



2020

ARAPAHOE COUNTY PROPERTY ASSESSMENT STUDY



WILDROSE
APPRAISAL, INCORPORATED
Audit Division



September 15, 2020

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

RE: Final Report for the 2020 Colorado Property Assessment Study

Dear Ms. Mullis:

Wildrose Appraisal Inc.-Audit Division is pleased to submit the Final Reports for the 2020 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.

A handwritten signature in black ink that reads "Harry J. Fuller". The signature is written in a cursive, flowing style.

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

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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.

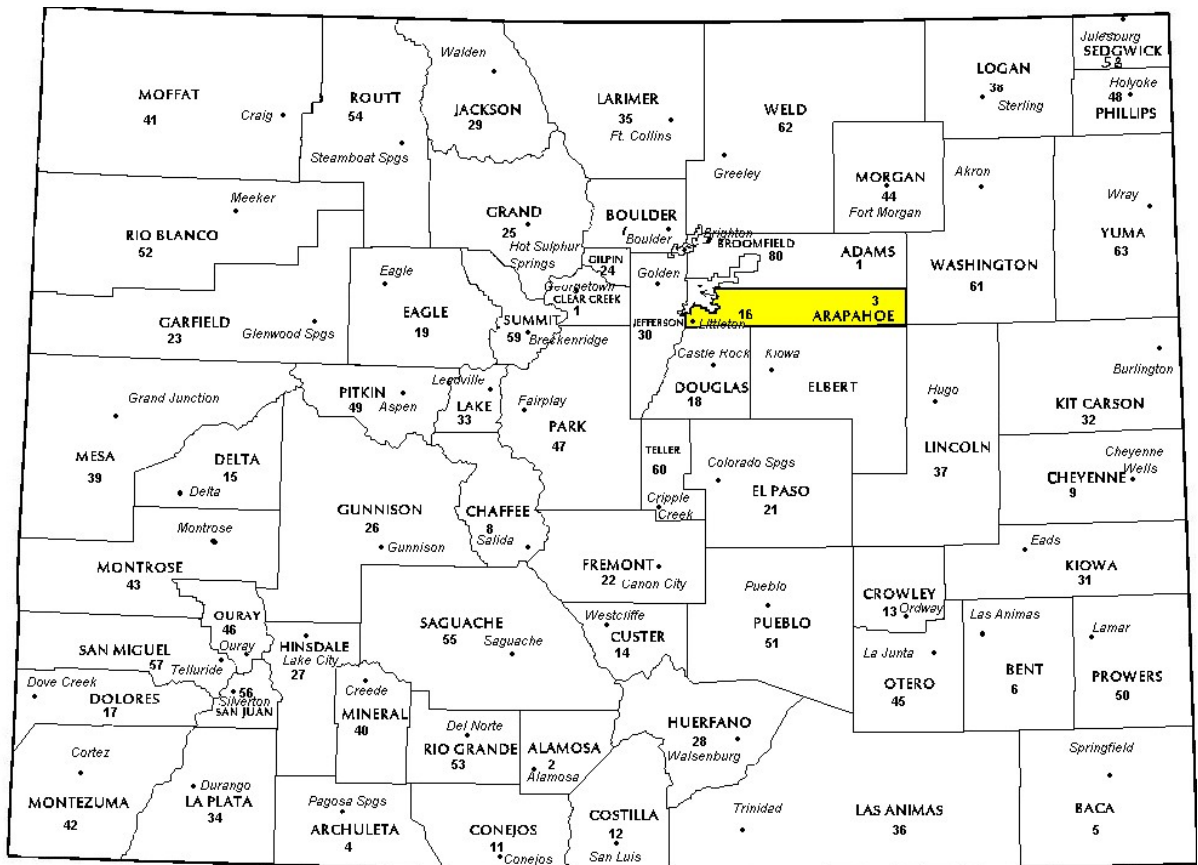
Wildrose Audit has completed the Property Assessment Study for 2020 and is pleased to report its findings for Arapahoe County in the following report.

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 had an estimated population of approximately 637,068 people with 797.3 people per square mile, according to the U.S. Census Bureau's 2016 estimated census data. This represents a 11.4 percent change from April 1, 2010 to July 1, 2016.

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^o 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 properties were analyzed. Sales were collected for each property class over the appropriate sale period, which was typically defined as the 18-month period between January 1, 2017 and June 30, 2018. Counties with less than 30 sales typically extended the sale period back up to 5 years prior to June 30, 2018 in 6-month increments. If there were still fewer than 30 sales, supplemental appraisals were performed and treated as proxy sales. Residential sales for all counties using this method totaled at least 30 per county. For commercial sales, the total number analyzed was allowed, in some cases, to fall below 30. There were no sale quantity issues for counties requiring vacant land analysis or condominium analysis. 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. For the largest 11 counties, the residential ratio statistics were broken down by economic area as well.

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
Condominium	Between .95-1.05	Less than 15.99
Single Family	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	387	0.990	1.031	6.4	Compliant
Condominium	N/A	N/A	N/A	N/A	N/A
Single Family	26,999	1.000	1.005	2.9	Compliant
Vacant Land	180	1.031	1.065	20.2	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
Condominium	N/A
Single Family	Compliant
Vacant Land	Compliant

Conclusions

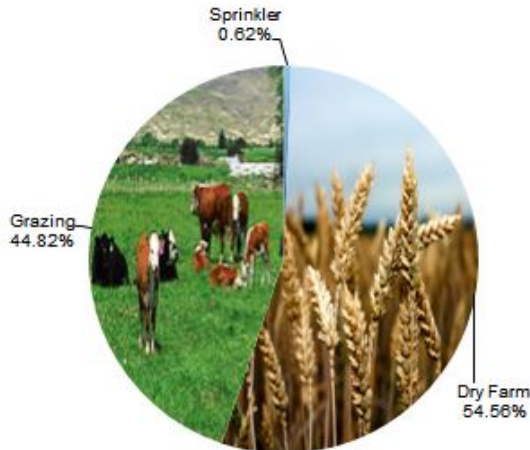
After applying the above described methodologies, it is concluded that Arapahoe County is reasonably treating its sold and unsold properties in the same manner.

Recommendations

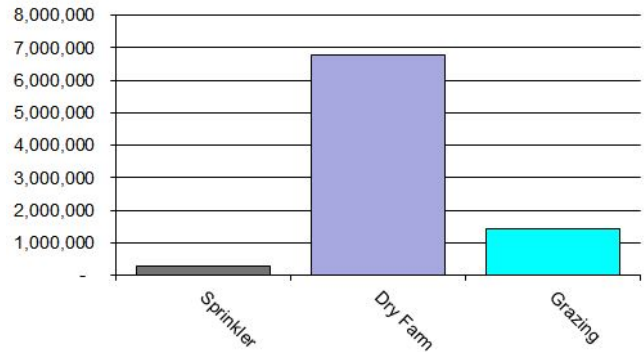
None

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	1,924	149.67	287,946	287,624	1.00
4127	Dry Farm	169,476	40.03	6,784,145	6,504,246	1.04
4147	Grazing	139,198	10.31	1,434,867	1,434,867	1.00
Total/Avg		309,436	27.49	8,506,958	8,226,737	1.03

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.

Property Taxation for the valuation of agricultural outbuildings.

Recommendations

None

Conclusions

Arapahoe County has complied with the procedures provided by the Division of

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
- Personal Knowledge of Occupants at Assessment Date
- 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
- Personal Knowledge of Occupants at Assessment Date
- Aerial Photography/Pictometry

Arapahoe County has 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 2020 for Arapahoe County. This study was conducted by checking selected sales from the master sales list for the current valuation period. Specifically WRA selected 61 sales listed as unqualified.

All but one of the sales selected in the sample gave reasons that were clear and supportable. One sale 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.

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.

Conclusions

Arapahoe County appears to be doing a good 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 2020 in Arapahoe County. The review showed that subdivisions were discounted pursuant to the Colorado Revised Statutes in Article 39-1-103 (14) and by applying the recommended methodology in ARL Vol 3, Chap 4. Subdivision Discounting in the intervening year can be accomplished by reducing the absorption period by one year.

In instances where the number of sales within an approved plat was less than the absorption

rate per year calculated for the plat, the absorption period was left unchanged.

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
- 1/3 county businesses 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 2020 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:

- Accounts with obvious discrepancies
- 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*

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Steve Kane, *Audit Statistician*

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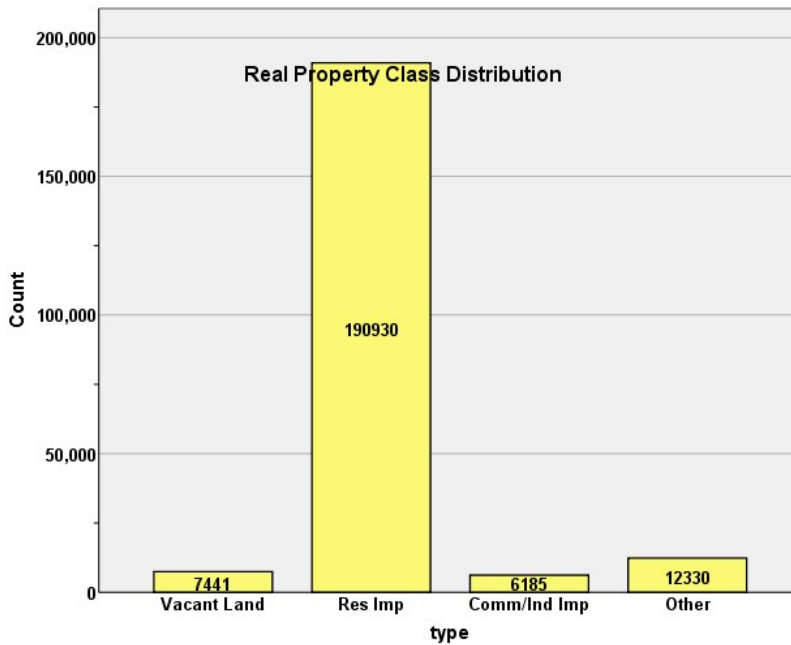
J. Andrew Rodriguez, *Field Analyst*

APPENDICES

**STATISTICAL COMPLIANCE REPORT
FOR ARAPAHOE COUNTY
2020**

I. OVERVIEW

Arapahoe County is an urban county that is part of the Denver metropolitan area. The county has a total of 216,886 real property parcels, according to data submitted by the county assessor’s office in 2020. 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 78.6% of all vacant land parcels.

For residential improved properties, single family properties accounted for 84.5% of all residential properties. The next significant subclass of properties was condominiums (coded 1230), which accounted for 14.4% 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, the following geographic levels were used by the assessor to value residential, commercial and vacant land properties:

Geo Area	Residential	Comm/Ind	Vacant Land
Economic Area	N	N	N
Neighborhood	N	N	V
Subdivision	N	N	N

Codes

V=Valid Geographic Level – used for modeling

N = Not used as Geographic Level for modeling

Note: The MRA models and time studies, are done by region for single family properties. Regions are defined in the extra document which was given to Harry during his 2019 field visit. The MRA modeled value is NOT the final value used for residential properties. A comparable sales selection process is use to value single family, condos, and duplex/triplex properties. Commercial models are applied by similar use not geographic location.

Based on the above geographic breakdowns for Arapahoe County, 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 2020 Colorado Property Assessment Study. Information was provided by the Arapahoe Assessor’s Office in April 2020. The data included all 5 property record files as specified by the Auditor.

III. RESIDENTIAL SALES RESULTS

There were 26,999 qualified residential sales for the 24-month sale period ending June 30, 2018. The sales ratio analysis was as follows:

Ratio Statistics

Median	1.000
Price Related Differential	1.005
Coefficient of Dispersion	2.9

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	58	0.2%
	2.00	104	0.4%
	3.00	852	3.2%
	4.00	680	2.5%
	5.00	1074	4.0%
	6.00	536	2.0%
	7.00	1049	3.9%
	8.00	5296	19.7%
	9.00	358	1.3%
	10.00	2725	10.1%
	11.00	5130	19.1%
	12.00	338	1.3%
	13.00	821	3.1%
	14.00	1091	4.1%
	15.00	183	0.7%
	16.00	230	0.9%
	17.00	725	2.7%
	18.00	5366	19.9%
	19.00	198	0.7%
	20.00	1	0.0%
	102.00	1	0.0%
	103.00	5	0.0%
	104.00	31	0.1%
	105.00	2	0.0%
	106.00	10	0.0%
	107.00	1	0.0%
	108.00	5	0.0%
	110.00	5	0.0%
111.00	1	0.0%	
112.00	4	0.0%	
113.00	27	0.1%	
114.00	6	0.0%	
117.00	3	0.0%	
119.00	1	0.0%	
Overall		26917	100.0%
Excluded		82	
Total		26999	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion
1.00	1.001	1.001	.020
2.00	1.000	1.003	.026
3.00	.999	1.001	.034
4.00	1.000	1.002	.034
5.00	1.000	1.003	.031
6.00	1.000	1.004	.045
7.00	1.000	1.001	.029
8.00	1.000	1.001	.032
9.00	1.000	1.003	.039
10.00	1.000	1.002	.027
11.00	1.000	1.001	.027

12.00	1.000	1.001	.020
13.00	1.000	1.003	.028
14.00	1.000	1.004	.025
15.00	1.000	1.000	.017
16.00	1.000	.999	.030
17.00	1.000	1.002	.027
18.00	1.000	1.002	.028
19.00	1.001	1.002	.026
20.00	.995	1.000	.000
102.00	.963	1.000	.000
103.00	.982	.998	.022
104.00	.994	1.004	.047
105.00	.965	1.008	.008
106.00	1.018	1.011	.048
107.00	1.074	1.000	.000
108.00	.991	.974	.044
110.00	1.007	1.029	.052
111.00	1.058	1.000	.000
112.00	1.031	1.496	.113
113.00	1.000	1.001	.047
114.00	1.043	.980	.059
117.00	1.088	1.042	.065
119.00	1.063	1.000	.000
Overall	1.000	1.005	.029

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
8.00	1.000	1.002	.018
11.00	1.001	1.000	.020
18.00	1.000	1.001	.019
26.00	1.000	1.001	.017
27.00	1.000	1.001	.018
36.00	.998	1.002	.024
38.00	.998	1.000	.021
40.00	1.002	1.000	.014
45.00	1.007	1.008	.060
52.00	1.000	1.000	.021
69.00	1.002	1.006	.037
87.00	.995	1.001	.022
91.00	1.000	1.002	.029
102.00	.999	1.002	.025
109.00	1.001	1.001	.017
110.00	1.000	1.001	.023
111.00	1.000	1.002	.026
112.00	1.002	1.001	.030
115.00	.993	1.004	.043
117.00	1.000	1.001	.012
119.00	1.001	1.002	.023
126.00	1.000	1.000	.016
147.00	1.001	1.001	.029

148.00	1.001	1.001	.015
149.00	1.000	1.001	.019
151.00	1.008	1.002	.034
155.00	.977	1.006	.057
157.00	1.000	1.002	.023
164.00	1.000	1.001	.030
166.00	.999	1.001	.025
170.00	.976	1.004	.042
173.00	.992	1.001	.030
174.00	1.005	1.004	.049
176.00	.994	1.003	.033
178.00	1.000	1.007	.040
179.00	1.000	1.002	.023
183.00	1.000	1.002	.026
192.00	.995	1.013	.058
196.00	1.000	1.001	.017
218.00	.995	1.004	.048
220.00	1.000	1.005	.031
225.00	1.000	1.002	.031
226.00	.999	1.003	.024
231.00	.974	1.005	.054
247.00	1.000	1.002	.027
248.00	.998	1.004	.043
253.00	1.000	1.001	.018
262.00	1.001	1.007	.043
263.00	1.000	1.001	.020
264.00	.999	1.014	.048
271.00	1.002	1.002	.023
272.00	.999	1.001	.015
273.00	1.001	1.002	.033
277.00	1.000	1.002	.023
279.00	1.004	1.001	.025
280.00	1.001	1.001	.019
284.00	.998	1.001	.016
285.00	1.001	1.001	.032
288.00	1.001	1.001	.028
291.00	.998	1.002	.030
304.00	1.001	1.004	.037
315.00	.999	1.003	.035
321.00	1.000	1.003	.038
324.00	.992	1.001	.029
345.00	1.002	1.001	.020
348.00	1.000	1.005	.048
349.00	1.001	1.002	.027
350.00	1.001	1.005	.049
354.00	1.000	1.002	.034
371.00	1.002	1.001	.028
372.00	1.000	1.002	.026
374.00	1.000	1.002	.022
378.00	.999	1.000	.014
380.00	.999	1.005	.036
387.00	1.000	1.001	.020
391.00	1.003	1.004	.033
401.00	.995	1.002	.049
410.00	1.000	1.001	.029
423.00	.992	1.002	.043
431.00	.999	1.002	.031

457.00	1.000	1.002	.020
458.00	.997	1.000	.013
479.00	1.005	1.005	.050
481.00	1.021	1.003	.050
509.00	1.000	1.002	.024
564.00	.993	1.010	.078
570.00	1.000	1.001	.021
582.00	.989	1.002	.033
596.00	1.000	1.001	.024
599.00	1.008	1.000	.027
601.00	1.000	1.001	.016
606.00	.984	1.002	.034
607.00	1.006	1.003	.042
608.00	1.002	1.001	.036
609.00	1.007	1.001	.022
612.00	1.006	1.002	.045
613.00	1.004	1.002	.033
614.00	1.005	1.002	.030
626.00	1.000	1.005	.018
648.00	1.000	1.001	.017
654.00	1.001	1.001	.022
661.00	1.000	1.001	.021
683.00	1.007	1.001	.038
686.00	1.002	1.002	.022
718.00	.998	1.006	.039
732.00	1.002	1.002	.019
761.00	1.000	1.001	.025
763.00	1.000	1.001	.015
774.00	.993	1.001	.022
782.00	1.001	1.003	.039
790.00	1.000	1.001	.014
791.00	1.000	1.000	.011
844.00	1.000	.999	.052
847.00	1.000	1.001	.021
903.00	1.002	1.001	.035
915.00	1.002	1.004	.029
960.00	1.000	1.001	.013
977.00	1.005	1.006	.031
979.00	1.000	1.002	.028
989.00	.998	1.001	.023
1000.00	.987	1.001	.036
1018.00	1.000	1.001	.015
1021.00	1.001	1.004	.029
1040.00	1.000	1.002	.030
1041.00	1.000	1.003	.035
1046.00	1.000	1.001	.019
1047.00	1.005	1.001	.035
1054.00	1.001	1.007	.032
1090.00	1.001	1.003	.032
1097.00	.996	1.002	.028
1172.00	1.001	1.002	.030
1173.00	.997	1.002	.028
1183.00	.950	1.016	.095
1202.00	1.000	1.001	.016
1210.00	1.002	1.005	.035
1254.00	.993	1.003	.054
1291.00	1.002	1.007	.040

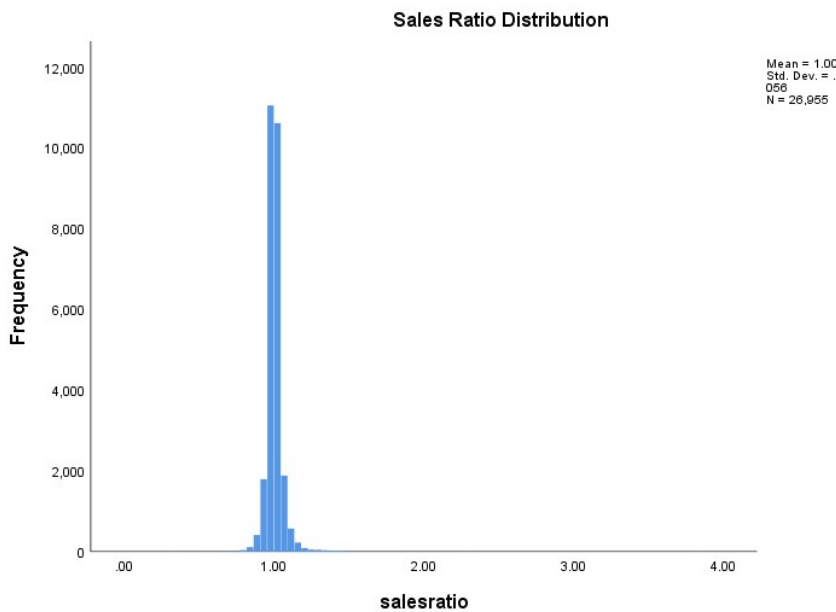
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1324.00	1.000	1.002	.025
1380.00	.994	1.003	.032
1386.00	1.002	1.001	.021
1394.00	1.000	1.001	.018
1454.00	1.000	1.001	.017
1478.00	1.029	1.003	.047
1479.00	.998	1.003	.036
1481.00	.999	1.001	.025
1483.00	.998	1.001	.031
1524.00	1.003	1.001	.031
1526.00	1.001	1.004	.027
1564.00	1.000	1.002	.029
1566.00	1.000	.999	.022
1583.00	1.001	1.002	.018
1584.00	.995	1.001	.023
1586.00	1.000	1.003	.024
1588.00	.998	1.002	.024
1589.00	1.000	1.002	.023
1590.00	1.000	1.001	.017
1591.00	.999	1.004	.029
1592.00	.999	1.001	.029
1594.00	1.000	1.001	.025
1635.00	.997	1.004	.042
1647.00	1.000	1.001	.023
1659.00	.999	1.008	.057
1712.00	1.000	1.001	.016
1720.00	.998	1.000	.016
1725.00	1.001	1.002	.030
1750.00	1.000	1.001	.027
1751.00	.999	1.001	.011
1753.00	.999	1.001	.035
1763.00	1.000	1.001	.019
1766.00	1.000	1.002	.021
1776.00	1.002	1.000	.026
1780.00	1.002	1.003	.039
1783.00	1.000	1.005	.022
1789.00	.994	1.002	.023
1808.00	1.000	1.002	.029
1811.00	.999	1.001	.019
1819.00	1.000	1.002	.037
1834.00	1.001	1.004	.046
1835.00	.991	1.001	.028
1860.00	.993	1.001	.024
1863.00	1.001	1.000	.006
1866.00	1.000	1.002	.018
1875.00	.908	1.006	.092
1876.00	.990	1.001	.031
1882.00	1.006	1.004	.036
1900.00	.990	1.006	.049
1903.00	1.000	1.006	.050
1907.00	1.000	1.001	.026
1909.00	1.003	1.001	.024
1913.00	1.001	1.001	.025
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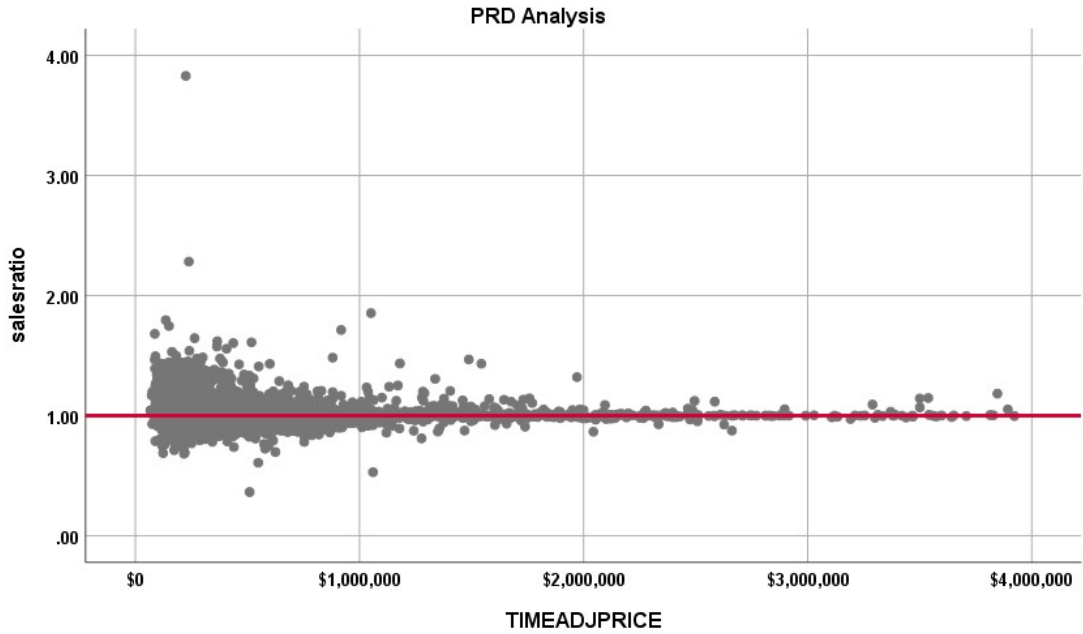
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1937.00	.969	1.001	.035
1940.00	.997	1.001	.031
1942.00	1.002	1.001	.016
1943.00	1.010	1.003	.038
1956.00	1.001	1.002	.022
1959.00	1.000	1.001	.024
1978.00	.999	1.002	.027
2000.00	1.000	1.003	.035
2014.00	1.002	1.000	.015
2017.00	1.000	1.001	.016
2022.00	.989	1.002	.029
2050.00	.998	1.000	.019
2052.00	.992	1.001	.022
2053.00	1.002	1.002	.033
2060.00	1.000	1.003	.027
2065.00	1.013	1.004	.052
2068.00	1.002	1.005	.047
2080.00	.999	1.002	.057
2083.00	1.000	1.004	.034
2084.00	1.002	1.002	.033
2085.00	1.001	1.001	.028
2094.00	.997	1.005	.046
2101.00	1.000	1.002	.023
2102.00	1.003	1.001	.022
2103.00	1.009	1.002	.029
2104.00	1.002	1.001	.021
2107.00	1.000	1.002	.019
2110.00	1.000	1.002	.016
2118.00	1.004	1.001	.024
2126.00	1.000	1.002	.027
2131.00	.994	1.003	.035
2133.00	.989	1.003	.062
2146.00	1.003	1.001	.030
2156.00	.999	1.000	.010
2159.00	1.000	1.001	.017
2161.00	1.001	1.002	.026
2162.00	1.003	1.003	.032
2172.00	.999	1.005	.034
2175.00	.994	1.003	.042
2176.00	1.002	1.000	.020
2179.00	1.000	1.004	.029
2181.00	.992	1.002	.031
2193.00	.965	1.013	.078
2228.00	.987	1.002	.038
2238.00	1.000	1.001	.013
2250.00	1.000	1.002	.021
2256.00	.998	1.010	.062
2265.00	.977	1.004	.051
2270.00	1.000	1.004	.046
2276.00	1.002	1.002	.027
2289.00	1.002	1.001	.019
2292.00	1.001	1.002	.023
2293.00	1.001	1.001	.028
2294.00	1.000	1.002	.018

2295.00	1.002	1.001	.020
2297.00	1.002	1.001	.027
2300.00	1.000	1.000	.015
2305.00	.994	1.002	.031
2306.00	1.008	1.001	.028
2312.00	1.002	1.001	.025
2313.00	1.000	1.002	.029
2314.00	.998	1.001	.030
2315.00	.999	1.001	.020
2317.00	1.001	1.002	.021
2318.00	1.017	1.001	.038
2323.00	.997	1.002	.032
2324.00	1.000	1.001	.025
2329.00	1.003	1.003	.041
2330.00	1.000	1.000	.025
2332.00	.996	1.002	.030
2342.00	1.001	1.001	.028
2353.00	.976	1.006	.052
2363.00	1.001	1.002	.015
2368.00	.989	1.002	.029
2373.00	1.011	1.002	.043
2374.00	1.007	1.002	.033
2405.00	1.000	1.001	.016
2436.00	1.002	1.001	.025
2437.00	1.008	1.002	.038
2438.00	1.000	1.000	.019
2440.00	1.005	1.001	.028
2448.00	1.001	1.002	.038
2455.00	1.001	1.001	.022
2465.00	1.001	1.004	.034
2473.00	1.000	1.002	.028
2476.00	1.000	1.002	.022
2490.00	.996	1.002	.032
2500.00	1.002	1.003	.031
2516.00	1.000	1.005	.031
2518.00	.999	1.003	.034
2525.00	1.000	1.001	.020
2526.00	1.000	1.000	.009
2549.00	1.000	1.003	.028
2567.00	.985	1.002	.070
2586.00	1.006	1.002	.031
2613.00	.999	1.002	.027
2688.00	1.001	1.002	.027
2689.00	.997	1.002	.035
2744.00	1.000	1.001	.027
2750.00	.999	1.001	.024
2752.00	1.000	1.002	.026
2764.00	1.002	1.001	.020
2766.00	.999	1.000	.023
2768.00	1.000	1.002	.046
2770.00	1.008	1.006	.050
2779.00	.987	1.002	.029
2798.00	.999	1.002	.032
2799.00	1.004	1.003	.038
2801.00	1.002	1.006	.055
2813.00	.999	1.002	.029
2814.00	1.003	1.001	.027

2815.00	1.000	1.001	.023
2816.00	.998	1.003	.025
2893.00	1.001	1.001	.018
2902.00	1.001	1.001	.021
2905.00	1.000	1.001	.018
2906.00	1.002	1.002	.025
2912.00	.999	1.002	.015
2913.00	.989	1.006	.047
2918.00	.999	1.000	.017
2932.00	.999	1.001	.015
2935.00	.998	1.005	.033
2938.00	1.001	1.001	.020
2939.00	1.000	1.002	.025
3003.00	.994	1.004	.047
Overall	1.000	1.002	.030

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:





NOTE: Above sales do not include sales over \$4,000,000.

The above histogram indicates that the distribution of the sale ratios was within state mandated limits.

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	Std. Error	Standardized Coefficients Beta	t	Sig.
.	1	(Constant)	1.036	.021		50.056	.000
		SalePeriod	-.001	.002	-.043	-.385	.701
1.00	1	(Constant)	.995	.007		146.682	.000
		SalePeriod	.001	.000	.237	1.823	.074
2.00	1	(Constant)	1.019	.010		98.296	.000
		SalePeriod	-.001	.001	-.153	-1.566	.121
3.00	1	(Constant)	1.007	.004		264.482	.000
		SalePeriod	.000	.000	-.051	-1.500	.134
4.00	1	(Constant)	1.013	.005		208.618	.000
		SalePeriod	.000	.000	-.046	-1.201	.230
5.00	1	(Constant)	1.003	.003		295.550	.000
		SalePeriod	7.224E-5	.000	.009	.286	.775
6.00	1	(Constant)	1.019	.012		86.546	.000
		SalePeriod	-.001	.001	-.034	-.778	.437
7.00	1	(Constant)	1.009	.003		323.605	.000

		SalePeriod	-.001	.000	-.069	-2.234	.026
8.00	1	(Constant)	1.003	.001		701.401	.000
		SalePeriod	4.384E-6	.000	.001	.042	.967
9.00	1	(Constant)	1.000	.006		165.330	.000
		SalePeriod	.001	.000	.064	1.204	.229
10.00	1	(Constant)	1.008	.002		485.366	.000
		SalePeriod	.000	.000	-.049	-2.573	.010
11.00	1	(Constant)	1.008	.001		895.722	.000
		SalePeriod	-.001	.000	-.086	-6.182	.000
12.00	1	(Constant)	1.012	.005		188.595	.000
		SalePeriod	-4.643E-5	.000	-.006	-.109	.913
13.00	1	(Constant)	1.011	.004		257.478	.000
		SalePeriod	.000	.000	-.040	-1.134	.257
14.00	1	(Constant)	1.008	.004		256.032	.000
		SalePeriod	.000	.000	.027	.894	.371
15.00	1	(Constant)	1.000	.005		203.195	.000
		SalePeriod	3.582E-5	.000	.007	.095	.924
16.00	1	(Constant)	1.010	.010		103.502	.000
		SalePeriod	.000	.001	-.013	-.203	.839
17.00	1	(Constant)	1.014	.004		249.663	.000
		SalePeriod	-.001	.000	-.094	-2.543	.011
18.00	1	(Constant)	1.003	.001		802.000	.000
		SalePeriod	2.953E-6	.000	.000	.032	.974
19.00	1	(Constant)	1.011	.007		143.347	.000
		SalePeriod	4.095E-5	.001	.005	.073	.942
104.00	1	(Constant)	.972	.020		49.776	.000
		SalePeriod	.004	.002	.462	2.803	.009
113.00	1	(Constant)	.927	.019		49.301	.000
		SalePeriod	.008	.002	.692	4.789	.000

a. Dependent Variable: salesratio

The above analysis indicated that no significant residential market trend was present in the sale data within each economic area. While there was a statistically significant trend for several economic areas, the magnitude of the trend in each was insignificant. 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 2020 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	163809	\$227	\$246
SOLD	26996	\$230	\$246

Report

VALSF

ECONAREA	sold	N	Median	Mean
1.00	UNSOLD	272	\$334	\$319
	SOLD	58	\$337	\$336
2.00	UNSOLD	951	\$302	\$304
	SOLD	104	\$326	\$316
3.00	UNSOLD	4471	\$223	\$231
	SOLD	825	\$227	\$237
4.00	UNSOLD	4933	\$244	\$245
	SOLD	673	\$259	\$264
5.00	UNSOLD	7668	\$212	\$222
	SOLD	1058	\$216	\$225
6.00	UNSOLD	3124	\$191	\$199
	SOLD	522	\$190	\$198
7.00	UNSOLD	7190	\$197	\$201
	SOLD	1033	\$205	\$209
8.00	UNSOLD	25610	\$204	\$213
	SOLD	5221	\$210	\$216
9.00	UNSOLD	2068	\$197	\$201
	SOLD	358	\$199	\$203
10.00	UNSOLD	22847	\$249	\$260
	SOLD	2719	\$263	\$277
11.00	UNSOLD	24762	\$224	\$234
	SOLD	4904	\$223	\$235
12.00	UNSOLD	3418	\$403	\$434
	SOLD	338	\$426	\$442
13.00	UNSOLD	5843	\$289	\$293
	SOLD	809	\$300	\$308
14.00	UNSOLD	8008	\$337	\$382
	SOLD	1085	\$359	\$368
15.00	UNSOLD	1384	\$290	\$286
	SOLD	180	\$298	\$294
16.00	UNSOLD	2054	\$282	\$310
	SOLD	228	\$311	\$326
17.00	UNSOLD	4312	\$250	\$261
	SOLD	699	\$265	\$274
18.00	UNSOLD	28083	\$216	\$224
	SOLD	5251	\$226	\$232
19.00	UNSOLD	1163	\$216	\$218
	SOLD	197	\$213	\$217
104.00	UNSOLD	133	\$166	\$158
	SOLD	28	\$209	\$201
113.00	UNSOLD	180	\$162	\$168
	SOLD	27	\$202	\$210

There were two economic areas with greater than 10 percent difference in the median value per square foot between sold and unsold properties (in red) – for these economic areas, we compared the median change in taxable years 2018 and 2020 between sold and unsold properties for these two economic areas. We will contact the assessor concerning these differences.

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
321.00	UNSOLD	21	\$218	\$250		321.00	UNSOLD	21	1.0759	1.0908	
	SOLD	51	\$315	\$308	44%		23%	SOLD	51	1.1965	1.1937
416.00	UNSOLD	208	\$236	\$248		416.00	UNSOLD	208	1.0856	1.0855	
	SOLD	25	\$299	\$306	27%		23%	SOLD	25	1.1870	1.1951
1021.00	UNSOLD	426	\$337	\$344		1021.00	UNSOLD	426	1.1328	1.1439	
	SOLD	56	\$378	\$378	12%		10%	SOLD	56	1.2594	1.2800
1324.00	UNSOLD	758	\$339	\$340		1324.00	UNSOLD	758	1.1791	1.1810	
	SOLD	112	\$381	\$388	12%		14%	SOLD	112	1.2926	1.2971
1526.00	UNSOLD	288	\$344	\$346		1526.00	UNSOLD	288	1.1105	1.1280	
	SOLD	49	\$425	\$416	24%		20%	SOLD	49	1.2633	1.2929
2373.00	UNSOLD	74	\$207	\$208		2373.00	UNSOLD	74	1.0133	0.9940	
	SOLD	74	\$259	\$245	26%		18%	SOLD	74	1.1883	1.1478
3003.00	UNSOLD	134	\$166	\$159		3003.00	UNSOLD	134	1.4167	1.4623	
	SOLD	28	\$209	\$201	26%		27%	SOLD	28	1.5649	1.5936
3013.00	UNSOLD	182	\$162	\$169		3013.00	UNSOLD	182	1.3333	1.3641	
	SOLD	27	\$202	\$210	25%		24%	SOLD	27	1.5116	1.5370

Please note that the above 8 neighborhoods were identified out of a total of 384 residential neighborhoods, or 2.1 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.

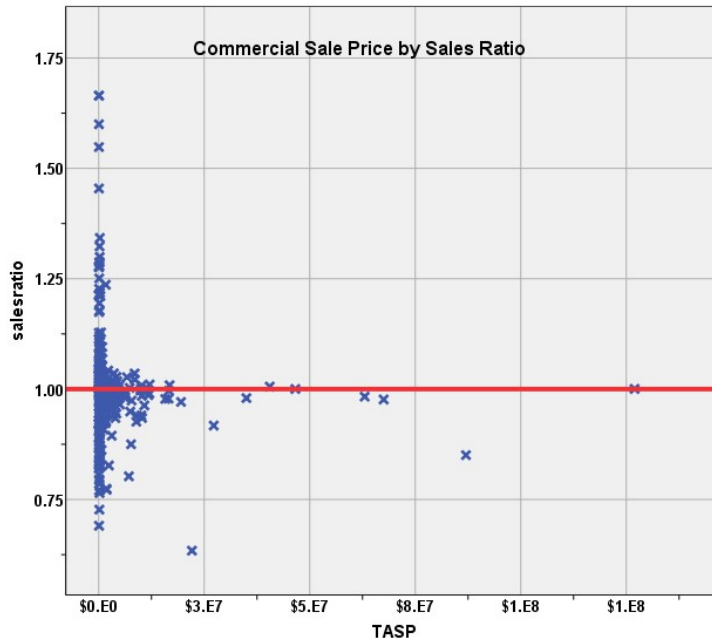
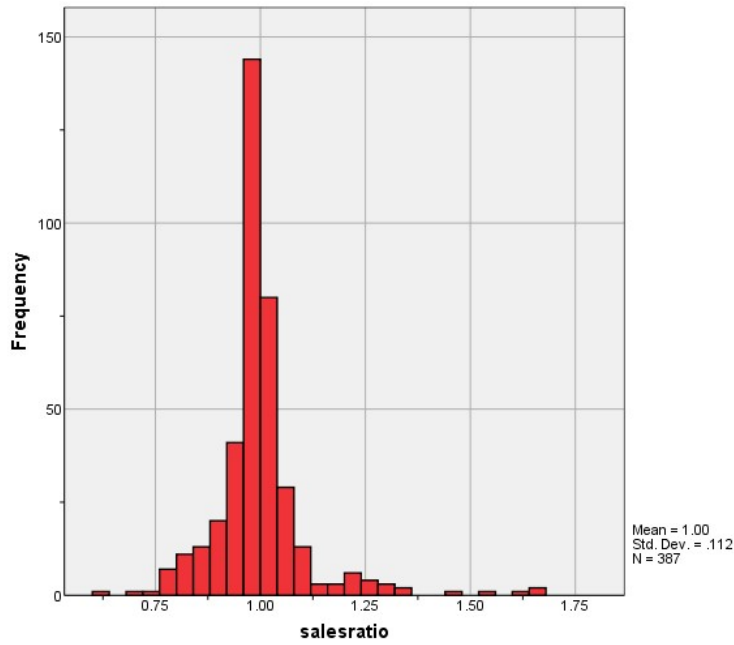
IV. COMMERCIAL/INDUSTRIAL SALE RESULTS

There were 388 qualified commercial/industrial sales for the 24-month sale period ending June 30, 2018. Using IAAO guidelines, we trimmed one sale, resulting in a final total of 387 commercial sales. The sales ratio analysis was as follows:

Ratio Statistics

Median	0.990
Price Related Differential	1.031
Coefficient of Dispersion	6.4

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:



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

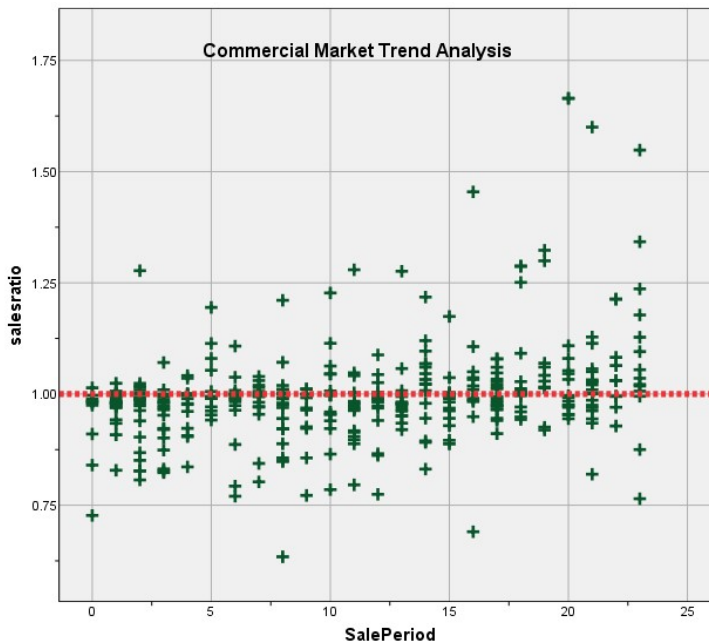
Commercial Market Trend Analysis

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

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	.941	.010		90.779	.000
	SalePeriod	.005	.001	.305	6.280	.000

a. Dependent Variable: salesratio



Although there was a statistically significant trend, 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.

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	N	Median	Mean
UNSOLD	5757	\$127	\$164
SOLD	390	\$144	\$169

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	946	\$136	\$165	
	SOLD	35	\$208	\$269	
2215.00	UNSOLD	77	\$115	\$123	
	SOLD	5	\$142	\$145	
2220.00	UNSOLD	619	\$110	\$127	
	SOLD	71	\$122	\$135	
2230.00	UNSOLD	1369	\$197	\$259	
	SOLD	30	\$170	\$224	
2235.00	UNSOLD	1062	\$89	\$97	
	SOLD	53	\$126	\$172	
2245.00	UNSOLD	1527	\$133	\$146	
	SOLD	185	\$160	\$151	
3215.00	UNSOLD	29	\$72	\$81	
	SOLD	5	\$76	\$107	

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

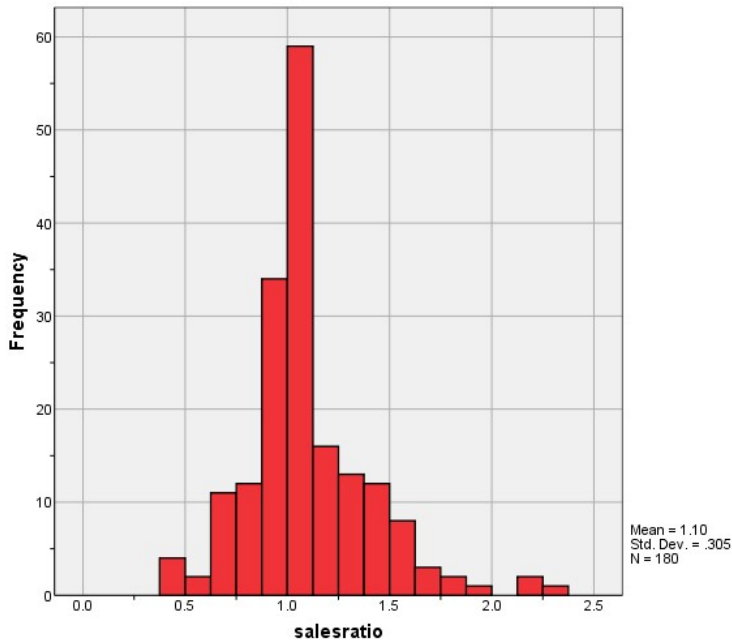
V. VACANT LAND SALE RESULTS

There were 180 qualified vacant land sales for the 24-month sale period ending June 30, 2018. The sales ratio analysis results were as follows:

Ratio Statistics

Median	1.031
Price Related Differential	1.065
Coefficient of Dispersion	20.2

The above ratio statistics were in compliance overall with the standards set forth by the Colorado State Board of Equalization (SBOE) for the overall 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.

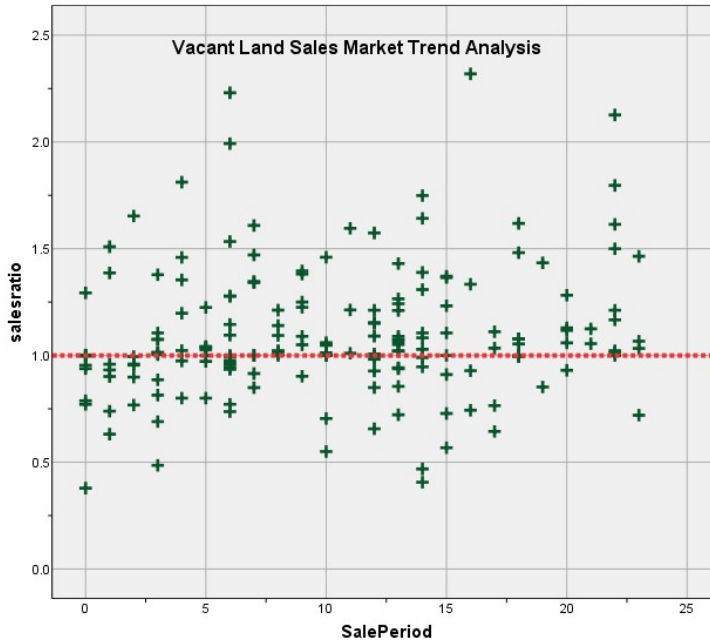
Vacant Land Market Trend Analysis

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

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	1.016	.042		24.070	.000
	SalePeriod	.008	.004	.166	2.244	.026

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 2018 and 2020 between each group. The following were the results:

Report			
DIFF			
	N	Median	Mean
UNSOLD	3252	1.0000	1.1048
SOLD	139	1.2062	1.2616

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		1	1.2000	1.2000
	SOLD		3	1.1429	1.1429
011854	UNSOLD		8	1.0000	1.0845
	SOLD		7	1.2062	1.1984
017062	UNSOLD		1	1.0000	1.0000
	SOLD		3	1.2500	1.1667
033222	UNSOLD		5	1.2500	1.2558
	SOLD		5	1.2122	1.3635
053966	UNSOLD		3	1.0625	1.0342
	SOLD		3	1.0625	1.2813

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 Mean Centered
		Lower Bound	Upper Bound		Lower Bound	Upper Bound	Actual Coverage		Lower Bound	Upper Bound			
1.00	1.005	.998	1.012	1.001	.999	1.009	95.2%	1.004	.996	1.011	1.001	.020	2.8%
2.00	1.005	.994	1.016	1.000	.997	1.001	96.1%	1.002	.992	1.013	1.003	.026	5.8%
3.00	1.002	.998	1.006	.999	.998	1.000	95.7%	1.001	.997	1.005	1.001	.034	6.1%
4.00	1.008	1.003	1.013	1.000	.999	1.001	95.8%	1.006	1.001	1.010	1.002	.034	6.5%
5.00	1.004	1.001	1.007	1.000	.999	1.000	95.3%	1.001	.999	1.004	1.003	.031	5.7%
6.00	1.011	.999	1.023	1.000	.999	1.001	95.8%	1.007	.997	1.017	1.004	.045	13.9%
7.00	1.003	1.000	1.006	1.000	.999	1.000	95.2%	1.002	.999	1.005	1.001	.029	5.3%
8.00	1.003	1.001	1.004	1.000	1.000	1.000	95.1%	1.001	1.000	1.003	1.001	.032	5.3%
9.00	1.006	1.000	1.012	1.000	.996	1.002	96.1%	1.003	.997	1.008	1.003	.039	5.9%
10.00	1.004	1.001	1.006	1.000	1.000	1.000	95.4%	1.002	1.000	1.004	1.002	.027	5.6%
11.00	1.002	1.001	1.004	1.000	1.000	1.000	95.1%	1.002	1.001	1.003	1.001	.027	4.3%
12.00	1.012	1.006	1.018	1.000	1.000	1.001	95.6%	1.010	1.005	1.016	1.001	.020	5.6%
13.00	1.007	1.003	1.011	1.000	.999	1.001	95.7%	1.004	1.000	1.007	1.003	.028	5.8%
14.00	1.011	1.007	1.015	1.000	1.000	1.000	95.4%	1.007	1.004	1.010	1.004	.025	6.8%
15.00	1.000	.995	1.005	1.000	.999	1.001	96.2%	1.000	.995	1.005	1.000	.017	3.4%
16.00	1.008	.997	1.019	1.000	.999	1.000	95.9%	1.009	.997	1.021	.999	.030	8.4%
17.00	1.005	1.001	1.009	1.000	.999	1.000	95.5%	1.003	.999	1.007	1.002	.027	5.4%
18.00	1.003	1.002	1.004	1.000	1.000	1.000	95.2%	1.001	1.000	1.002	1.002	.028	4.7%
19.00	1.012	1.004	1.019	1.001	1.000	1.004	96.1%	1.010	1.004	1.015	1.002	.026	5.2%
104.00	1.019	.996	1.042	.994	.989	1.037	97.1%	1.015	.990	1.041	1.004	.047	6.2%
113.00	1.005	.978	1.032	1.000	.971	1.037	98.1%	1.004	.985	1.023	1.001	.047	6.8%

Commercial/Industrial

Ratio Statistics for CurrTot / TASP

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 Mean Centered
	Lower Bound	Upper Bound		Lower Bound	Upper Bound	Actual Coverage		Lower Bound	Upper Bound			
.997	.985	1.008	.990	.984	.995	95.8%	.966	.942	.990	1.031	.064	11.3%

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

Ratio Statistics for CurrLnd / TASP

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 Mean Centered
	Lower Bound	Upper Bound		Lower Bound	Upper Bound	Actual Coverage		Lower Bound	Upper Bound			
1.097	1.052	1.141	1.031	1.007	1.066	95.6%	1.030	.979	1.080	1.065	.202	27.8%

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

Sale Price

Case Processing Summary

		Count	Percent
SPRec	\$50K to \$100K	59	0.2%
	\$100K to \$150K	480	1.8%
	\$150K to \$200K	1230	4.6%
	\$200K to \$300K	5194	19.2%
	\$300K to \$500K	14199	52.6%
	\$500K to \$750K	4293	15.9%
	\$750K to \$1,000K	788	2.9%
	Over \$1,000K	756	2.8%
Overall		26999	100.0%
Excluded		0	
Total		26999	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
\$50K to \$100K	1.042	1.001	.103	16.1%
\$100K to \$150K	1.012	1.000	.069	11.3%
\$150K to \$200K	1.001	1.000	.054	8.5%
\$200K to \$300K	1.001	1.000	.037	7.5%
\$300K to \$500K	1.000	1.000	.024	4.1%
\$500K to \$750K	.999	1.000	.025	4.4%
\$750K to \$1,000K	.999	1.000	.025	5.1%
Over \$1,000K	1.000	1.025	.025	6.6%
Overall	1.000	1.005	.029	5.6%

Subclass

Case Processing Summary

		Count	Percent
ABSTRIMP	.00	1	0.0%
	1212.00	21702	80.4%
	1215.00	71	0.3%
	1220.00	48	0.2%
	1222.50	1	0.0%
	1225.00	61	0.2%
	1230.00	5115	18.9%
	Overall		26999
Excluded		0	
Total		26999	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
.00	1.128	1.000	.000	.
1212.00	1.000	1.001	.027	5.3%
1215.00	1.000	1.012	.046	18.6%
1220.00	1.006	1.012	.054	7.0%
1222.50	.951	1.000	.000	.
1225.00	1.001	1.053	.050	8.2%
1230.00	.999	1.003	.039	6.5%
Overall	1.000	1.005	.029	5.6%

Improvement Age

Case Processing Summary

	Count	Percent
AgeRec		
.00	1	0.0%
Over 100	113	0.4%
75 to 100	303	1.1%
50 to 75	2831	10.5%
25 to 50	11915	44.1%
5 to 25	7858	29.1%
5 or Newer	3978	14.7%
Overall	26999	100.0%
Excluded	0	
Total	26999	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
.00	1.128	1.000	.000	.
Over 100	1.001	1.008	.032	7.5%
75 to 100	1.000	1.007	.033	10.1%
50 to 75	1.000	1.001	.029	6.3%
25 to 50	1.000	1.010	.030	5.7%
5 to 25	1.000	1.001	.025	4.2%
5 or Newer	1.001	1.004	.034	6.6%
Overall	1.000	1.005	.029	5.6%

Improved Area

Case Processing Summary

	Count	Percent
ImpSFRec .00	1	0.0%
LE 500 sf	51	0.2%
500 to 1,000 sf	3569	13.2%
1,000 to 1,500 sf	8530	31.6%
1,500 to 2,000 sf	6897	25.5%
2,000 to 3,000 sf	5788	21.4%
3,000 sf or Higher	2163	8.0%
Overall	26999	100.0%
Excluded	0	
Total	26999	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
.00	1.128	1.000	.000	.
LE 500 sf	.999	.996	.051	9.4%
500 to 1,000 sf	1.000	1.003	.038	6.6%
1,000 to 1,500 sf	1.000	1.002	.031	5.6%
1,500 to 2,000 sf	1.000	1.001	.026	4.6%
2,000 to 3,000 sf	1.000	1.001	.025	4.4%
3,000 sf or Higher	1.000	1.019	.029	8.4%
Overall	1.000	1.005	.029	5.6%

Improvement Quality

Case Processing Summary

	Count	Percent
QUALITY	1	0.0%
A	805	3.0%
A-	1206	4.5%
A+	460	1.7%
B	2603	9.6%
B-	2888	10.7%
B+	2755	10.2%
C	11376	42.1%
C-	310	1.1%
C+	4226	15.7%
D	27	0.1%
D-	5	0.0%
D+	24	0.1%
E	2	0.0%
F	1	0.0%
R	7	0.0%
R-	10	0.0%
X	138	0.5%
X-	117	0.4%
X+	38	0.1%
Overall	26999	100.0%

Excluded	0	
Total	26999	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
	1.128	1.000	.000	.
A	1.000	1.059	.026	5.1%
A-	1.000	1.001	.028	4.3%
A+	1.000	1.006	.032	14.2%
B	1.000	1.004	.027	4.4%
B-	1.000	1.000	.025	4.3%
B+	1.001	1.001	.030	4.8%
C	1.000	1.003	.033	6.2%
C-	1.000	1.003	.038	6.6%
C+	1.000	1.001	.023	4.2%
D	1.002	.980	.033	9.8%
D-	1.008	1.015	.085	20.2%
D+	1.000	.965	.039	7.2%
E	1.211	1.075	.163	23.1%
F	1.362	1.000	.000	.
R	1.000	1.000	.004	0.6%
R-	.998	1.001	.008	1.4%
X	1.000	1.002	.028	8.4%
X-	1.001	.998	.019	4.0%
X+	1.000	1.000	.012	3.2%
Overall	1.000	1.005	.029	5.6%

Commercial Median Ratio Stratification

Sale Price

Case Processing Summary

		Count	Percent
SPRec	LT \$25K	2	0.5%
	\$25K to \$50K	19	4.9%
	\$50K to \$100K	29	7.5%
	\$100K to \$150K	41	10.6%
	\$150K to \$200K	45	11.6%
	\$200K to \$300K	32	8.3%
	\$300K to \$500K	32	8.3%
	\$500K to \$750K	26	6.7%
	\$750K to \$1,000K	24	6.2%
	Over \$1,000K	137	35.4%
Overall		387	100.0%
Excluded		0	
Total		387	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
LT \$25K	.910	1.005	.099	14.0%
\$25K to \$50K	1.046	.990	.214	29.7%
\$50K to \$100K	.994	.996	.082	11.3%
\$100K to \$150K	1.007	1.000	.102	13.4%
\$150K to \$200K	1.010	.999	.073	10.7%
\$200K to \$300K	.995	1.003	.099	13.3%
\$300K to \$500K	.989	1.000	.031	5.2%
\$500K to \$750K	.995	1.001	.033	5.0%
\$750K to \$1,000K	.990	1.001	.023	3.4%
Over \$1,000K	.982	1.011	.032	5.9%
Overall	.990	1.031	.064	11.4%

Subclass

Case Processing Summary

	Count	Percent
ABSTRIMP	2212.00	35
	2215.00	5
	2216.00	1
	2220.00	71
	2230.00	30
	2235.00	53
	2245.00	185
	2250.00	2
	3215.00	5
Overall	387	100.0%
Excluded	0	
Total	387	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
2212.00	.983	1.015	.032	5.8%
2215.00	.954	1.026	.045	8.2%
2216.00	1.071	1.000	.000	.
2220.00	.986	1.018	.033	5.8%
2230.00	.984	1.003	.039	6.9%
2235.00	.997	1.007	.028	5.1%
2245.00	.996	1.015	.098	15.1%
2250.00	.948	1.030	.032	4.5%
3215.00	.987	.996	.008	1.3%
Overall	.990	1.031	.064	11.4%

Improvement Age

Case Processing Summary

		Count	Percent
AgeRec	Over 100	7	1.8%
	75 to 100	4	1.0%
	50 to 75	36	9.3%
	25 to 50	159	41.1%
	5 to 25	98	25.3%
	5 or Newer	83	21.4%
Overall		387	100.0%
Excluded		0	
Total		387	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
Over 100	1.010	1.010	.033	4.8%
75 to 100	.988	1.002	.029	5.0%
50 to 75	.984	1.002	.040	7.5%
25 to 50	.992	1.022	.050	8.6%
5 to 25	.990	1.011	.052	8.4%
5 or Newer	.988	1.068	.122	18.9%
Overall	.990	1.031	.064	11.4%

Improved Area

Case Processing Summary

		Count	Percent
ImpSFRec	LE 500 sf	15	3.9%
	500 to 1,000 sf	80	20.7%
	1,000 to 1,500 sf	61	15.8%
	1,500 to 2,000 sf	25	6.5%
	2,000 to 3,000 sf	22	5.7%
	3,000 sf or Higher	184	47.5%
Overall		387	100.0%
Excluded		0	
Total		387	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
LE 500 sf	.922	1.025	.124	18.3%
500 to 1,000 sf	.997	1.031	.117	18.5%
1,000 to 1,500 sf	1.000	1.009	.073	10.6%
1,500 to 2,000 sf	1.000	1.023	.078	11.9%
2,000 to 3,000 sf	.993	1.038	.065	11.0%
3,000 sf or Higher	.985	1.016	.030	5.4%
Overall	.990	1.031	.064	11.4%

Improvement Quality

Case Processing Summary

		Count	Percent
QUALITY	A	5	1.3%
	B	31	8.0%
	C	291	75.2%
	D	60	15.5%
Overall		387	100.0%
Excluded		0	
Total		387	

Ratio Statistics for CurrTot / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
A	.996	1.001	.006	0.8%
B	.992	1.048	.044	8.8%
C	.989	1.036	.074	12.6%
D	.997	1.008	.035	5.6%
Overall	.990	1.031	.064	11.4%

Vacant Land Median Ratio Stratification

Sale Price

Case Processing Summary

		Count	Percent
SPRec	LT \$25K	3	1.7%
	\$25K to \$50K	6	3.3%
	\$50K to \$100K	37	20.6%
	\$100K to \$150K	23	12.8%
	\$150K to \$200K	19	10.6%
	\$200K to \$300K	21	11.7%
	\$300K to \$500K	26	14.4%
	\$500K to \$750K	15	8.3%
	\$750K to \$1,000K	10	5.6%
	Over \$1,000K	20	11.1%
Overall		180	100.0%
Excluded		0	
Total		180	

Ratio Statistics for CurrLnd / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
LT \$25K	1.095	1.009	.055	9.3%
\$25K to \$50K	1.476	.963	.302	43.0%
\$50K to \$100K	1.265	1.008	.179	23.1%
\$100K to \$150K	1.034	.997	.191	32.7%
\$150K to \$200K	.975	.993	.156	25.7%
\$200K to \$300K	1.000	1.012	.167	26.2%
\$300K to \$500K	1.005	1.001	.129	20.2%
\$500K to \$750K	1.012	.992	.151	23.9%
\$750K to \$1,000K	1.110	.999	.202	22.7%
Over \$1,000K	1.006	1.011	.181	26.7%
Overall	1.031	1.065	.202	30.3%

Subclass

Case Processing Summary

	Count	Percent	
ABSTRLND	.00	23	12.8%
	100.00	30	16.7%
	200.00	11	6.1%
	300.00	6	3.3%
	400.00	27	15.0%
	1112.00	62	34.4%
	1230.00	1	0.6%
	2112.00	4	2.2%
	2130.00	9	5.0%
	2135.00	7	3.9%
Overall	180	100.0%	
Excluded	0		
Total	180		

Ratio Statistics for CurrLnd / TASP

Group	Median	Price Related Differential	Coefficient of Dispersion	Coefficient of Variation Median Centered
.00	.972	1.037	.151	20.3%
100.00	1.004	1.037	.089	15.7%
200.00	1.003	.959	.095	19.8%
300.00	1.027	.994	.088	14.3%
400.00	1.023	1.088	.172	30.3%
1112.00	1.245	1.111	.230	28.9%
1230.00	1.293	1.000	.000	.
2112.00	.645	1.044	.260	36.2%
2130.00	.901	.983	.198	25.1%
2135.00	1.048	1.011	.126	18.6%
Overall	1.031	1.065	.202	30.3%