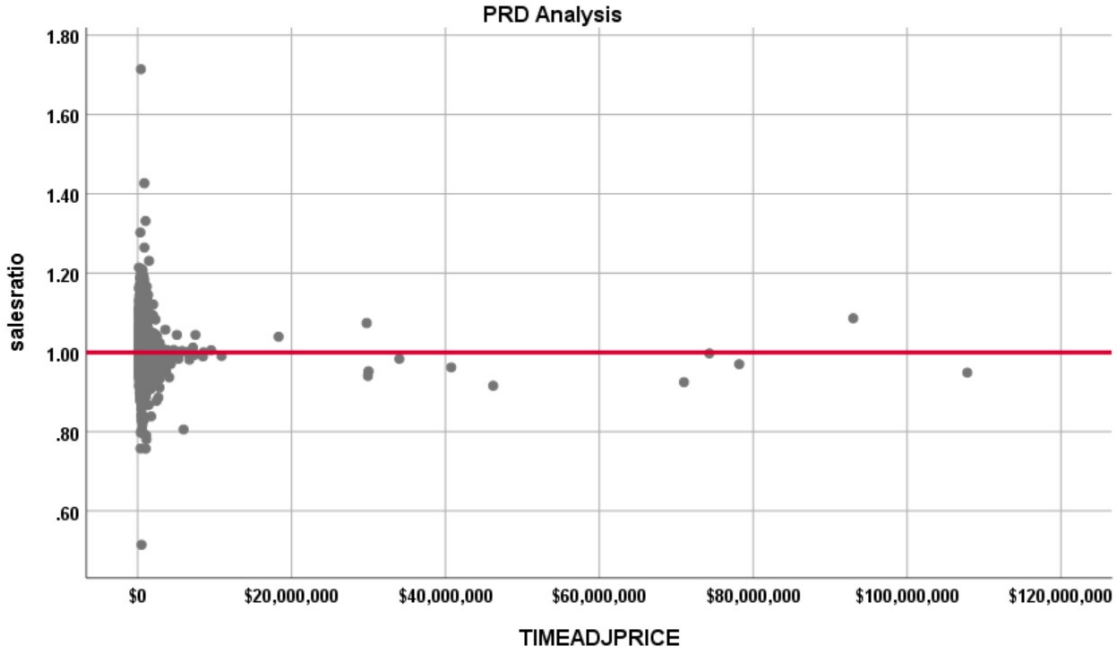
2085	1.001	1.001	.031
2086	1.000	1.001	.022
2088	1.012	1.003	.047
2089	1.015	1.006	.049
2101	1.001	1.001	.012
2102	.999	1.001	.016
2103	1.002	1.001	.012
2106	.991	1.003	.038
2107	1.000	1.002	.016
2108	.994	1.002	.036
2126	1.001	1.001	.017
2131	.999	1.001	.021
2159	1.000	1.000	.006
2161	.999	1.000	.012
2162	1.000	1.001	.018
2172	1.000	1.001	.013
2175	1.000	1.001	.012
2176	.999	1.000	.008
2179	1.000	1.000	.012
2181	1.001	1.001	.020
2238	1.000	1.001	.021
2250	1.000	1.001	.019
2270	.999	1.002	.021
2276	1.003	1.001	.020
2289	1.006	1.001	.027
2291	1.004	1.002	.033
2292	1.002	1.000	.012
2294	1.000	1.000	.013
2300	1.000	1.001	.014
2306	1.000	1.000	.015
2313	1.000	1.000	.012
2314	.999	1.001	.012
2316	.999	1.000	.015
2317	.999	1.000	.009
2324	.999	1.001	.013
2327	1.000	1.000	.013
2329	1.002	1.001	.017
2332	1.003	1.001	.018
2333	1.004	1.001	.030
2334	.997	1.001	.023
2335	1.019	1.002	.034
2353	1.003	1.001	.019
2363	1.001	1.001	.011
2405	1.001	1.001	.011
2414	1.000	1.001	.015
2437	1.002	1.001	.015
2448	1.001	1.002	.041
2465	.999	1.001	.017
2473	1.000	1.001	.015
2477	1.011	1.002	.039
2500	1.002	1.000	.017
2514	.998	1.001	.028
2516	1.000	1.000	.012
2518	1.001	1.001	.014
2549	1.000	1.000	.011
2610	1.006	1.004	.036
2613	1.000	1.001	.015

2752	.999	1.001	.016
2764	1.000	1.001	.014
2801	.999	1.000	.019
2902	1.001	1.000	.008
2905	1.000	1.000	.005
2906	.999	1.001	.014
2938	1.000	1.000	.007
2939	1.001	1.001	.014
Overall	1.000	1.001	.019

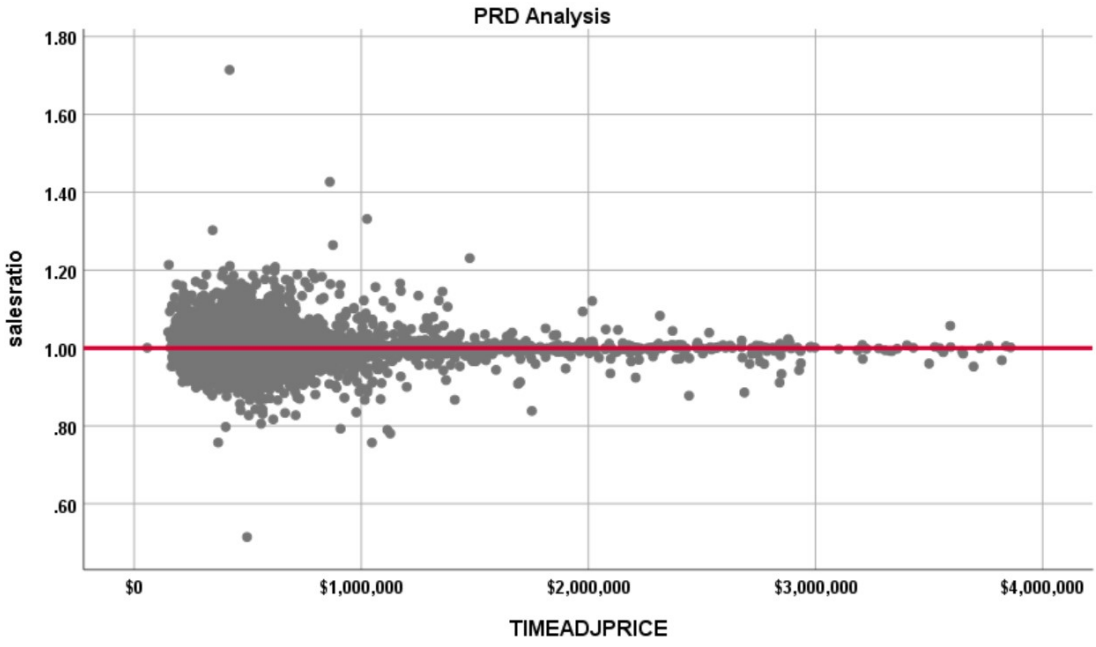
The above ratio statistics, stratified by neighborhoods, were in compliance with the standards set forth by the Colorado State Board of Equalization (SBOE) for the overall residential sales. The following graphs describe further the sales ratio distribution for all of these properties:



ALL SALES



SALES LESS THAN $4,000,000



The Price-Related Differential (PRD) for all sales is 1.002; for the sales less than $4,000,000 in the above graph, the PRD is 1.001. Both were within the IAAO standards for the PRD. We also performed a regression analysis between the sales ratio and the assessor's current value to further test for regressivity or progressivity in the residential sales valuation, as follows:

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.001	.000		2380.291	.000
	CurrTot	7.097E-10	.000	.007	.941	.347

a. Dependent Variable: salesratio

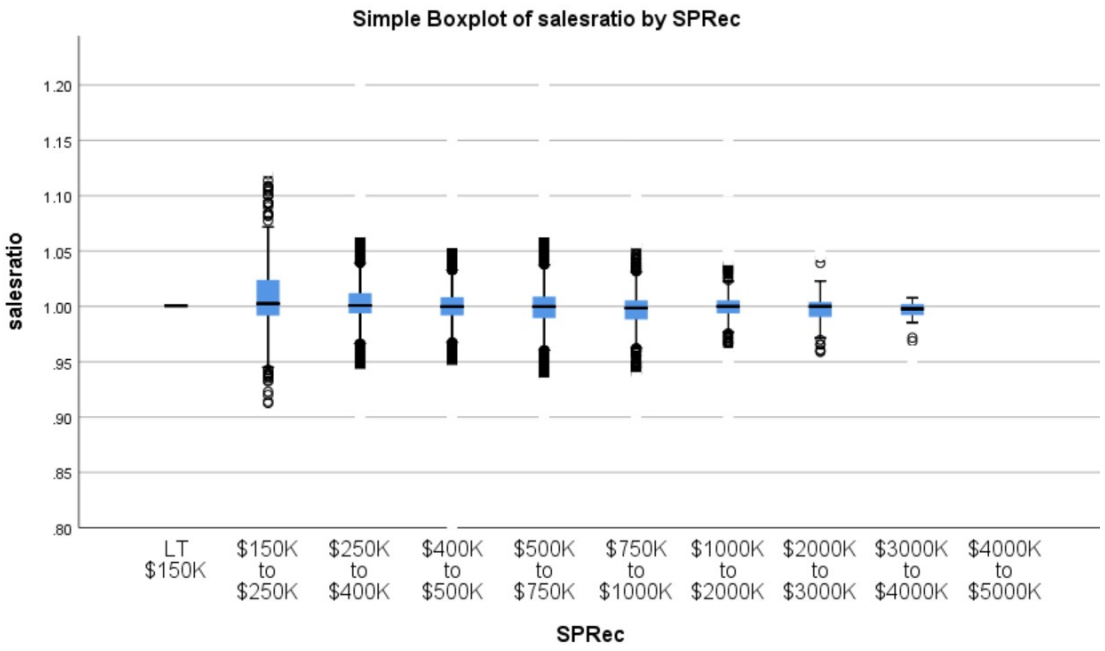
The slope of the line is not significant, which indicates that sales ratios are similar across the entire sale price array. We also stratified the sales ratio analysis by the sale price range, as follows:

Case Processing Summary

		Count	Percent
SPRec	LT $150K	1	0.0%
	$150K to $250K	575	2.8%
	$250K to $400K	7597	37.6%
	$400K to $500K	5974	29.5%
	$500K to $750K	4675	23.1%
	$750K to $1000K	742	3.7%
	$1000K to $2000K	508	2.5%
	$2000K to $3000K	120	0.6%
	$3000K to $4000K	26	0.1%
Overall		20218	100.0%
Excluded		0	
Total		20218	

Ratio Statistics for CurrTot / TASP

Group	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
LT $150K	1.000	.000	.
$150K to $250K	1.001	.024	3.7%
$250K to $400K	1.000	.016	2.5%
$400K to $500K	1.000	.016	2.9%
$500K to $750K	1.000	.019	3.1%
$750K to $1000K	1.000	.020	3.8%
$1000K to $2000K	1.000	.020	4.1%
$2000K to $3000K	1.001	.016	2.9%
$3000K to $4000K	1.000	.011	1.9%
Overall	1.001	.017	2.9%



Note: Blue box area in chart above denotes 25% to 75% of sales ratios per category, while the whiskers beyond the blue boxes denote 10% to 90% of the sales ratios by category.

The above box and whisker chart indicates that the sales ratio distribution was more or less consistent across the sale price range for Arapahoe County.

Residential Market Trend Analysis

We next analyzed the residential dataset using the 24-month sale period, with the following results:

Coefficients[a]

ECONAREA	Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
.	1	(Constant)	.999	.005		187.531	.000
		SalePeriod	.000	.000	.059	.439	.662
1.00	1	(Constant)	.997	.004		222.633	.000
		SalePeriod	.001	.000	.532	1.664	.140
2.00	1	(Constant)	.997	.004		221.961	.000
		SalePeriod	.000	.000	.168	1.552	.124
3.00	1	(Constant)	1.001	.003		352.680	.000
		SalePeriod	-3.692E-5	.000	-.011	-.178	.859
4.00	1	(Constant)	1.002	.003		375.000	.000
		SalePeriod	.000	.000	-.025	-.604	.546
5.00	1	(Constant)	1.002	.002		574.205	.000
		SalePeriod	-2.841E-5	.000	-.008	-.221	.825
6.00	1	(Constant)	.997	.003		334.241	.000
		SalePeriod	.000	.000	.053	.804	.422

7.00	1	(Constant)	1.002	.002		553.392	.000
		SalePeriod	-8.090E-5	.000	-.025	-.629	.529
8.00	1	(Constant)	1.002	.001		1246.597	.000
		SalePeriod	-6.699E-5	.000	-.017	-1.077	.281
10.00	1	(Constant)	1.001	.001		965.154	.000
		SalePeriod	-8.474E-5	.000	-.025	-1.081	.280
11.00	1	(Constant)	1.003	.001		981.717	.000
		SalePeriod	2.481E-5	.000	.005	.333	.739
12.00	1	(Constant)	.997	.006		157.421	.000
		SalePeriod	.001	.000	.092	1.504	.134
13.00	1	(Constant)	1.004	.002		402.103	.000
		SalePeriod	.000	.000	-.086	-1.865	.063
14.00	1	(Constant)	1.002	.002		585.556	.000
		SalePeriod	-2.047E-5	.000	-.005	-.153	.878
15.00	1	(Constant)	1.000	.005		214.286	.000
		SalePeriod	-8.236E-5	.000	-.020	-.246	.806
16.00	1	(Constant)	1.000	.002		604.469	.000
		SalePeriod	1.725E-5	.000	.005	.137	.891
18.00	1	(Constant)	1.002	.001		1312.855	.000
		SalePeriod	-3.941E-5	.000	-.011	-.693	.488
19.00	1	(Constant)	1.002	.002		489.545	.000
		SalePeriod	.000	.000	-.094	-1.572	.117

a. Dependent Variable: salesratio

The above analysis indicated that no significant residential market trend was present in the sale data within each economic area. We concluded that the assessor has adequately adjusted for market trending for residential properties.

Sold/Unsold Analysis

In terms of the valuation consistency between sold and unsold residential properties, we compared the median actual value per square foot for 2021 between each group. The following results present the overall results, as well as by economic area, for sold and unsold properties:

Report
VALSF

sold	N	Median	Mean
UNSOLD	172774	$236	$257
SOLD	20255	$244	$264

Report
VALSF

ECONAREA	sold	N	Median	Mean
1.00	UNSOLD	323	$361	$349
	SOLD	9	$305	$311
2.00	UNSOLD	971	$314	$315
	SOLD	85	$355	$356
3.00	UNSOLD	5075	$230	$243
	SOLD	285	$242	$258
4.00	UNSOLD	5081	$259	$260
	SOLD	565	$281	$282

5.00	UNSOLD	8037	$219	$230
	SOLD	777	$233	$246
6.00	UNSOLD	3463	$205	$215
	SOLD	229	$221	$232
7.00	UNSOLD	7703	$202	$207
	SOLD	633	$214	$218
8.00	UNSOLD	29028	$214	$223
	SOLD	3885	$221	$230
10.00	UNSOLD	23666	$257	$271
	SOLD	1944	$278	$293
11.00	UNSOLD	27342	$230	$241
	SOLD	4445	$235	$247
12.00	UNSOLD	3507	$438	$471
	SOLD	282	$451	$476
13.00	**UNSOLD**	**6234**	**$302**	**$309**
	SOLD	**472**	**$350**	**$347**
14.00	UNSOLD	8399	$359	$404
	SOLD	1122	$378	$395
15.00	UNSOLD	1470	$303	$301
	SOLD	148	$313	$319
16.00	UNSOLD	6844	$272	$295
	SOLD	661	$280	$305
18.00	UNSOLD	30177	$225	$235
	SOLD	4295	$236	$244
19.00	UNSOLD	1288	$246	$250
	SOLD	280	$228	$238
104.00	UNSOLD	143	$197	$195
	SOLD	22	$228	$218
112.00	UNSOLD	39	$209	$227
	SOLD	10	$239	$236
113.00	UNSOLD	187	$202	$207
	SOLD	20	$210	$225

There was one economic areas with greater than 10 percent difference in the median value per square foot between sold and unsold properties (in red) – for this economic area, we next compared the median change in taxable years 2019 and 2021 between sold and unsold properties for these two economic areas. This test indicated a difference of less than 5 percent. Based on these results, we concluded that there was no significant gap in value between residential sold and unsold properties by economic area for Arapahoe County.

We next compared residential sold and unsold properties for neighborhood with at least 25 sales using the median value per square foot method. Neighborhoods with more than a 10 percent difference in either sold/unsold test were identified, as follows:

VALSF							DIFF					
NBHD		N	Median	Mean	Med Diff	Mean Diff	NBHD		N	Median	Mean	Med Diff	Mean Diff
157	.00	362	273.9465	283.1689			157	.00	362	1.0373	1.0382		
	1.00	37	303.9873	312.1920	11%	10%		1.00	37	1.1411	1.1340	10%	9%
	Total	399	275.9576	285.8602				Total	399	1.0411	1.0471		
179	.00	405	262.5958	267.7275			179	.00	405	1.0176	1.0201		
	1.00	25	295.3978	296.3043	12%	11%		1.00	25	1.1227	1.1322	10%	11%
	Total	430	263.8068	269.3889				Total	430	1.0234	1.0266		
271	.00	319	282.0745	284.3768			271	.00	319	0.9627	0.9902		
	1.00	43	311.7708	322.6931	11%	13%		1.00	43	1.1629	1.1518	21%	16%
	Total	362	286.4123	288.9282				Total	362	0.9717	1.0094		
702	.00	22	340.8921	332.8860			702	.00	22	1.1091	1.3121		
	1.00	32	305.9404	302.0189	-10%	-9%		1.00	32	0.9997	1.0002	-10%	-24%
	Total	54	315.2692	314.5944				Total	54	1.0207	1.1273		
1202	.00	264	269.1675	274.1274			1202	.00	264	1.0491	1.0474		
	1.00	35	298.2270	300.7725	11%	10%		1.00	35	1.1423	1.1549	9%	10%
	Total	299	273.6493	277.2464				Total	299	1.0625	1.0600		
2500	.00	791	317.5000	317.0876			2500	.00	791	1.0169	1.0256		
	1.00	81	365.2834	364.3221	15%	15%		1.00	81	1.0943	1.1117	8%	8%
	Total	872	319.4645	321.4752				Total	872	1.0218	1.0336		

Please note that the above 6 neighborhoods were identified out of a total of 269 residential neighborhoods, or 2.2 percent of all neighborhoods. We will consult with the assessor regarding these neighborhoods to identify possible factors explaining these differences.

Based on the above overall results, we concluded that the assessor has valued sold and unsold residential properties in a similar manner.

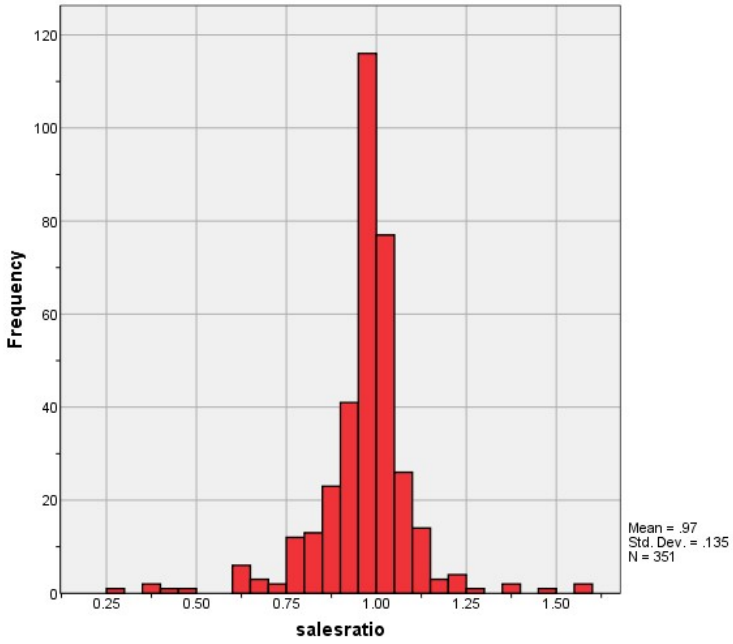
IV. COMMERCIAL/INDUSTRIAL SALE RESULTS

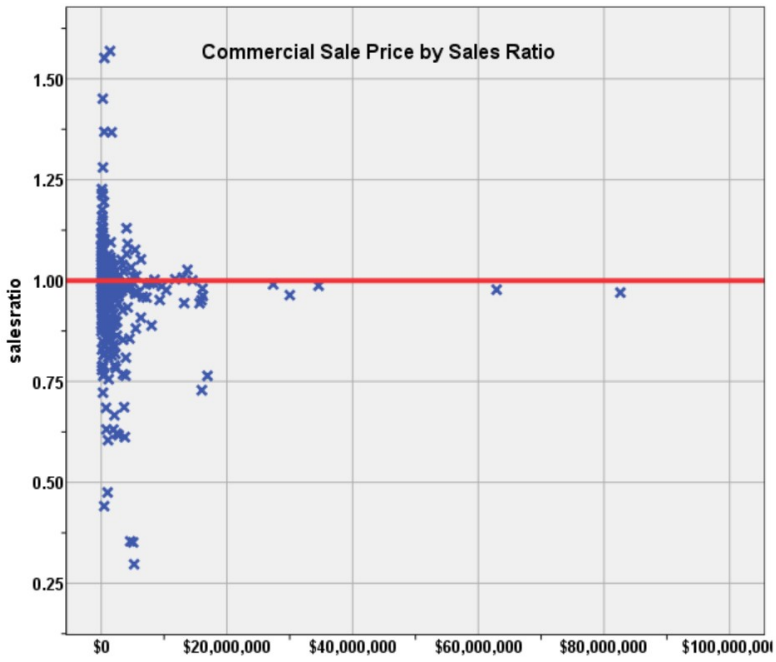
There were 351 qualified commercial/industrial sales for the 24-month sale period ending June 30, 2020. The sales ratio analysis was as follows:

Ratio Statistics

Median	**0.985**
Price Related Differential	**1.022**
Coefficient of Dispersion	**8.2**

The above ratio statistics were in compliance overall with the standards set forth by the Colorado State Board of Equalization (SBOE) for the overall commercial sales. The following histogram describes further the sales ratio distribution for these properties:


Frequency
120
100
80
60
40
20
0
0.25
0.50
0.75
1.00
1.25
1.50
salesratio
Mean = .97
Std. Dev. = .135
N = 351


Commercial Sale Price by Sales Ratio
salesratio
1.50
1.25
1.00
0.75
0.50
0.25
$0
$20,000,000
$40,000,000
$60,000,000
$80,000,000
$100,000,000

SALES LESS THAN $10,000,000

The above histogram indicates that the distribution of the sale ratios was within state mandated limits. No sales were trimmed.

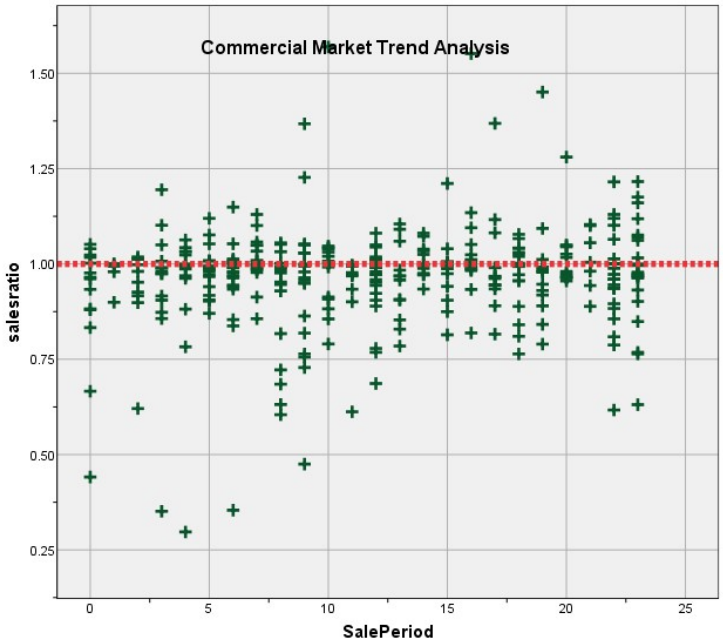
Commercial Market Trend Analysis

We next analyzed the commercial dataset using the 24-month sale period, with the following results:

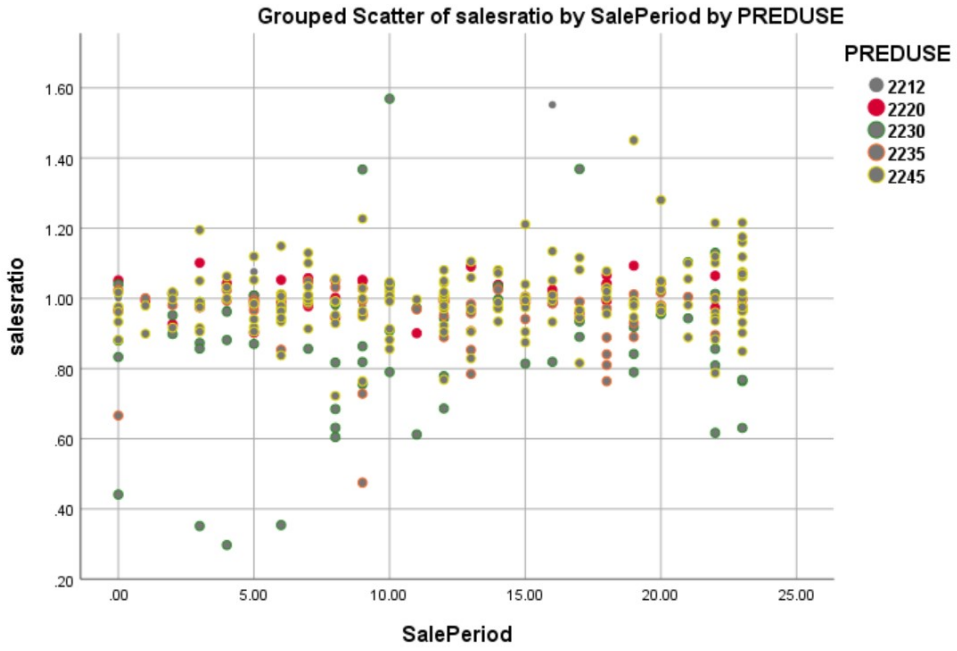
Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.936	.014		64.677	.000
	SalePeriod	.003	.001	.133	2.501	.013

a. Dependent Variable: salesratio



COMMERCIAL MARKET TREND BY MAJOR SUBCLASS



We also stratified the market trend analysis by major commercial subclass, as follows:

Coefficients[a]

PREDUSE	Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
2212	1	(Constant)	1.007	.067		15.016	.000
		SalePeriod	.000	.005	.020	.082	.936
2220	1	(Constant)	.998	.013		76.728	.000
		SalePeriod	.001	.001	.115	.805	.425
2230	1	(Constant)	.826	.054		15.426	.000
		SalePeriod	.004	.004	.123	.937	.353
2235	1	(Constant)	.942	.031		30.729	.000
		SalePeriod	-1.359E-5	.002	-.001	-.006	.995
2245	1	(Constant)	.969	.016		61.713	.000
		SalePeriod	.002	.001	.164	2.084	.039

Dependent Variable: salesratio

Although there was a statistically significant trend overall, when the sales were stratified by major commercial subclass, the resulting trends were not significant; therefore, we concluded that the assessor has adequately dealt with market trending for commercial properties.

Commercial/Industrial Sale Frequency Analysis

Given the potential impact of the COVID-19 pandemic on commercial sales activity, we also performed the following sales frequency analysis of qualified commercial sales. The chart tracks commercial sales by subclass, with SPRec coded as follows:

1 = Jan/Mar 2019
2 = Apr/Jun 2019
8 = Apr/Jun 2020 (COVID-19 Pandemic)

PREDUSE * SPRec Crosstabulation

			SPRec 1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
PREDUSE	2212	Count	4	2	2	2	3	2	3	1
		% within PREDUSE	21.1%	10.5%	10.5%	10.5%	15.8%	10.5%	15.8%	5.3%
	2220	Count	3	9	8	5	5	9	6	5
		% within PREDUSE	6.0%	18.0%	16.0%	10.0%	10.0%	18.0%	12.0%	10.0%
	2230	Count	10	4	5	5	11	8	9	7
		% within PREDUSE	16.9%	6.8%	8.5%	8.5%	18.6%	13.6%	15.3%	11.9%
	2235	Count	5	11	5	11	5	6	7	4
		% within PREDUSE	9.3%	20.4%	9.3%	20.4%	9.3%	11.1%	13.0%	7.4%
	2245	Count	30	17	18	27	16	27	15	10
		% within PREDUSE	18.8%	10.6%	11.3%	16.9%	10.0%	16.9%	9.4%	6.3%
Total		Count	52	43	38	50	40	52	40	27
		% within PREDUSE	15.2%	12.6%	11.1%	14.6%	11.7%	15.2%	11.7%	7.9%

NOTE: Subclass 2220 is Offices.

Sold/Unsold Analysis

In terms of the valuation consistency between sold and unsold commercial properties, we first compared the median value per square foot between sold and unsold commercial properties, as follows:

Report
VALSF

sold	N	Median	Mean
UNSOLD	6028	$140	$179
SOLD	351	$170	$187

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of VALSF is the same across categories of sold.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .01.

Report
VALSF

ABSTRIMP	sold	N	Median	Mean
2212.00	UNSOLD	961	$168	$193
	SOLD	19	$203	$205
2220.00	UNSOLD	626	$122	$137
	SOLD	51	$146	$180
2230.00	UNSOLD	1568	$188	$247
	SOLD	58	$217	$248
2235.00	UNSOLD	1077	$106	$121
	SOLD	54	$140	$149
2245.00	UNSOLD	1550	$155	$167
	SOLD	160	$190	$181

Based on the above differences for Subclasses 2212, 2235 and 2245, we will meet with the assessment staff to further explain these differences.

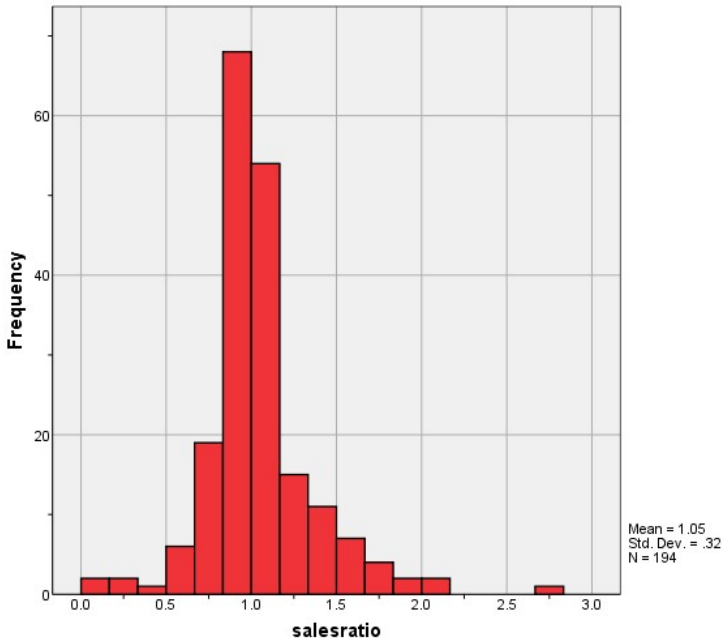
V. VACANT LAND SALE RESULTS

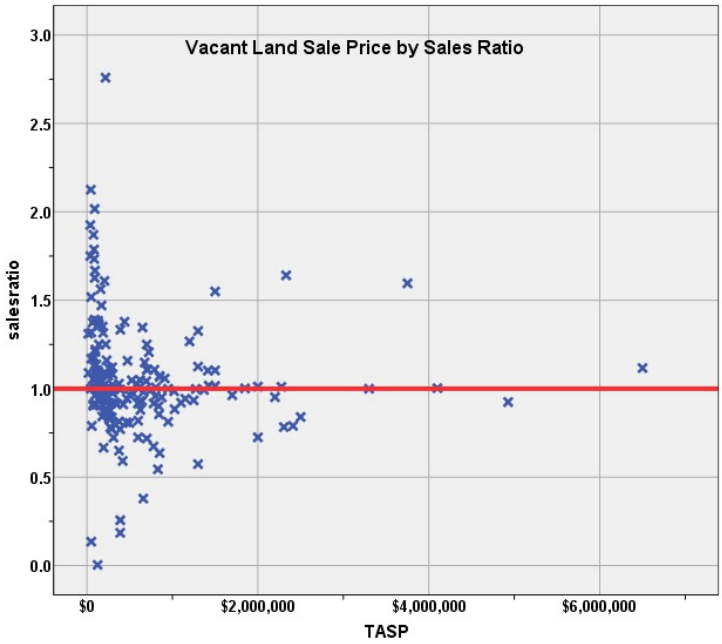
There were 194 qualified vacant land sales for the 24-month sale period ending June 30, 2020. The sales ratio analysis results were as follows:

Ratio Statistics

Median	**1.000**
Price Related Differential	**1.033**
Coefficient of Dispersion	**20.1**

The above ratio statistics were in compliance overall with the standards set forth by the Colorado State Board of Equalization (SBOE) for the overall vacant land sales. The following graphs describe further the sales ratio distribution for all of these properties:





The above histogram indicates that the distribution of the vacant land sale ratios was within state mandated limits, while the above scatter plot indicated that there was no price related differential issues. No sales were trimmed.

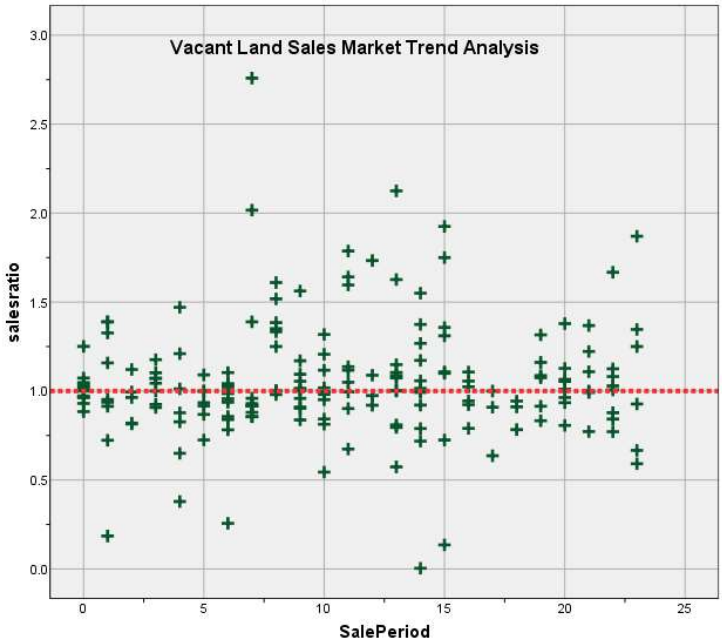
Vacant Land Market Trend Analysis

We next analyzed the vacant land dataset using the 24-month sale period, with the following results:

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.020	.043		23.917	.000
	SalePeriod	.003	.003	.058	.808	.420

a. Dependent Variable: salesratio



The above analysis indicated that no significant market trending was present in the vacant land sale data. We concluded that the assessor has adequately dealt with market trending for vacant land properties.

Sold/Unsold Analysis

In terms of the valuation consistency between sold and unsold vacant land properties, we compared the median change in actual value for taxable years 2019 and 2021 between each group. The following were the results:

Report

DIFF

sold	N	Median	Mean
UNSOLD	4922	1.0000	1.0644
SOLD	172	1.0679	1.1690

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of DIFF is the same across categories of sold.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

We next examined the change in value for subdivisions with at least 3 sales:

Report
DIFF

SUBDIVNO	sold	N	Median	Mean
001315	UNSOLD	43	1.4000	1.4750
	SOLD	9	1.2500	1.2278
018131	UNSOLD	6	1.0556	1.0556
	SOLD	4	1.0171	1.0279
022235	UNSOLD	15	.8776	.8857
	SOLD	14	.8776	.8939
032600	UNSOLD	8	1.0000	1.1200
	SOLD	3	1.2000	3.6236
033222	UNSOLD	2	1.0000	1.0000
	SOLD	5	.8571	1.0632
033223	UNSOLD	10	1.0000	.9464
	SOLD	6	1.0000	1.1865
038566	UNSOLD	1	1.0714	1.0714
	SOLD	6	1.0714	1.1482
053966	UNSOLD	1	1.1176	1.1176
	SOLD	3	1.1176	1.1387
053986	UNSOLD	1	1.3333	1.3333
	SOLD	3	1.0667	1.0980
061888	UNSOLD	5	1.0357	1.0468
	SOLD	7	1.0357	1.0251
066499	UNSOLD	90	1.8333	1.6014
	SOLD	5	1.8333	1.8333
067789	UNSOLD	9	.5500	.7184
	SOLD	4	.4811	.5843

Based on the comparison between sold and unsold properties at the subdivision level, we concluded that the county assessor valued sold and unsold vacant land properties consistently.

VI. CONCLUSIONS

Based on this statistical analysis, there were no significant compliance issues concluded for Arapahoe County as of the date of this report.

STATISTICAL ABSTRACT

Residential

Ratio Statistics for CurrTot / TASP

ECONAREA	Mean	95% Confidence Interval for Mean		Median	95% Confidence Interval for Median			Weighted Mean	95% Confidence Interval for Weighted Mean		Price Related Differential	Coefficient of Dispersion	Coefficient of Variation
		Lower Bound	Upper Bound		Lower Bound	Upper Bound	Actual Coverage		Lower Bound	Upper Bound			Mean Centered
.	1.001	.997	1.006	1.001	1.000	1.003	96.7%	.999	.995	1.004	1.002	.009	1.7%
1.00	1.002	.995	1.009	1.000	.994	1.012	96.1%	1.002	.995	1.008	1.001	.007	0.9%
2.00	1.003	.998	1.007	1.000	.997	1.002	97.1%	1.002	.998	1.006	1.001	.013	2.0%
3.00	1.001	.998	1.004	1.001	1.000	1.002	95.6%	.999	.996	1.002	1.002	.015	2.5%
4.00	1.000	.998	1.003	1.000	.999	1.001	95.7%	1.000	.997	1.002	1.001	.019	3.3%
5.00	1.001	1.000	1.003	1.000	1.000	1.001	95.6%	1.001	.999	1.002	1.001	.014	2.4%
6.00	.999	.996	1.002	.999	.997	1.000	95.3%	.997	.994	1.001	1.001	.014	2.3%
7.00	1.001	.999	1.002	1.000	.999	1.001	95.3%	1.000	.999	1.002	1.001	.014	2.3%
8.00	1.002	1.001	1.003	1.000	1.000	1.001	95.3%	1.001	1.000	1.002	1.001	.018	2.7%
10.00	1.000	.999	1.001	1.000	1.000	1.000	95.2%	1.000	.999	1.001	1.001	.014	2.3%
11.00	1.004	1.003	1.005	1.001	1.000	1.001	95.2%	1.003	1.002	1.004	1.001	.021	3.4%
12.00	1.005	.998	1.012	1.000	1.000	1.001	95.0%	1.003	.998	1.007	1.002	.021	5.4%
13.00	1.000	.998	1.003	1.000	.999	1.000	95.2%	1.000	.997	1.002	1.001	.014	2.9%
14.00	1.002	1.000	1.004	1.000	1.000	1.000	95.5%	1.001	.999	1.003	1.001	.016	3.0%
15.00	.999	.995	1.004	1.000	.998	1.001	96.0%	.997	.991	1.004	1.002	.014	2.8%
16.00	1.001	.999	1.002	1.000	1.000	1.001	95.3%	1.000	.998	1.002	1.001	.012	2.3%
18.00	1.002	1.001	1.003	1.000	1.000	1.000	95.3%	1.001	1.000	1.002	1.001	.016	2.6%
19.00	.999	.997	1.001	1.000	.999	1.000	95.2%	.999	.997	1.002	1.000	.011	1.8%

Commercial/Industrial

	95% Confidence Interval for Mean			95% Confidence Interval for Median				95% Confidence Interval for Weighted Mean				Coefficient of Variation
Mean	Lower Bound	Upper Bound	Median	Lower Bound	Upper Bound	Actual Coverage	Weighted Mean	Lower Bound	Upper Bound	Price Related Differential	Coefficient of Dispersion	Mean Centered
.968	.954	.982	.985	.977	.991	95.8%	.947	.927	.967	1.022	.082	14.0%

The confidence interval for the median is constructed without any distribution assumptions. The actual coverage level may be greater than the specified level. Other confidence intervals are constructed by assuming a Normal distribution for the ratios.

Vacant Land

	95% Confidence Interval for Mean			95% Confidence Interval for Median				95% Confidence Interval for Weighted Mean				Coefficient of Variation
Mean	Lower Bound	Upper Bound	Median	Lower Bound	Upper Bound	Actual Coverage	Weighted Mean	Lower Bound	Upper Bound	Price Related Differential	Coefficient of Dispersion	Mean Centered
1.049	1.004	1.095	1.000	.993	1.024	96.3%	1.016	.958	1.073	1.033	.201	30.5%

The confidence interval for the median is constructed without any distribution assumptions. The actual coverage level may be greater than the specified level. Other confidence intervals are constructed by assuming a Normal distribution for the ratios.

Residential Median Ratio Stratification

Subclass

Case Processing Summary

		Count	Percent
ABSTRIMP	.00	1	0.0%
	1212.00	20069	99.3%
	1215.00	88	0.4%
	1220.00	34	0.2%
	1225.00	26	0.1%
Overall		20218	100.0%
Excluded		0	
Total		20218	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
.00	1.000	1.000	.000	.
1212.00	1.000	1.001	.017	2.8%
1215.00	.994	1.007	.061	8.8%
1220.00	.963	1.006	.051	6.9%
1225.00	.967	1.031	.061	16.2%
Overall	1.000	1.001	.017	2.9%

Improvement Age

Case Processing Summary

		Count	Percent
AgeRec	.00	1	0.0%
	Over 100	105	0.5%
	75 to 100	256	1.3%
	50 to 75	2492	12.3%
	25 to 50	7723	38.2%
	5 to 25	5084	25.1%
	5 or Newer	4557	22.5%
Overall		20218	100.0%
Excluded		0	
Total		20218	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
.00	1.000	1.000	.000	.
Over 100	1.000	1.000	.011	2.7%
75 to 100	1.000	1.001	.014	3.2%
50 to 75	1.000	1.001	.016	3.2%
25 to 50	1.000	1.001	.014	2.5%
5 to 25	1.000	1.000	.014	2.2%
5 or Newer	1.001	1.001	.027	3.9%
Overall	1.000	1.001	.017	2.9%

Improved Area

Case Processing Summary

		Count	Percent
ImpSFRec	.00	1	0.0%
	LE 500 sf	1	0.0%
	500 to 1,000 sf	1316	6.5%
	1,000 to 1,500 sf	5572	27.6%
	1,500 to 2,000 sf	6206	30.7%
	2,000 to 3,000 sf	5472	27.1%
	3,000 sf or Higher	1650	8.2%
Overall		20218	100.0%
Excluded		0	
Total		20218	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
.00	1.000	1.000	.000	.
LE 500 sf	1.000	1.000	.000	.
500 to 1,000 sf	1.000	1.001	.016	2.6%
1,000 to 1,500 sf	1.000	1.001	.016	2.6%
1,500 to 2,000 sf	1.000	1.001	.018	3.0%
2,000 to 3,000 sf	1.000	1.001	.017	2.9%
3,000 sf or Higher	1.000	1.002	.020	3.8%
Overall	1.000	1.001	.017	2.9%

Improvement Quality

Case Processing Summary

		Count	Percent
QUALITY		1	0.0%
	A	1085	5.4%
	B	9363	46.3%
	C	9614	47.6%
	D	45	0.2%
	E	1	0.0%
	R	4	0.0%
	X	105	0.5%
Overall		20218	100.0%
Excluded		0	
Total		20218	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
	1.000	1.000	.000	.
A	1.000	1.001	.018	3.2%
B	1.000	1.001	.019	3.0%
C	1.000	1.001	.015	2.8%
D	1.000	1.001	.012	2.8%
E	.998	1.000	.000	.
R	.995	1.000	.008	1.2%
X	1.000	1.002	.020	3.4%
Overall	1.000	1.001	.017	2.9%

Commercial Median Ratio Stratification

Sale Price

Case Processing Summary

		Count	Percent
SPRec	LT $25K	6	1.7%
	$25K to $50K	1	0.3%
	$50K to $100K	17	4.8%
	$100K to $150K	34	9.7%
	$150K to $200K	24	6.8%
	$200K to $300K	36	10.3%
	$300K to $500K	37	10.5%
	$500K to $750K	25	7.1%
	$750K to $1,000K	17	4.8%
	Over $1,000K	154	43.9%
Overall		351	100.0%
Excluded		0	
Total		351	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
LT $25K	1.056	1.007	.058	8.6%
$25K to $50K	.936	1.000	.000	.
$50K to $100K	.995	1.004	.051	6.5%
$100K to $150K	.991	.999	.065	10.0%
$150K to $200K	1.015	1.004	.076	9.1%
$200K to $300K	.983	1.001	.089	13.6%
$300K to $500K	1.006	.995	.101	17.2%
$500K to $750K	.990	1.000	.044	7.4%
$750K to $1,000K	1.023	1.000	.094	18.7%
Over $1,000K	.977	.995	.086	15.3%
Overall	.985	1.022	.082	13.8%

Subclass

Case Processing Summary

		Count	Percent
ABSTRIMP	2212.00	19	5.4%
	2215.00	2	0.6%
	2220.00	51	14.5%
	2225.00	2	0.6%
	2230.00	58	16.5%
	2235.00	54	15.4%
	2245.00	160	45.6%
	2250.00	4	1.1%
	3215.00	1	0.3%
Overall		351	100.0%
Excluded		0	
Total		351	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
2212.00	.979	1.030	.049	14.1%
2215.00	1.014	.995	.019	2.6%
2220.00	.997	1.018	.040	5.7%
2225.00	.858	1.071	.276	39.1%
2230.00	.876	1.018	.177	25.7%
2235.00	.980	1.014	.063	11.3%
2245.00	.992	1.011	.066	9.6%
2250.00	.960	.976	.068	11.1%
3215.00	1.007	1.000	.000	.
Overall	.985	1.022	.082	13.8%

Improvement Age

Case Processing Summary

		Count	Percent
AgeRec	Over 100	3	0.9%
	75 to 100	3	0.9%
	50 to 75	31	8.8%
	25 to 50	150	42.7%
	5 to 25	106	30.2%
	5 or Newer	58	16.5%
Overall		351	100.0%
Excluded		0	
Total		351	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
Over 100	.992	1.000	.026	4.4%
75 to 100	.934	.994	.045	8.8%
50 to 75	1.001	1.011	.060	8.4%
25 to 50	.991	1.019	.087	14.9%
5 to 25	.980	1.002	.076	13.4%
5 or Newer	.970	1.103	.090	14.5%
Overall	.985	1.022	.082	13.8%

Improved Area

Case Processing Summary

		Count	Percent
ImpSFRec	LE 500 sf	11	3.1%
	500 to 1,000 sf	68	19.4%
	1,000 to 1,500 sf	43	12.3%
	1,500 to 2,000 sf	20	5.7%
	2,000 to 3,000 sf	21	6.0%
	3,000 sf or Higher	188	53.6%
Overall		351	100.0%
Excluded		0	
Total		351	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
LE 500 sf	.998	1.009	.056	7.3%
500 to 1,000 sf	.989	1.006	.064	8.7%
1,000 to 1,500 sf	.975	1.017	.082	11.6%
1,500 to 2,000 sf	.974	1.029	.099	13.5%
2,000 to 3,000 sf	1.000	1.032	.102	18.4%
3,000 sf or Higher	.983	1.009	.086	15.6%
Overall	.985	1.022	.082	13.8%

Improvement Quality

Case Processing Summary

		Count	Percent
QUALITY	A	2	0.6%
	B	32	9.1%
	C	286	81.5%
	D	31	8.8%
Overall		351	100.0%
Excluded		0	
Total		351	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
A	.974	1.000	.004	0.5%
B	.991	1.011	.060	12.2%
C	.983	1.035	.084	13.9%
D	.994	1.002	.090	15.0%
Overall	.985	1.022	.082	13.8%

Vacant Land Median Ratio Stratification

Sale Price

Case Processing Summary

		Count	Percent
SPRec	LT $25K	2	1.0%
	$25K to $50K	8	4.1%
	$50K to $100K	26	13.4%
	$100K to $150K	21	10.8%
	$150K to $200K	17	8.8%
	$200K to $300K	31	16.0%
	$300K to $500K	20	10.3%
	$500K to $750K	23	11.9%
	$750K to $1,000K	15	7.7%
	Over $1,000K	31	16.0%
Overall		194	100.0%
Excluded		0	
Total		194	

Ratio Statistics for CurrLnd / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
LT $25K	1.200	1.006	.092	13.0%
$25K to $50K	1.418	1.023	.326	44.4%
$50K to $100K	1.174	.992	.224	29.7%
$100K to $150K	1.071	.996	.134	25.7%
$150K to $200K	.996	1.005	.154	24.2%
$200K to $300K	.975	1.013	.179	37.5%
$300K to $500K	.863	.990	.240	33.9%

$500K to $750K	.995	.996	.138	20.2%
$750K to $1,000K	.951	.999	.135	18.7%
Over $1,000K	1.000	.987	.151	23.9%
Overall	1.000	1.033	.201	32.4%

Subclass

Case Processing Summary

		Count	Percent
ABSTRLND	.00	10	5.2%
	100.00	44	22.7%
	200.00	11	5.7%
	300.00	1	0.5%
	400.00	47	24.2%
	1112.00	59	30.4%
	1125.00	5	2.6%
	1135.00	2	1.0%
	1230.00	7	3.6%
	2120.00	1	0.5%
	2130.00	4	2.1%
	2135.00	2	1.0%
	9149.00	1	0.5%
Overall		194	100.0%
Excluded		0	
Total		194	

Ratio Statistics for CurrLnd / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
.00	.937	1.107	.310	67.2%
100.00	1.000	1.030	.074	10.7%
200.00	.911	1.054	.128	19.2%
300.00	1.082	1.000	.000	.
400.00	1.000	1.023	.095	12.8%
1112.00	1.108	1.077	.251	31.6%
1125.00	1.117	1.055	.235	33.3%
1135.00	1.286	1.034	.180	25.5%
1230.00	.840	.833	.445	55.8%
2120.00	2.125	1.000	.000	.
2130.00	.975	1.076	.218	31.5%
2135.00	.354	.636	.619	87.5%
9149.00	.004	1.000	.000	.
Overall	1.000	1.033	.201	32.4%