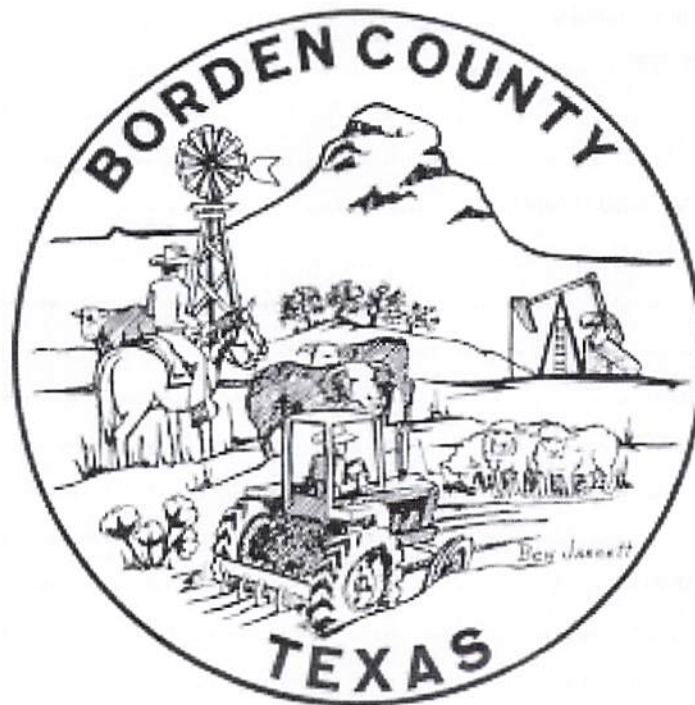


BORDEN COUNTY APPRAISAL DISTRICT



ADOPTED

BIENNIAL REAPPRAISAL PLAN 2021 – 2022

September 8, 2020

BORDEN COUNTY APPRAISAL DISTRICT

BIENNIAL REAPPRAISAL PLAN 2021-2022

TABLE OF CONTENTS

SCOPE OF RESPONSIBILITY	4
THE WRITTEN PLAN	4-5
PLAN FOR PERIODIC APPRAISAL.....	5-6
PERSONAL RESOURCES	6-7
STAFF EDUCATION AND TRAINING	7
DATA	7-8
APPRAISAL DISTRICT BOUNDARIES	8
SHARED APPRAISAL DISTRICT BOUNDARIES	8
INDEPENDENT PERFORMANCE TEST.....	8
APPRAISAL RESPONSIBILITIES.....	8
APPRAISAL RESOURCES	8
APPRAISAL FREQUENCY AND METHOD SUMMARY	8-9
REAPPRAISAL YEAR PROCESS	9
USPAP	9-10
HIGHEST AND BEST USE	10
PERFORMANCE ANALYSIS	10
ANALYSIS OF AVAILABLE RESOURCES	10
MASS APPRAISAL SYSTEM	10
REAL PROPERTY VALUATION	10
PERSONAL PROPERTY VALUATION	11
NOTICING PROCESS	11
HEARING PROCESS.....	11
DATA COLLECTION REQUIREMENTS	11
DATA COLLECTION/VALIDATION.....	11
SOURCES OF DATA.....	11-12
DATA MAINTENANCE	12
NEW CONSTRUCTION OR DEMOLITION	12
REMODELING	12
RE-INSPECTION OF PROBLEMATIC MARKET AREAS.....	12-13
RE-INSPECTION OF THE UNIVERSE OF PROPERTIES.....	13
FIELD OR OFFICE VERIFICATION OF SALES DATA & PROPERTY CHARACTERISTICS	13
PILOT STUDY	13
VALUATION BY TAX YEAR.....	13
MODEL DEVELOPMENT, COLLABORATION AND TESTING	13-14

RATIO STUDY PROCEDURES.....	15-16
APPROACHES TO VALUE.....	16
RESIDENTIAL REAL PROPERTY.....	16-17
MULTI-FAMILY REAL PROPERTY.....	17
RESIDENTIAL INVENTORY PROPERTY.....	18
COMMERCIAL REAL PROPERTY.....	18
MINERAL, INDUSTRIAL AND UTILITY REAL PROPERTY.....	18
VACANT REAL PROPERTY - LAND.....	18
SPECIAL VALUATION PROPERTIES – AGRICULTURAL USE PROPERTIES.....	18
SPECIAL INVENTORY.....	18
BUSINESS TANGIBLE PERSONAL PROPERTY.....	18-19
MINERAL, INDUSTRIAL AND UTILITY TANGIBLE PERSONAL PROPERTY.....	19
THE MASS APPRAISAL REPORT.....	19
VALUE DEFENSE.....	19
PLANNING AND ORGANIZATION.....	19-20
2019 CALENDAR OF KEY EVENTS.....	20-26
2020 CALENDAR OF KEY EVENTS.....	26-32
LIMITING CONDITIONS.....	32
SIGNATURE PAGE.....	33
REVALUATION DECISION.....	34
APPRAISAL – TAX YEAR 2021-2022.....	34
RESOLUTION FOR THE REAPPRAISAL.....	35
PROPERTY TAX LAW DEADLINES.....	36-42
TRUTH IN TAXATION IMPORTANT DATES.....	42
STANDARD 6 MASS APPRAISAL, DEVELOPMENT AND REPORTING.....	43-46
STATE COMPTROLLER RATIO STUDY SUMMARY.....	46
WEBSITES.....	46

Borden County Appraisal District 2021-2022 Biennial Reappraisal Plan

PROPOSED PLAN PRESENTED TO THE BORDEN COUNTY APPRAISAL DISTRICT BOARD OF DIRECTORS

SCOPE OF RESPONSIBILITY

The Borden County Appraisal District has prepared and published this reappraisal plan to provide our Board of Directors, citizens and taxpayers with a better understanding of the district's responsibilities and activities. This plan has several parts: a general introduction and then, several sections describing the appraisal effort by the appraisal district. The Borden County Appraisal District (CAD) is a political subdivision of the State of Texas created effective January 1, 1980. The provisions of the Texas Property Tax Code govern the legal, statutory, and administrative requirements of the appraisal district. A member board of directors, appointed by the taxing units within the boundaries of the Borden County Appraisal District, constitutes the district's governing body. The Chief Appraiser, appointed by the Board of Directors, is the chief administrator and chief executive officer of the appraisal district. The appraisal district is responsible for local property tax appraisal and exemption administration for two jurisdictions or taxing units in the county. Each taxing unit, Borden County and Borden County ISD, sets its own tax rate to generate revenue to pay for such things as road and street maintenance, courts, water systems, public school system and other public services. Property appraisals established by the appraisal district allocate the year's tax burden based on each taxable property's January 1 market value. The District also determines eligibility for several types of property tax exemptions such as those for homeowners, the elderly, disabled veterans, charitable or religious organizations and agricultural productivity valuation.

- Except as otherwise provided by the Property Tax Code, all taxable property is appraised at its "market value" as of January 1. Under the tax code, "market value" means the price at which a property would transfer for cash or its equivalent under prevailing market conditions under the following conditions:
- Exposed for sale in the open market with a reasonable time for the seller to find a purchaser;
- Both the seller and the buyer know of all the uses and purposes to which the property is adapted and for which it is capable of being used and of the enforceable restrictions on its use, and;
- Both the seller and buyer seek to maximize their gains, and neither is able to take advantage of the exigencies of the other.

The Property Tax Code defines special appraisal provisions for the valuation of residential homestead property (Sec. 23.23), productivity (Sec. 23.41), real property inventory (Sec. 23.12), dealer inventory (Sec. 23.121, 23.124, 23.1241 and 23.127), nominal (Sec. 23.18) or restricted use properties (Sec. 23.83) and allocation of interstate property (Sec. 23.03). The owner of real property inventory may elect to have the inventory appraised at its market value as of September 1 of the year preceding the tax year to which the appraisal applies by filing an application with the Chief Appraiser requesting that the inventory be appraised as of September 1. The Texas Property Tax Code, under Section 25.18; states that each appraisal office shall implement the plan for periodic reappraisal of property by the board of directors under Section 6.05(i). The district's current policy is to conduct general reappraisals every three years. However, appraised values are reviewed annually and are subject to change for purposes of equalization. Business personal properties, minerals and utility properties are appraised every year. The appraised value of real estate is calculated using specific information about each property. Using computer-assisted appraisal programs and recognized appraisal methods and techniques, we compare information with the data for similar properties and with recent market data. The district follows the standards of the International Association of Assessing Officers (IAAO) regarding its appraisal practices and procedures and subscribes to the standards promulgated by the Appraisal Foundation known as the Uniform Standards of Professional Appraisal Practice (USPAP) to the extent they are applicable. In cases where the appraisal district contracts for professional valuation services, the contract that is entered by each appraisal firm requires adherence to similar professional standards.

THE WRITTEN PLAN

Section 6.05, Tax Code, is amended by adding Subsection (i) to read as follows:

To ensure adherence with generally accepted appraisal practices, the Board of Directors of an appraisal district shall develop biennially a written plan for the periodic reappraisal of all property within the boundaries of the district according to the requirements of Section 25.18 and shall hold a public hearing to consider the proposed plan. Not later

than the 10th day before the date of the hearing, the secretary of the board shall deliver to the presiding officer of the governing body of each taxing unit participating in the district a written notice of the date, time, and place of the hearing. Not later than September 15 of each even numbered year, the board shall complete its hearings, make any amendments, and by resolution finally approve the plan. Copies of the approved plan shall be distributed to the presiding officer of the governing body of each taxing unit participating in the district and to the comptroller within 60 days of the approval date.

PLAN FOR PERIODIC APPRAISAL

Section 5.05 adds requirement for the appraisal district to appraise property in accordance with any appraisal manuals required by law to be prepared and issued by the Comptroller.

Subsections (a) and (b), Section 25.18, Tax Code, are amended to read as follows:

- Each appraisal office shall implement the plan for the periodic reappraisal of property approved by the Board of Directors under Section 6.05 (i).
- The plan shall provide for the following reappraisal activities for all real and personal property in the district at least once every 3 years:
 - Identifying properties to be appraised through physical inspection or by other means of identification, including deeds or other legal documentation, aerial photographs, land-based photographs, surveys, maps, and property sketches; the Borden CAD annually reappraises all property in the district including residential, commercial, vacant land, mobile homes, business personal property, and mineral, industrial, and utility real and personal properties. The Borden CAD researches the deeds filed in the Borden County Clerk's Office and request copies of relevant deeds. These deeds are read and abstracted by the district staff. Information is recorded in the CAMA (Computer Assisted Mass Appraisal) system including grantor, grantee, date of recording, date of sale, any pertinent property or deed information, volume, page and file number of county clerk's record. Property identification numbers are assigned to each parcel of property. All businesses are mailed a rendition in early January of each year. Owners are required by state law to list all their business personal property. Failure of an owner to render results in a 10% penalty. If fraud is involved in a false, rendition it is possible a 50% penalty could be assessed. Renditions are sent to and required of utility companies, compressor stations and pipelines. The valuation of these complex properties and mineral interest are outsourced to P&A (Prichard & Abbott Inc.). Copies of deeds and received renditions related to oil and gas properties are forwarded to P&A. Oil and gas wells are discovered using Texas Railroad Commission records. Ownership is determined by records known as division orders that are generally available from the purchasers of the oil and gas. Maps have been developed that show ownership lines for all real estate. These maps are stored digitally and are available to the staff of the district on their computer desktops. The maps are used to identify the properties and/or areas to be physically inspected.
 - Identifying and updating relevant characteristics of each property in the appraisal records; Appraisers drive the county and gather data about each home, commercial business or vacant land tract. The appraiser carries a CAMA generated property appraisal card for each property that contains information on the property and allows the appraiser to update relevant information. The appraiser notes the condition of the property and any changes to the property since the last inspection, such as measurements, additions, new construction, demolition, renovation, deterioration, rehabilitation, occupation, abandonment, etc. Pictures of the property are taken (if possible, as needed) to compare with the pictures that have been captured previously and stored in the CAMA system. Data noted on the cards and transferred to the CAMA system include an exterior sketch of the improvement, with measurements, which allows the system to calculate square footage for the various areas of the building. Components of the building such as bathrooms, fireplaces, air conditioning, type of roof and covering, type of exterior wall, type of foundation, etc. are listed and appropriate values are assigned by the CAMA system. The appraiser looks for newly constructed properties, remodeled properties or demolished property sites as he/she drives through the county. Business personal property is inspected each year. The appraiser looks at the quality of the inventory, how dense the stocking is, and makes general notes about the equipment seen. If his/her observation is different than the rendition made by the taxpayer, additional information is gathered, and a higher value may be assigned than the rendered amount.
 - Defining market areas in the district; Annually, appraisers combine similar types of property into "neighborhoods". These neighborhoods have improvements that are similar construction and type as well as similar years of construction. Market sales are examined to confirm which areas are similar. A "neighborhood" for analysis purposes is defined as the largest geographic groupings of properties where the property's physical, economic, governmental and social forces are generally similar and uniform, resulting in consistent and uniform values over the defined market area or neighborhood. There is no difference in how the four forces affect values throughout the county, and no discernible areas of variable value as evidenced in

- market sales, so we look at the whole county as a neighborhood or one, county-wide market area.
- Identifying property characteristics that affect property value in each market area, including;
 - The location and market area of the property;
 - Physical attributes of property, such as size, age and condition;
 - Legal and economic attributes; and
 - Easements, covenants, leases, reservations, contracts, declarations, special assessments, ordinances, or legal restrictions; each parcel of property has detailed information recorded in the CAMA system. For land the legal description, dimensions, zoning, size, available utilities and special characteristics are noted in a form that can be used and compared with other land parcels. Each improvement shows the sketch and dimensions, a picture of the improvement, the class which indicates the perceived comparative construction quality, the actual or effective year of the construction of each part of the improvement, the type of roof, the roof covering, the exterior covering, the foundation type, number of baths, fireplaces, air conditioning type, other attributes and overall condition of the improvement. Other characteristics that affect the parcel's value, such as legal and economical attributes, that are apparent from the inspection should be noted in the CAMA system for further consideration. Characteristics that are not physically apparent, such as easements, leases, restrictions, and other legal parameters should be noted within the CAMA system as they become evident through research in the Clerk's office or other documentation.
 - Developing an appraisal model that reflects the relationship among the property characteristics affecting value on each market area and determines the contribution of individual property characteristics. The CAMA system began with the cost approach to value and to estimate original cost of each improvement. That cost is based on local modifiers to the Marshall-Swift cost system, a nationally recognized cost estimation system. By utilizing these cost systems, properties are equalized as to their original costs. Components measured in the value include the size of the structure, number of bathroom fixtures, type of roof structure, roof covering, exterior covering, special features such as fireplaces, hot tubs, cabinetry and other special amenities. The market sales were then studied for improvement contributions in each neighborhood (market area) and adjustments to cost are applied to each neighborhood (market area) in the form of all types of depreciation. This resulted in a value schedule that is then analyzed each year and compared to current market sales to determine any trend or value change over time. Finally, each structure is rated as to its current condition. Ratings range from unsound to excellent. Sales are also categorized using the same condition rating system so that the sales comparisons will be made to properties of like construction and condition. This same concept is used in commercial, industrial and apartment property. Significantly, larger neighborhoods or areas are indicated for these properties using sales and income data. Oil and gas values are set for each lease in the same manner as analysts appraise a lease for sale or purchase. Economically recoverable reserves are estimated using geological knowledge, decline curves, and production records, and the value assigned is determined using price of product, discounted value of future production and expense to produce. Utilities, railroads and pipelines are individually appraised using the three approaches to value. The appraisal is a "unit appraisal" that looks at the entire company to be appraised, values it based on original cost less depreciation, net income to the company, and comparable sales if they exist. Then the value for each jurisdiction is set based on the amount of equipment, lines or customers within that jurisdiction.
 - Applying the conclusions reflected in the model to the characteristics of the properties being appraised by utilizing the age, quality, condition, construction components, and other variables, the model is developed and applied to all parcels within the neighborhood (market area). Similar values per square foot for similar age, construction quality and condition are assigned. Models are developed and the CAMA system applies all the factors and assigns value to each parcel.
 - Reviewing the appraisal results to determine value. After completing the process of assigning values to all parcels within the neighborhood (market area) using the computer assisted mass appraisal programs, comparisons are made of those values per square foot within the neighborhood (market area) with current sales data from the neighborhood (market area). A sales ratio is run for the neighborhood (market area) to determine if the values that have been assigned are acceptable. Commercial property is compared by category or type of business. Adjustments are made in mass by the appraiser utilizing the CAMA system. All similar improvements are compared to verify reasonableness of value and equality. Oil and gas leases are valued individually and values for the entire lease are entered into the CAMA system. The CAMA system then distributes the value according to the ownership interest specified in the division order of the lease.

PERSONNEL RESOURCES

Staffing and budget requirements for tax year 2021 are detailed in the 2021 appraisal district budget, as adopted by the Board of Directors and attached to the written biennial plan by reference. The reappraisal plan is adjusted to reflect the

available staffing in tax year 2021 and the anticipated staffing for tax year 2022. Staffing can impact the cycle of real property re-inspection and personal property on-site review that can be accomplished in the 2021-2022-time period. Information Systems (IS) support, provided by Pritchard & Abbott, Inc., of Ft. Worth, TX is detailed with year specific functions identified and system upgrades scheduled. Computer-generated forms are reviewed for revisions based on year and reappraisal status. Legislative changes are scheduled for completion and testing. Existing maps and data requirements are specified, and updates scheduled. The district has contracted with Pritchard & Abbott, Inc., of Ft. Worth, Texas to help with special projects, the Residential, Commercial and Personal Property appraisal and to assist in completion of the valuation modeling and schedule revisions. This is a 3-year contract and will renew on an annual basis at the end of the term. The valuation of all Industrial, Mineral, and Utility Properties within the district is contracted with Pritchard & Abbott, Inc., of Ft. Worth, Texas. All contracts for appraisal services are required to meet International Association of Assessing Officers (IAAO) "Standards on Contracting Assessment Services".

STAFF EDUCATION AND TRAINING

All personnel that are performing appraisal work are subject to the provisions of the Property Taxation Professional Certification Act and must be registered with the Texas Department of Licensing and Regulations (TDLR) TDLR is responsible for ensuring appraisers are professional, knowledgeable, competent and ethical. This is accomplished through a statewide program of registration, licensing, education, experience, testing and certification for all property tax professionals. Upon registration, appraisers registered with TDLR have up to five years to take a series of appraisal courses and exams to achieve certification as a Registered Professional Appraiser (RPA). During each subsequent twenty-four-month period after certification, appraisers must complete an additional thirty hours of continuing education. Continuing education is in the form of IAAO, Texas Association of Assessing Officers (TAAO), Texas Association of Appraisal Districts (TAAD) and other approved Property Tax Assistance Division (PTAD) courses and seminars. Failure to meet these minimum standards will result in a registrant losing their TDLR license and will also result in the removal of the employee from the appraiser position. In addition to the mandated required courses for appraisers, additional specialized training is offered to all staff. The Chief Appraiser attends a Public Funds Investment training course biennially. Customer service and public relations training is offered to each employee. Public information Act and Open Meetings Act training is received from the Attorney General's website. Records maintenance and retention training is received from the Texas State Library and Archives Commission website. Additional webinar training on various topics is offered by the State Comptroller's office. Staff training is also received by attending seminars, user meetings, classes and on the job. After certification, the RPA must receive additional training with a minimum of 30 hours of continuing education within a 2-year period. The continuing education must include 2 hours of professional ethics, state laws and rules update course and 7 hours in USPAP. The RTA must receive additional training with a minimum of 30 hours of continuing education within a 2-year period. The continuing education must include 2 hours of professional ethics and state laws and rules update course.

The appraisal district staff consist of two employees:

- Chief Appraiser (Professional/Administration/Appraisals)
- Deputy Chief Appraiser (Tax collections/Customer service/ Clerical)

The Chief Appraiser is registered with TDLR as a Registered Professional Appraiser (RPA) and a Register Texas Assessor/Collector (RTA). The Deputy Chief Appraiser is registered with TDLR as a Register Texas Assessor/Collector (RTA) and has passed all required classes and state test. She will have her 5-years' experience in December 2022. She will get her RPA certification then. The district has contracted with P&A to provide personnel and expertise towards the completion of the appraisal of all properties in the county including field work, data analysis, valuation modeling, schedule revisions and taxpayer protest portions of the reappraisal plan. All contracts for appraisal services are required to meet IAAO "Standards on Contracting Assessment Services".

DATA

The district is responsible for establishing and maintaining approximately 23,920 real and personal property accounts covering approximately 900 square miles within Borden County. This data includes property characteristic and ownership and exemption information. Property characteristic data on new construction is updated through an annual field effort; existing property data is maintained through a field review that is prioritized by last field inspection date. Sales are routinely validated during a separate field effort; however, sales are validated as part of the new construction and data review field activities. General trends in cost and market data are acquired through various sources, including internally generated questionnaires to buyer and seller, university research centers, and market data centers and vendors. The district makes a broad range of information available for public access, including detailed information on the appraisal process, property characteristics data, residential sales, certified values, protests and appeal procedures, property maps, and a tax calendar. Related tax information and district forms, including exemption applications and business personal property renditions, are also available. The district's website, www.bordencad.org, makes a broad range of information available for public access, including information on the appraisal process, property characteristics

data, certified values and protest procedures. Downloadable files of related tax information and district forms, including exemption applications and business personal property renditions are also available.

APPRAISAL DISTRICT BOUNDARIES

The appraisal district's boundaries are the same as the county's boundaries.

SHARED APPRAISAL DISTRICT BOUNDARIES

The district established procedures whereby ownership and property data information are routinely exchanged. Appraisers from adjacent appraisal districts discuss data collection and valuation issues to minimize the possibility of differences in property characteristics, legal descriptions, and other administrative data. Borden CAD shares boundaries with Howard and Martin Counties.

INDEPENDENT PERFORMANCE TEST

According to Chapter 5 of the Texas Property Tax Code and Section 403.302 of the Texas Government Code, the State Comptroller's Property Tax Division (PTAD) conducts a property value study (PVS) of each Texas school district and each appraisal district every other year.

The code also requires the Comptroller:

- To use sales and recognized auditing and sampling techniques;
- Review each appraisal district's appraisal methods, standards and procedures to determine whether the district used recognized standards and practices (MAP review);
- Test the validity of school district taxable values in each appraisal district and presume the appraisal roll values are correct when values are valid; and
- Determines the level and uniformity of property tax appraisal in each appraisal district.

The methodology used in the property value study includes stratified samples to improve sample representativeness and techniques or procedures of measuring uniformity. This study utilizes statistical analysis of sold properties (sale ratio studies) and appraisals of unsold properties (appraisal ratio studies) as a basis for assessment ratio reporting. For appraisal districts, the reported measures include median level of appraisal, coefficient of dispersion (COD), the percentage of properties within 10% of the median, the percentage of properties within 25% of the median, and price-related differential (PRD) for properties overall and by state category (i.e., categories A, B, C, D and F1 are directly applicable to real property). There is one independent school district in Borden County for which appraisal rolls are annually developed. The preliminary results of this study are released in January in the year following the year of appraisal. The final results of this study are certified to the Education Commissioner of the Texas Education Agency (TEA) in the following July of each year for the year of appraisal. This outside (third party) ratio study provides additional assistance to the CAD in determining areas of market activity or changing market conditions.

APPRAISAL RESPONSIBILITIES

The appraisal staff is responsible for collecting and maintaining property characteristics data for classification and valuation. Accurate valuation of real and personal property methods requires a physical description of personal property, land and building characteristics. This appraisal activity is responsible for administering, planning and coordinating all activities involving data collections and maintenance of all commercial, residential and personal property types which are located in Borden County. The data collection effort involves the field inspection of real and business personal property accounts, done by Prichard & Abbott, as well as data entry of all data collected into the existing information system. The goal is to periodically field inspect residential and commercial properties in Borden County every year. The appraisal opinion of value for all property located in the district is reviewed and evaluated each year.

APPRAISAL RESOURCES

- **Personnel** – Appraisers from Prichard & Abbott conduct the appraisal activities
- **Data** – The data used by field appraisers includes the existing property characteristic information contained in the Computer Assisted Mass Appraisal System (CAMA) from the district's computer system. The data is printed on an appraisal card for the appraiser to use as a guide. Other data may include maps, sales, photos and actual cost and market information. The district gathers information from both buyers and sellers.

APPRAISAL FREQUENCY AND METHOD SUMMARY

- **Residential Property** – Residential property is physically examined every 3 years with appraisers walking each home noting condition of the improvement and looking for changes that might have occurred to the property since the last on-site check. Exterior pictures are taken of homes, as updates are needed. The properties are analyzed annually to ensure sales that have occurred during the past 12 months are within a +/-3% range of appraised value.
- **Commercial Property** – Commercial and industrial real estate is observed annually to verify class and condition. The inspection occurs as the Business Personal Property (BPP) appraisers are checking the BPP accounts.

- **Business Personal Property** – Business personal property is observed annually by the BPP appraisers. Renditions are sent to each BPP account to provide additional information on which to base values on all BPP accounts.
- **Minerals** – Working and royalty interests of producing oil and gas wells are appraised annually. The most recent production data available from the Texas Railroad Commission is downloaded into the appraisal software that estimates economically recoverable reserves. Those reserves are then valued based upon State mandated pricing using the previous year’s average of oil and gas values. A discount is applied for the anticipated life of the well in order to consider the value of money over time to recover those reserves. Each producing lease is valued as a unit and then that value is divided according to the various owners of the lease listed in division orders.
- **Utilities and Pipelines** – Utility companies and pipelines are appraised annually using a unit value developed using the three approaches to value. For example, a utility company’s total value in the State is estimated using cost, market and income approaches to value and then the entire value is allocated using components of that utility company that have situs in the various tax units of the Borden CAD. Components include such things as miles of transmission lines, miles of distribution lines, substation and the like for an electric company.

REAPPRAISAL YEAR PROCESS

Performance Analysis: The equalized values from the previous tax year are analyzed with ratio studies to determine the appraisal accuracy and appraisal uniformity overall and by market area within property reporting categories. Ration studies are conducted in compliance with the current Standard on Ratio Studies of the IAAO (International Association of Assessing Officers).

Analysis of Available Resources: Staffing and budget requirements for tax year 2021 and 2022 are detailed in the 2021 and 2022 budgets, as adopted by the board of directors and attached to the written biennial plan by reference. Existing appraisal practices, which are continued from year to year, are identified and methods utilized to keep these practices current are specified. IS (Information Systems) support is detailed with year specific functions identified and system upgrades scheduled. Existing maps and data requirements are specified, and updates scheduled.

Mass Appraisal System: CAMA revisions that are required are specified, scheduled, and completed by the IS provider. All computer forms, system revisions and procedures are reviewed and revised as required.

Data Collection Requirements: Field and office procedures are reviewed and revised as required for data collection. Activities scheduled for each tax year include new construction, demolition, remodeling, re-inspection of problematic market areas, re-inspection of the universe of properties on an annual cycle, and field or office verification of sales data and property characteristics.

Pilot Study by Tax Year: New and/or revised mass appraisal models are tested each tax year. Ratio studies, by market area, are conducted on proposed values each year. Proposed values on each category are tested for accuracy and reliability.

Valuation by Tax Year: Using market analysis of comparable sales and locally tested cost data, valuation models are specified and calibrated in compliance with supplemental standards from the IAAO and USPAP (Uniform Standards of Professional Appraisal Practice). The calculated values are tested for accuracy and uniformity using ratio studies. This step is predicted on having sufficient market sale, to accomplish either market comparison or calculate an appropriate local modifier for cost data.

The Mass Appraisal Report: Each tax year the property tax code required Mass Appraisal Report is prepared and certified by the Chief Appraiser after the conclusion of the appraisal phase of the ad valorem tax calendar (on or about May 15). The Mass Appraisal Report is completed in compliance with **Standard Rule 6-8** of USPAP. The signed certification by the Chief Appraiser is compliant with **Standard Rule 6-9** of USPAP. This written reappraisal plan is attached to the report by reference. The report date is the certification date (on or about July 25)

Value Defense: Evidence to be used by the appraisal district to meet its burden of proof for market value and equity in both informal settings and informal appraisal review board hearings is specified and tested.

Planning and Organization: A calendar of key events with critical completion dates is prepared for each major work area. This calendar identifies all key events for appraisal, clerical, customer service and information systems. A calendar is prepared for tax years 2021 and 2022. Production standards for field activities are calculated and incorporated in the planning and scheduling process.

USPAP

The Tax Code, Section 23.01, appraisal generally, subsection (b) states:

The market value of property shall be determined by the application of generally accepted appraisal methods and techniques. If the appraisal district determines the appraised value of a property using mass appraisal standards, the

mass appraisal standards must comply with the Uniform Standards of Professional Appraisal Practice. The same or similar appraisal methods and techniques shall be used in appraising the same or similar kinds of property. However, each property shall be appraised based upon the individual characteristics that affect the property's market value.

HIGHEST AND BEST USE

The highest and best use must be physically possible, financially feasible and productive to its maximum potential. The residential staff will conduct a highest and best use analysis of residential property to ensure the current use of property supports the highest present value as of the date of the appraisal. The highest and best use of residential property is normally its current use. Residential Valuation undertakes reassessment of the highest and best use in transition areas and areas of mixed residential and commercial use. Adjustments to the property value is made via changes in land classification or adjustment factors; improvement adjustment factors or classification code; or a combination of land and improvement adjustments are made in order to properly appraise the subject property at market value.

PERFORMANCE ANALYSIS

In each year 2021 and 2022 the previous tax year's equalized values are analyzed with ratio studies (as sales data is available) to determine appraisal accuracy and appraisal uniformity overall and by market area, within state property reporting categories. Ratio studies are conducted in compliance with the current Standard on Ratio on Studies from the IAAO. Mean, median and weighted mean ratios are calculated for properties in each reporting category to measure the level of appraisal (appraisal accuracy). The mean and the median are determined and calculated for each market to indicate the level of appraisal (appraisal accuracy) by property reporting category. In 2021 and 2022 this analysis will be used to develop the starting point for uniformity or equity of existing appraisals. In 2021 and 2022, any reporting category that may have been previously excluded from ratio studies, due to lack of data, will be readdressed. If sufficient market data has been discovered and verified, the category will be tested and analyzed to arrive at an indication of uniformity or equity of existing appraisals.

ANALYSIS OF AVAILABLE RESOURCES

Staffing and budget requirements for tax year 2021 are detailed in the 2021 appraisal district budget, as adopted by the board of directors and attached to the written biennial plan by reference. The reappraisal plan is adjusted to reflect the available staffing in tax year 2021 and the anticipated staff for tax year 2022. Existing appraisal practices, which are continued from year to year, are identified and methods utilized to keep these practices current are specified. Each year, real property appraisal depreciation tables and RCN (replacement cost new) tables are tested against verified sales data (as available) to ensure they represent current market data. The cap rate study by commercial real property type should be updated from current market data and market rents are reviewed and updated from local published data (as available and necessary). Personal property quality/density schedules should be tested and analyzed based on renditions and prior year hearing documentation. The data used by field appraisers includes the existing property characteristic information contained in CAMA from the district's computer system. The data is printed on an appraisal card. As work is completed, the properties changes are input into CAMA. Other data used includes maps, sales data, fire and damage reports, photos and actual cost and market information. The districts cultivate sources and gathers information from both buyers and sellers. IS support, provided by Prichard & Abbott, Inc. (P&A) of Fort Worth, TX, is detailed with year specific functions identified and system upgrades scheduled. Computer generated forms are reviewed for revisions based on year and reappraisal status. Legislative changes are scheduled for completion and testing. Existing maps and data requirements are specified, and updates scheduled.

MASS APPRAISAL SYSTEM

Computer Assisted Mass Appraisal (CAMA) system revisions are completed by the Information Systems Software Provider. The provider performs system revisions and procedures. Borden CAD contracted with Pritchard & Abbott, Inc for these services. Pritchard & Abbott (P&A) supports the software and they make programming updates as needed.

REAL PROPERTY VALUATION

Revisions to cost models, income models and market models are specified, updated and tested each year (as information is available). Value schedules are tested with market data (sales) to ensure that the appraisal district is in compliance with Section 23.011 of the Texas Property Tax Code (Cost Method of Appraisal). Market adjusted, and replacement cost new tables as well as depreciation tables are tested for accuracy and uniformity using ratio study tools and compared with cost data from recognized industry leaders, such as Marshall & Swift Valuation Services. Land tables are updated using current market data including sales and cash rents. Value modifiers are developed for property categories by market area (as necessary) and tested on a pilot basis with ratio study tools. Currently and historically income specific data has been unavailable or irrelevant, however, if such data becomes available and appropriate, then income, expense and occupancy data will be updated in the income models for various property classes and cap rate studies will be completed using current sales and market data. The resulting models will be tested using ratio study tools.

PERSONAL PROPERTY VALUATION

Valuation procedures are reviewed; modified as needed; and tested. Business Personal Property is inspected on-site annually. The latest edition of the Comptroller's Guide (as adjusted and pertinent) and Marshall & Swift are utilized, as necessary, in the appraisal of personal property in the district.

NOTICING PROCESS

Section 25.19 appraisal notice forms are reviewed and edited for updates and changes are signed off on by the Chief Appraiser. Updates include the latest copy of the Comptroller's Property Taxpayer Remedies and Property Tax Notice of Protest form. The Chief Appraiser is required to notify a taxpayer of his property's appraised value if the property is reappraised. Borden CAD mails notices to all property owners every year. After appraisals are completed and changes to properties and schedules are entered into CAMA, P&A is notified, and notices are printed according to Section 25.19, proofed by the Chief Appraiser, stuffed and mailed by P&A.

HEARING PROCESS

Protest hearing schedules for informal meetings and formal Appraisal Review Board (ARB) hearings are reviewed and updated as required. Standards of documentation are reviewed and amended as required. The appraisal district hearing documentation is reviewed and updated to reflect the current valuation process. Production of documentation is tested and in compliance with the Texas Property Tax Code, requiring the district to provide evidence packets to taxpayers within 15 days of the request, is ensured. Evidence packets include data, schedules, formulas and all other information the district may introduce at an ARB hearing. Tax Code Section 5.104 adds notice to each property owner or designated agent who is authorized to submit a Comptroller prescribed survey regarding the ARB.

DATA COLLECTION REQUIREMENTS

Data collection requires organization, planning and supervision of the field effort. Data collection procedures have been established for residential, commercial and personal property. Activities scheduled for each tax year include new construction, demolition, remodeling, and re-inspection of problematic market area, as well as re-inspection of the universe of properties. Field and office procedures are reviewed and revised as required for data collection.

DATA COLLECTION/VALIDATION

The appraiser conducts field inspections and records information on an appraisal card. The quality of the data used is extremely important in establishing accurate values of taxable property. While production standards are established and upheld for the various field activities, quality of data is emphasized as the goal and responsibility of the appraiser. Quality control is necessary to ensure accuracy and uniformity of valuations. Data collection of real property involves maintaining data characteristics of the property on CAMA. The information contained in CAMA includes site characteristics, such as land size, use and location, and improvement data, such as square foot of living area, year built and effective age, quality of construction and condition. Other characteristics that affect value, such as legal and economic attributes, that are apparent from the inspection should be noted on the CAMA worksheet for further consideration and analysis within the market study. Other characteristics that are not physically apparent, such as easements, leases, and restrictions and other legal parameters, should be noted within the CAMA system and included in the market analysis as they become evident through research in the Clerk's office or other documentation. The field appraiser uses the Borden CAD Appraisal Manual that establishes uniform procedures for the correct listing of real property. All properties are coded according to this manual and the approaches to value are structured and calibrated based on this coding system. The field appraiser uses this manual during their initial training and as a guide in the field inspection of properties. The date of last inspection and the appraiser responsible is listed on the appraisal card. If a property owner or jurisdiction disputes the district's records concerning data CAMA may be altered based on the evidence provided. Typically, a field inspection is requested to verify this evidence for the current year's valuation or for the next year's valuation. Every year a field review of properties (as listed previously, by category) in the jurisdiction is done during the field effort. Data collection for personal property involves maintaining information on the Personal Property System. The type of information contained in the system includes property such as business inventory, furniture and fixture, machinery and equipment, cost and location and mobile homes. The field appraisers when conducting on-site inspections uses the appraisal manual as a guide to correctly list all personal property that is taxable. The appraisal manual that is utilized by the field appraiser is located and maintained in the district office. The manual is also available for public inspection. The district periodically updates the appraisal manual with input from the valuation group and field/contract appraisers.

SOURCES OF DATA

The sources of our data collection and verification are through data review field efforts, hearings, sales validation, field effort and property owner correspondence. A principle source of data comes from the deeds filed in the Clerk's office. Property owners are one of the best sources for identifying incorrect data that generates a field check. The property

owner may provide sufficient data to allow correction of records without the appraiser having to go on-site. The appraiser will drive through the county to review the accuracy of our data and identify properties that have to be re-evaluated. The sales validation effort in real property pertains to the collection of data of properties that have sold. For residential and commercial, sales validation involves on-site inspection by the field appraiser to verify the accuracy of our data or to get confirmation of a sale price. Soil surveys and agricultural surveys of farming and ranching property owners and industry professionals are helpful for productivity value and calibration. Accuracy and validity in property descriptions and characteristics data is the highest goal and is stressed throughout the appraisal process from year to year. Appraisal opinion quality and validity relies on data accuracy as its foundation. The Chief Appraiser rides with the contract field appraiser to randomly select properties to verify the procedures and practices being used by the appraisers.

DATA MAINTENANCE

The district's contracted field appraiser is responsible for coordinating activities involving file building, quality assurance and data maintenance of the different property types after data collection. These responsibilities fall into three activities: file building, quality assurance and data retention. The file building activity is to build and maintain the work packs that are sent with the appraiser to the field. This includes maintaining mapping records, property data cards, benchmark property descriptions, angle sketches and other data. The district is responsible for warehousing the information. The quality assurance activity is for ensuring correct data as it is received from the contract field appraiser. This includes verifying proper codes, balancing and vectoring sketches and ensuring proper data entry. The data entry activity is performed by the contract appraiser and the appraisal district staff and input directly into CAMA.

NEW CONSTRUCTION OR DEMOLITION

New construction may be identified from the field inspections or county offices may provide notification of utility hookups and/or septic system installation. New construction field and office review procedures are identified and revised as required. Field production standards are established and procedures for monitoring tested. Official Public Records also indicate new development areas that must be inspected. Demolition may be identified from field inspections or owner reporting. Process to verifying demolition of improvements is specified. System input procedures are identified and revised as required. New mobile home installations as verified with the Texas Department of Housing & Community Affairs (TDHC), are also included in yearly inspections.

REMODELING

Market areas with extensive improvement remodeling are identified, verified and field activities scheduled to update property characteristic data. Update to valuation procedures are tested with ratio studies before finalized in the valuation modeling.

RE-INSPECTION OF PROBLEMATIC MARKET AREAS

Market areas are areas within the appraisal district where values are considered consistent or in relative harmony among individual properties, an area where physical, economical, governmental and social forces and other influences (i.e. demographic patterns, regional location factors, employment and income patterns, general trends in real property prices and rents, interest rate trends, availability of vacant land and construction trends and cost) have similar influences on property values. The effect on values may be real and quantifiable or may be perceived. In either case, the market area is the first basis for market analysis. Real property market areas, by property classification, are examined for: low or high protest volumes; low or high sales ratios; or high coefficient of dispersion. Market areas that fail any or all of these tests are determined to be problematic. Field reviews are scheduled to verify and/or correct property characteristics data. Additional sales data is researched and verified. Usually, in the absence of adequate market data, neighborhood delineation is verified, and neighborhood clusters are identified; however due to the small size of the district, it is impossible to delineate or distinguish between specific neighborhoods, so the entire county must be considered as a whole in general when defining the market area.

RE-INSPECTION OF THE UNIVERSE OF PROPERTIES

The International Association of Assessing Officers, Standard on Mass Appraisal of Real Property specifies that the universe of properties should be re-inspected on a cycle of four-six (4-6) years. Section 25.18(b) of the Texas Property Tax Code requires re-inspection at least once every three years. The re-inspection may include the re-measurement of at least two (2) sides of each improved property. Physical inspection is considered to be the most fundamental step in achieving reliable property valuations. Uniform Standards of Professional Appraisal Practice (USPAP) does not require inspection for reappraisal. "Only that the characteristics of a property, relevant to an assignment be identified." Frequent physical inspections are nevertheless necessary to ensure that each property is appraised according to its conditions as of January 1. Borden CAD will be on an annual physical inspection cycle for all properties within the district. The contracted field appraiser has an appraisal card of each property to be inspected and makes notes of changes,

depreciation, remodeling, additions, demolitions, etc. The annual re-inspection requirements for tax years 2021 and 2022 are scheduled on the key events calendar.

FIELD OR OFFICE VERIFICATION OF SALES DATA & PROPERTY CHARACTERISTICS

All three approaches to estimating market value depend in some way on market information. Appraisal records must contain complete and accurate information about sale prices and conditions of properties within the district. Sales information must be verified and property characteristics data contemporaneous with the date of sale captured. The sales ratio tools require that the property that sold must equal the property appraised in order that statistical analysis results will be valid. The reliability of any valuation model or sales ratio study depends on the quantities and quality of its data. Borden CAD obtains sales information from deed filings, buyer/seller questionnaires, telephone, face-to-face interviews and sales information on comparable properties in neighboring counties (if available).

PILOT STUDY

New and/or revised mass appraisal models are tested. These modeling tests (sales ratio studies) are attempted each tax year. These tests require sufficient data and a lack thereof may limit not only the scope but the performance of the test. Actual test results (when available and sufficient) are compared with anticipated results and those models not performing satisfactorily are refined and retested. The procedures used for model specification and model calibration are in compliance with USPAP Standard Rule 6. (see pages 40-43) A pilot study helps to evaluate what to correct and how data is collected on representative sets of properties. Estimated values are assigned and then analyzed to determine what factors contribute to value. Certain factors or characteristics may not be vital to valuation but are maintained because they may be useful for explaining values to taxpayers.

VALUATION BY TAX YEAR

Valuation by tax year, using market analysis of comparable sales and locally tested cost data (if available), market area specific income and expense data (if available), and valuation models are specified and calibrated in compliance with the supplemental standards from the International Association of Assessing Officers and USPAP. The calculated values are tested for accuracy and uniformity using ration studies. Performance standards are those as established by the IAAO Standard on Ration Studies. Property values in all market areas are updated each reappraisal year. Tax year 2021 is a reappraisal year. Tax year 2022 is a reappraisal year.

MODEL DEVELOPMENT, COLLABORATION AND TESTING

Property valuation models seek to explain the market c=alue of properties from market data and sales. Models (schedules) are constructed to represent the operation of forces of supply and demand. These models have evolved from three broad theories of value: Cost, Market (sales comparison) and Income. Model development requires good theory, data analysis and research. Any developed model that accurately reflects the market will make the value defense burden of the appraisal district much more credible. The best value models will be accurate, rational and explainable. Model building (development) requires two distinct steps. Model specification (model design based on appraisal theory and market analysis, supply & demand variables and their interrelationships) and model calibration (solving for unknown qualities in a model) such as construction cost, sales price adjustments or capitalization rates. Qualitative and quantitative data are used in the mass appraisal models. Qualitative data (such as location, roof type or heating and cooling systems) are analyzed to evaluate the relationship between two variables. Quantitative data (the presence or the absence of a defining or specific feature) are based on measuring or counting for example, the square feet of a structure. Model calibration is the process of estimating the variables in a mass appraisal model; called the coefficients (they are the cost, capitalization rates, market adjustments, etc.). Borden CAD uses simple calibration to adjust existing developed models in use. Simple calibration promotes consistency in results and parcels can be recalibrated in mass. This is particularly effective when combined with ratio studies to monitor the level of appraisal by key property type. To evaluate the accuracy of the schedule values, property sales information is collected throughout the year. Each property buyer receives a sales letter along with any other necessary forms as soon as the CAD office updates the ownership in the appraisal records. When the sales letter is returned, the sale amount and any other pertinent information is recorded within that parcel's sale records. Information is also gathered from other appraisers, other appraisal districts and state reviewers. All credible information is included in the sales records and confirmation is attempted through additional sales letters (to buyers and sellers as necessary) or other personal contact. Given that the State of Texas is a non-discloser state, and that the information needed by the CAD is often confidential in nature, the market analysis performed is limited by the availability or pertinent and complete data, including sales prices, sales conditions and circumstances, income and expense data, etc. as discussed hereafter, each sale is initially considered (assumed) to be a market transaction unless otherwise proved. The resulting conclusions from the market analysis are therefore limited by those assumptions. The mass appraisal conducted yearly by the Borden CAD also can claim the Jurisdiction Exemption (USPAP) due to the limited scope and purpose of the appraisal and considering the guidelines of the Texas Property Tax Code. Given that market data (sales, leases, and other individual indications of value) is severely limited in Borden

County, due to few and infrequent actual occurrences, the annual market analysis is often expanded to include transactions of comparable property from neighboring counties, as available. Each property is reevaluated as if it were in Borden County using existing property schedules and that value is then compared to its sale price within the market analysis. Each sale is analyzed to determine the conditions of the sale. All sales included in the study must be a "market value" transaction, as defined in Section 1.04(7) of the Texas Property Tax Code and quoted earlier in this manual. Any sale determined not to be an "arm's length" transaction is then omitted from the final study. Several criteria are also considered when determining if each sales price needs any adjustment including, but not limited to: date of sale (in comparison to date of appraisal), special or unusual financing terms, inclusion of personal property, inclusion of intangible value and significant variances between the market value and the sale price due to physical changes to the property that cannot be accounted for due to the January 1 target date. If adjustments can be made to the sales price to show a current, "arm's length" value (including time and financing adjustments), the adjusted value is used in the ratio study. Any adjustments to reported sales prices must be discussed, debated, and approved by the Chief Appraiser. Sales used to determine real estate value should not include value that can be attributed to personal property or intangible value. For example, if a home sells, and the transaction included personal property (vehicles, boats, furniture, free-standing appliances, tools, etc.), the value associated with that personal property should be deducted from the reported sales price. The resulting, adjusted sales price is then used in the ratio study. Likewise, commercial property transactions often include both personal property and intangible value. For example, if a motel sells and the buyer purchased the motel franchise along with the real estate, the value of the franchise (being tangible) should be deducted from the sales price before being used in any market study. Determining the value of any intangibles in any transactions can be problematic and will require research into the industry and the local and similar markets. Although suspected by the staff, and often reported by buyers, adjustment for intangibles requires confirmation from outside sources and the seller. Financing adjustments occur rarely. Typically, prudent buyers will strive to acquire the most reasonable financing available, and then purchase the property of their choice using that same financing. Atypical financial arrangements usually accompany transactions that would not be considered "arm's length" and would therefore be omitted from the ratio study. Time adjustments are adjustments to the reported sales price of the property that are made when and if it can be proven that the general market trend in an area is changing over a given period of time. While relatively simple to calculate in the abstract, time adjustments are extremely difficult to quantify without substantial data, especially in small, rural markets. If a typical property transfers more than one time in a given time period (ideally no more than 1 year), each time being an "arm's length" transaction with typical financing and without physical changes to the property, the difference in the sales prices can be attributed to the general market. This difference, expressed as a positive or negative percentage per month, can then be applied to other property's sales prices to adjust the price to a standard date, usually January 1 of the appraisal year. For example, a residence may sell for \$50,000 on June 1 and then sell again on October 1 (5 months later) for \$55,000. The difference of \$5,000 (or 10% of the original sales price) is allocated as a market increase of 2% per month. A market decrease is calculated in the same way. If this was an "arm's length" transaction of a typical property that same percentage of increase or decrease can be used on other sales to adjust their sales prices to the January 1 target date. A statistical analysis of each class of property is conducted using the available, credible and adjusted sales information. Within each class of property, the appraisal district looks for not only an acceptable median value, but also a reasonable COD. Each of these values is considered when determining whether to adjust a class schedule, and by how much. The sample size of each class analysis is also a major consideration. Classes that exhibit little or slow activity are allowed a larger variance due to the fact that minimal data sets (small samples) may tend to give incomplete analysis or biased results for an entire statistical population. Once a median value indicates that a particular property type or class needs adjustment, and the COD value reflects a consistent result, schedule values are recalculated to produce a revised analysis. The resulting median ratio should indicate that the adjusted appraised values of property more closely matches the current market value, as tested by the sales used in the analysis. The appraised values of all properties sold and unsold, within that type or class are then recalculated, using the increase or decrease indicated by the ratio study, and submitted for notification. If, as explained earlier, the market analysis was expanded to include transactions of comparable properties from the neighboring counties, the resulting adjusted schedules are applied to any sales within the county to determine whether any local modifier should be used within in Borden CAD to further refine the overall market analysis. A similar process is used to determine whether any neighborhood factors are needed by analyzing sales within a specific area (market segments) in comparison to the overall general market. These areas could be neighborhoods, cities, school districts or any other definable areas within the appraisal district that displays market trends or values differing from the trends or values derived from the market as a whole. Any significant and quantifiable differences then need to be addressed with economic adjustments to the properties within the pertinent area.

RATIO STUDY PROCEDURES (IAAO's Standard on Ration Studies is attached)

I. Collect and Post Sales Data

- A. Solicit sales information from all new property owners through sales letters and/or personal contact**
- B. Collect sales information from outside appraisers and from fee appraisals presented**
- C. Utilize sales information from Comptroller's office**
- D. Post sales information to the sales database**
 - 1. Record actual sale price**
 - 2. Note unusual financing**
 - 3. Note non-arm's length participants**
 - 4. Adjust sales price for inclusion of personal property or intangible value**
 - 5. Initiate frozen characteristics/partial sale codes if necessary**
 - a. Imminent construction/renovation can bias any later analysis by including values not part of the original transaction**
 - b. Sale including only a portion of the property described can also produce skewed results**
 - 6. Note any legal restrictions or economic characteristics that may affect value**

II. Preliminary Analysis

- A. Run sales analysis (by type, group or class) which includes any and all sales collected to date**
- B. Note median result and COD**
- C. Examine each sale included**
 - 1. Compare sale ratio to median result**
 - 2. Ratios substantially higher or lower than the median result (outliers) are singled out for further, in- depth analysis**
 - a. Note seller-financial institutions, known real estate opportunists, probates, known persons who finance their own transactions**
 - b. Note buyer-financial institutions, known real estate opportunist, and re-location companies**
 - c. Examine deed records to confirm "arm's length" violations not evident form examination of buyer and seller**
 - i. contract for deed**
 - ii. assumption of previous note**
 - iii. atypical financing**
 - d. Re-inspect properties to rule out any physical differences from the current property records**
 - e. Outlier sales that cannot be excluded or adjusted in the subsequent analysis**
- D. Adjust original data set**
 - 1. Omitted sales that are not "arm's length"**
 - 2. Adjust sales value for time or financing if necessary and possible**
 - 3. Adjust appraisal values for physical differences if applicable**

III. Secondary Analysis

- A. Run sales analysis (by type, group or class) utilizing information from preliminary analysis**
- B. Note median result and COD**
 - 1. Median value may or may not change significantly**
 - 2. COD value should improve**
- C. Note sample size**
 - 1. Compare number of sales within the class to the perceived number of total properties within the class**
 - 2. From experience and discussion among the appraisal staff, determine whether any median result different from 1.00 is significant**
- D. Attempt to increase sample size (if necessary)**
 - 1. Utilize time adjustments if determinable**
 - 2. Keep in mind marketing time for local market and any trends**
 - 3. Be careful to not include more sales just for sales sake**
 - 4. Changing markets and trends cannot be reflected in sales that are too old without accurate time adjustments**
- E. Apply results of analysis to current records**
 - 1. Any class whose median value is not significantly different from 1.00 does not require adjustment**
 - 2. Any class whose median value indicates that an adjustment is necessary should be analyzed**
 - a. Look at typical depreciation (age/condition) for that class as reflected in the sales analysis.**
 - b. Calculate increases necessary to raise the individual ratios to produce a median result of 1.00 (keeping in mind that because of depreciation, the percentage increase required is going to be necessarily larger that the difference in percentage points needed to reach a 1.00 result)**

- c. Apply the calculated increase to the database
- 3. Repeat procedure for all classes determined to need adjustment
- F. Run analysis again to test results
- IV. Examine results to identify neighborhoods that need adjustment
 - A. As individual sales are examined, note any areas that consistently show ratios significantly different from all the median result
 - B. Run analysis excluding the area in question
 - C. Run analysis including only the neighborhood in question
 - D. Check for significant variance between the two results
 - E. Apply neighborhood factor to correct variance

APPROACHES TO VALUE

As mentioned earlier, there are three basic approaches to value: Cost, Market and Income. Not every approach is pertinent and useful for valuing all property types. For instance, the cost approach is not applicable to the valuation of vacant land. Standard Rule 6-1 of USPAP requires “the mass appraiser to be aware of and correctly employ those recognized methods and techniques (approaches to value) necessary to produce a credible mass appraisal.” Standard Rule 6-8(j) required under scope of work requirements, used in developing an appraisal, that the exclusion of the sales comparison approach (market approach), cost approach or income approach must be explained. Section 23.01(b) of the Texas Property Tax Code states: “The market of property shall be determined by the application of generally accepted appraisal methods and techniques. If the appraisal district determines the appraised value of a property using mass appraisal standards, the mass appraisal standards must comply with USPAP. The same or similar appraisal methods and techniques shall be used in appraising the same or similar kinds of property. However, each property shall be appraised based upon the individual characteristics that affect the property’s market value.” Section 23.0101 states: “In determining the market value of property, the Chief Appraiser shall consider the cost, income and market data comparison methods of appraisal and use the most appropriate method.” Which one of the three methods is the most appropriate?

Generally, it will depend on three factors.

- Typical practice for appraising a particular property type
- Whether or not the necessary data is reasonably available for use of a particular approach
- If the result by use of the approach would be meaningful.

Borden CAD typically uses the approach to value dependent upon the property use or type. For consumptive use properties, such as a single-family residence, the district uses a cost/hybrid model. It is a sales market adjusted model that is typical for appraisal districts using mass appraisal. Borden CAD in compliance with Section 23.01 of the Property Tax Code is consistent in the “use of the same method for the same or similar kinds of property.” In compliance with USPAP Standards Rule 6-8(j) the “Jurisdictional Exception Rule” is invoked due to the contrary requirement of the USPAP rule and of Section 23.0101 of the Property Tax Code and the requirement that the Chief Appraiser use the most appropriate of these methods. Use of a specific or particular approach to value during the appraisal phase of the tax calendar does not prevent the use of alternative or support alternative approaches during the equalization phase of the tax calendar. Special use appraisal for agricultural properties are in compliance with the comptroller appraisal manuals for appraisal of agricultural land as well as in compliance with the Texas Property Tax Code.

RESIDENTIAL REAL PROPERTY

In accordance with Section 11.01 of the Texas Property Tax Code, the Borden CAD strives to discover, appraise and assess all taxable property within the jurisdictions of the Appraisal District. Each parcel shall be appraised including all determinable improvements, factors and conditions affecting the property as a whole. Improvements, as defined in Section 1.04(3), includes in structure affixed to the land that is not readily, reasonably, and immediately portable. The structure adds value to the property and would be typically included in any sale of the property as a whole.

This includes, but is not limited to:

- Above ground swimming pools
- Patios
- Storage buildings or units, regardless of its permanent attachment, or lack thereof, to the land by means of metal tie-downs or anchorage to a foundation.

Mobile or Manufactures Homes can either be Real Estate or Tangible Personal Property, depending on the ownership of the land which the structure is affixed, and/or the status of the Title or the Statement of Location as determined by the Texas Department of Housing and Community Affairs. In either case, Mobile or Manufactures Homes are taxable under Section 11.14 of the Tax Code. With proper proof of ownership, Mobile or Manufactured Homes are eligible to apply for Residential Homestead Exemption. Fences, residential, commercial or agricultural are considered appurtenances to the land and are included in the value of the site. Square foot measurements of each type of building are based on the

perimeter measurements of that building. Schedule values are originally based on local modified construction cost, adjusted over time by market conditions determined by sales. Therefore, a buildings value per square foot applies not to usable area but constructed area. Using the building code descriptions and schedules, each structure is assigned an undepreciated value per square foot. Depreciation (physical, functional and economic) factors are applied to each structure as is necessary. Land values are determined from available information and applied using the appropriate basis (square footage, front footage, acreage, etc.). Residential properties are physically inspected on an annual basis. Changes that have occurred and observed condition are noted by the field appraiser and entered into account records. Pictures of the exterior of the residence are taken of new homes and to existing homes whenever a change in physical appearance has occurred. The appraiser is responsible for verifying and collecting accurate and reliable property data. By reasoned use of developed models, an appraiser can finalize a preliminary property value while in the field. CAD uses cost schedules to value residential parcels in the district. These cost schedules (models) are hybrid models called "Market-Adjusted Cost Hybrid" computer assisted mass appraisal models. These hybrid models are the most predominately used by appraisal districts in the state. Few districts use a pure RCN (replacement cost new) cost model (schedule) to value residential properties. The CAD residential models consist of four main classes with class defining features for each class listed in the CAD Appraisal Manual. Property specific features are additives to the main class such as attached/detached garages, covers, storage buildings, etc. Residential structures are classified according to quality of construction, style and design, appeal and presence of certain features. Age and condition of structures are adjusted for from real estate depreciation tables. These depreciation tables adjust for not only physical deterioration, but also for market reactions to obsolescence. The real estate depreciation tables are called CDU (condition, desirability and usefulness) percent good tables. CDU is the overall value change from a benchmark new property, to reflect all losses of utility. A review and evaluation process, property data characteristics are compared against locally modified replacement cost from Marshall & Swift Valuation Services and from sales ratio (as data is available). Based on these statistics, a preliminary decision is made as to whether the value level within a class of residential properties needs to be changed for the current appraisal year, or if the values are at an acceptable existing level. Land valuation analysis is conducted prior to sales analysis. The value of the land component to the property is estimated based on available market sales for comparable and competing land under similar use. A similar comparison and analysis of comparable land sales is conducted based on comparison of land characteristics found to influence the market price of the land. Specific land influences are considered, where necessary, and depending on individual lot or tract characteristics, to adjacent parcels outside the norm for such factors as access, view, shape, size and topography. The appraisers use abstraction and allocation methods to ensure that the estimated land values best reflect the contributory market value of land to the overall property value. Data on regional economic forces such as demographic patterns, regional location factors, employment, real property prices, interest rates, availability of vacant land, construction trends and cost are collected from various sources. Collected information provides the appraiser a current economic outlook on the real estate market. Information is gleaned from real estate publications and sources of continuing education including IAAO and TDLR approved classes. Rural land regions are analyzed each year in order to develop a base acreage price. Rural farm and ranch sales are grouped by property characteristics, location similarities and development potential. These sales are analyzed on a price per acre basis with regression analysis utilized as a means of analyzing the effects of size, or the economy of scale, within specific markets where there is typically a wide variety of sizes within a specific location. Appraisal schedules are built using regression models for calculating the unit prices. Specific land influences are used, where necessary, to adjust parcels outside the neighborhood norm for such factors as view, shape, size and topography, among others. A neighborhood is a group of properties that share important characteristics. A neighborhood is typically a distinct group of properties that is often identified by a geographic (physical) boundary or a group of properties that reacts in a similar manner to market influences. Market area analysis involves the examination of how physical, economic, governmental and social forces and other influences affect property values. The effects of these forces are also used to identify, classify and stratify comparable properties into smaller, manageable subsets of the universe of properties known as neighborhoods. Residential valuation and neighborhood analysis is conducted on various market areas within the Borden County school district. Analysis of comparable market sales forms the basis of estimating market activity and the level of supply and demand affecting market prices for any given market area, neighborhood or district. Market sales indicate the effects of these market forces and are interpreted by the appraiser into an indication of market price ranges and indications of property component change considering a given time period relative to the date of appraisal. Cost and market approaches to value are the basic techniques utilized to interpret these sales. The highest and best use of property is the reasonable and probable use that supports the highest present value as the date of the appraisal, unless the property is appraised under a jurisdiction exception. The highest and best use must be physically possible, legal, financially feasible and productive to the maximum allowed usage of the property. The highest and best use of a residential property is normally its current use.

MULTI-FAMILY REAL PROPERTY

There are no multi-family residential properties in Borden County.

RESIDENTIAL INVENTORY PROPERTY

There are no residential inventory properties in Borden County.

COMMERCIAL REAL PROPERTY

The fee simple interest of commercial real property is appraised as required by state statute. The effect of easements, restrictions, encumbrances, leases, contracts or special assessments are considered on an individual basis. Commercial properties are on a physically inspected basis. Changes that have occurred and observed conditions are noted by the field appraiser and entered into account records. Pictures of the exterior of the improvement are taken whenever a change in physical appearance has occurred. The appraiser is responsible for verifying and collecting accurate and reliable property data. Borden CAD uses cost schedules to value commercial parcels in the district. These cost schedules are actually hybrids models called "Market-Adjusted Cost Hybrid" computer assisted mass appraisal models. Commercial structures are classified according to quality of construction and type of use. Effective age and condition of structures are adjusted for with depreciation tables. Effective age estimates are based on the utility of the improvements relative to where the improvement lies on the scale of its total economic life and its competitive position in the marketplace. Effective age estimates are considered and reflected based on eight levels or ranking of observed condition, given actual or effective age. Additional forms of depreciation such as external and/or functional obsolescence can be applied. A review of commercial cost schedules (models) is performed annually (as information is available) and a decision is made as to whether the value level within a class of commercial properties needs to be changes for the current appraisal year, or if the values are at acceptable existing level.

MINERAL, INDUSTRIAL AND UTILITY REAL PROPERTY

The valuation of all mineral, industrial and utility real property within the district is contracted out to Prichard & Abbott, Inc. See attached P&A's Biennial Reappraisal Plan.

VACANT REAL PROPERTY - LAND

The sales comparison approach to value is primarily used to value vacant real property within the district. Vacant land is valued according to common units of comparison. Borden CAD develops per lot site land valuation tables for the platted town area. Land tables based on per acre value are utilized for rural platted and un-platted areas within the district. Land sale prices are also expressed on the same unit comparison basis and stratified (sorted) according to location and probable use. Sorting criteria ensure that land values will reflect market data for parcels with similar or competitive uses in the same market area.

SPECIAL VALUATION PROPERTIES – AGRICULTURAL USE PROPERTIES

The Texas Constitution permits special agricultural appraisal on land used for farm and ranch use if its owner meets specific requirements. Casual uses such as home vegetable gardens do not constitute qualified agricultural use. Section 23.51 of the Texas Property Tax Code sets the standards for determining if land qualifies for agricultural appraisal. Section 23 Subchapter D deals with the allowed uses and the application process involved with agricultural land appraisal. The appraiser annually inspects the area to see that the properties are continuing in agricultural use. Owners are not required to reapply unless there is a question on the use of the property. Agricultural land classes are mandated by the Property Tax Code. The Chief Appraiser of the district may establish additional categories. All agricultural lands in the county are carried at their current market value. However, agricultural productively appraisal allows for qualified agricultural use land to be carried at its productivity value for property tax assessment purposes. Agricultural appraisal lowers the taxable value of the land. The productive capacity of agricultural property is based on a "net to land" calculation that is the average net income that a class of land would be likely to generate over a five-year based period. The law requires the district appraisers to use the "cash" or "share" lease method to determine the "net to "land". In a cash lease, rent is a fixed amount. In a share lease, rent is a share of the gross receipts for the year, less a share of certain expenses. Borden CAD has an Agricultural Advisory Board which meets with and advises the Chief Appraiser on the valuation and use of land that may designated for that agricultural use or that may be open space agricultural within the district. Each year the Comptroller of Public Accounts publishes an agricultural cap rate to be used by appraisal districts in their net to land capitalization of value. For 2018, Borden CAD used a ten percent (10%) capitalization rate in the appraisal of qualified agricultural productivity use lands.

SPECIAL INVENTORY

There are no special inventory properties in Borden County

BUSINESS TANGIBLE PERSONAL PROPERTY

The contracted appraisers (P&A) are responsible for developing fair and uniform market values for business personal property located within the district. There are 2 different personal property types appraised by the appraisers: Business Personal Property (BPP) accounts and Vehicles. The district reappraises all income producing BPP annually. Business

Personal Property is inspected annually and valued primarily according to the depreciated cost approach to value. Renditions are mailed to personal property owners in January of each year. When returned renditions appear to be inconsistent with observations by the appraiser, the State Comptroller's schedules (as adjusted) or outside vendors' valuation cost guides are utilized. The district uses the State Comptroller's depreciation schedule. As renditions are processed, the declared property is depreciated as necessary and the information is recorded in the appraisal records. Sources of data for vehicle valuation include property owner renditions and field inspections. Value estimates for vehicles are based on NADA published book values and property owner renditions. Each year there are some personal property accounts that fail to render. A letter is sent to the owner stating that a ten percent (10%) penalty will be assessed if the owner cannot give a significant reason for waiver of the penalty. A Late Rendition Penalty Waiver Request Form will also be sent along with the letter to be filled out by the owner should they have reasonable cause for the rendition being late.

MINERAL, INDUSTRIAL AND UTILITY TANGIBLE PERSONAL PROPERTY

The valuation of all mineral, industrial and utility personal property within the district is contracted out to Prichard & Abbott, Inc. P&A's Biennial Reappraisal Plan is attached to this Plan.

THE MASS APPRAISAL REPORT

Each tax year the required Mass Appraisal Report is prepared by the Chief Appraiser at the conclusion of the appraisal phase of the ad valorem tax calendar (on or about May 15). The Mass Appraisal Report is completed in compliance with Standard Rule 6-8 of USPAP. The signed certification by the Chief Appraiser is compliant with Standard Rule 6-9 of USPAP. This written reappraisal plan is attached to the Mass Appraisal Report.

VALUE DEFENSE

The Texas Constitution sets out five Rules for Property Tax in the State. The first rule requires that taxation must be equal and uniform. The second rule requires that property be taxed at current market value. Out of the Texas Property Tax Code these two rules are the most important requirements for county appraisal districts. The Borden CAD, as other districts, has the burden of establishing the value of properties within the district. That burden applies to market values (appraisal level) and to equal and uniform values (appraisal equity). The Texas Property Tax Code permits a property owner to protest any determination made by the appraisal district, the Chief Appraiser or ARB that applies to adversely affect the property owner. Of the numerous grounds for protest listed in the Property Tax Code, the two most commonly filed protest deals with value over market and with unequal appraisal. The CAD encourages property owners to meet with the Chief Appraiser and/or contracted appraisal staff to try and resolve disputes in an informal setting before a formal ARB hearing. Sometimes a mutually agreeable solution to an owner's protest at these informal meetings result in a settlement and the property owner waives any further right to a formal protest before the ARB. Should an agreement not be reach, informally, the taxpayer may present their arguments to the ARB as a formal appeal. The appraisal staff provided by P&A defends the position of the Chief Appraiser before the ARB. Chapter 41 of the Texas Property Tax Code deals with the right of a property owner to a formal ARB hearing. The appraisal district also has information delivery requirements concerning the ARB protest. Value defense is part of the equalization phase of the Tax Calendar. In formal hearings both mass appraisal and single property appraisal methods can be introduced. Mass appraisal and single property appraisal are systematic methods for arriving at estimates of value. They differ only in scope. Mass appraisal models have more terms because they attempt to replicate the market for one or more land uses across a wide geographic area. Single-property models, on the other hand, represent the market for one kind of land use in a limited area. Quality is measured differently in mass appraisal than in single-property appraisal. The quality of single-property appraisal is measured against a small number of comparable properties that have sold. The quality of mass appraisal is measured with statistics developed from a sample of sales in the entire area appraised by the model. Borden CAD may make use of both mass appraisal statistics and district sales comparison of a select few comparables as in single-property appraisal during formal ARB hearings.

PLANNING AND ORGANIZATION

Field inspections are carried out by the P&A field appraisers as assigned by the P&A appraisal supervisor, with input and direction from the Chief Appraiser. The field appraiser physically inspects areas required by the reappraisal cycle, checks all existing data, takes photographs of improvements (if possible, as needed), draws plans of new improvements for entry into the computer and rechecks any property on which a question or problem arises. Data entry of field work notes and sketches are performed by CAD staff under direction of the Chief Appraiser or supervisor. The P&A staff performs market analysis. Sales data is gathered throughout the year by Borden CAD staff from deed records, sales conformation letters and property owners and other sources (if available). The market data is analyzed, sales data is confirmed, outliers are identified, existing classification system is reviewed, and market schedules are reviewed and updated as necessary and final market schedules are presented to the Chief Appraiser for discussion and application to the universe of properties. A calendar of key events with critical completion dates is prepared for each major work area. A separate

calendar is prepared for tax year 2021 and 2022. Production standards for field activities are calculated and incorporated in the planning and scheduling process. As the Texas Property Tax Code is revised and local circumstances require the Calendar of Key Events may be changed as warranted. The Chief Appraiser may make changes to the work plan or schedule that does not conflict with statutory requirements or deadlines without additional board approval or plan amendment.

2021 CALENDAR OF KEY EVENTS

CAD staff training, and CE's as needed to be in compliance with TDLR
Gather documentation for CAD audit
Send website updates to Prichard & Abbott
Holidays
Research returned mail
Download new and updated Comptroller forms
Download taxpayer assistance information documents, pertinent to local taxpayers, from Comptroller's website for posting and distributing
Review and updated printed information provided for public use and education
Mail and process exemption applications (new homestead, disabled and 65 and over, disabled veterans and surviving spouse and open space applications due to ownership change, etc.)
Gather sales data from sales confirmation letters, deed records and other sales sources for sales files
Pick up copies of filed deeds from County Clerk's office
Research property ownership
Key name/address changes/splits/combines, new property and personal property into CAMA
Track value loss due to property acquiring 1st time exemptions and 1st time 1-d or 1-d-1 appraisal, value gain due to new improvements for taxing units
Send copies of associated mineral deeds to P&A
Send copies of splits/combine parcels to P&A mapping department
Update address change file as new addresses received and email to P&A
Process and sell digital copies of appraisal rolls to taxpayers
Prepare and post BOD agenda for quarterly meeting
Prepare and mail BOD packets for quarterly meeting
Maintain and keep updated permanent records and minutes of BOD, ARB and AG Board
Conflicts Disclosure statements filed by BOD members, Chief Appraiser
Prepare, update, balance and submit all financial reports for review and approval
Answer phone calls and assist walk-in customers

See also Property Tax Law Deadlines and Truth-in-Taxation Important Dates attached to this Plan

JANUARY

Oath of Office for new board members
Elect Board Officers
Conduct 1st quarter BOD meeting
BOD elects ARB Officers and District Judge appoints Board Chairperson & Secretary
Statutory appraisal date for most categories of taxable property – January 1
Mail statements to owners who have not paid their current taxes
Preliminary Property Value Study (PVS) findings are published and certify findings to the Texas Education Commissioner, and deliver findings to the school district (Gov't Code Section 403.301(g))
Chief Appraiser works on annual Operations Survey for the Comptroller's office
Last day for taxpayer to file 25.25 protest – January 31
Holiday – New Year's Day – January 1
Conduct field inspections on residential, land, mobile homes, commercial, industrial, pipelines and personal property:

- All real property visually inspected and checked for accuracy in class and depreciation
- Take pictures of improvements (as needed) and download to CAMA
- Check for new construction and demolition of improvements

Exemption applications mailed to property owners receiving exemptions in the prior tax year where annual application is required

BOD continue their terms

Post updated BOD General Policy and Policies for Public Access at post office, on county bulletin and CAD office

Deadline for Chief Appraiser to notify the Comptroller's office of eligibility to serve as Chief Appraiser is January 1

Rendition period starts January 2 and continues through April 15 for those property owners not requesting a filing extension

Taxing units making monthly payments are due by the last day of each month

Prepare and mail all Personal Property Renditions by January 15

Create list of renditions mailed and note date when rendition and/or extension request received

All real property "South Half" visually inspected and checked for accuracy in class and depreciation

Take pictures of improvements and download to CAMA

Begin planning sales ratio studies and market analysis

Review schedules in comparison to available sales data to determine areas needing significant adjustment or close review

Review renditions as received

Meet with Chief Appraiser and agricultural advisory board to discuss agricultural issues

MIUP appraisers continue work on discovery of properties and appraisals

Submit 25.25(b) Quarterly Report to the BOD and ARB by January 10

Start preparing for general operations audit by an independent CPA

Print appraisal card worksheets for field appraiser to reapply for annual exemptions or special valuations by January 31

Chief Appraiser schedules 1st yearly meeting of Agricultural Advisory Board

Check for 65 and over homestead exemptions that need to be granted automatically

Qualification for certain exemptions determined by January 1

Check that mapping updates have been processed as scheduled

Post updated public service announcement at post office and in CAD office

Place ¼ page ad in The Borden Star on availability of exemptions, rendition requirements, special appraisals, and tax deferrals

Complete CAD's annual report & submit to entities, and post in CAD office

Submit MICF (Media Information and Certification Form) to the PC Group

ARB

Coordinate scheduling of ARB meeting to address any issues and have them sign the Statement of Officer and Oath of Office forms

Coordinate annual training with members when schedule is available from PTAD

ARB Members continue their 2-year terms

FEBRUARY

Place AD's in Borden Star: Remember to Render & Homestead Exemptions

Submit Mobile Lien Form & 33.05 Limitations Form to the PC Group

Chief Appraiser continues working on Operations Survey for the Comptroller's office

Deadline for delivery applications for special appraisal and exemptions requiring annual applications – February 1

Holiday – Presidents Day – February 18

Taxes become delinquent February 1 if statement was mailed on or before January 10

Continue market analysis

Appraiser continue to work renditions as received

MIUP renditions and/or extension requests are faxed, mailed or emailed to P&A and the original filed in house

Email BPP renditions to Bryan Mathis & John Chancellor (P&A)

Transfer information from appraiser's Appraisal Card Worksheets to CAMA

Appraisers continue to work on discovery of property and appraisals

Coordinate with the PC Group on submission sales information and deed transactions to the State Comptroller's Office by February 1

Update rendition work list to current year and transfer information from received renditions to list

Receive and key rendition extension requests

Taxing units making monthly payments are due by the last day of each month

Contact agent if no Appointment of Agent form on file for property rendered

Board of Directors and Chief Appraiser sign affidavits regarding delinquent taxes

ARB

ARB members are signed up for annual training.

MARCH

Place AD's in Borden Star: Comptrollers Homestead Exemptions & BCAD Render
Send Appraisal Roll Format letter to Borden County, BCISD, And Sands ISD
Operations Survey for the Comptroller's office due
Email or fax questionnaires to Gins, Insurance Companies and Jami.Williams@tx.usda.gov
Appraisers continue to work renditions as received
Complete field work on Cat A, C, D, E, M properties
Complete ratio studies on real property
Finalize market analysis and determine adjustments to schedules
Update residential schedules, Ag schedules, and mobile home depreciation schedules
Have AG meeting to go over values
MIUP appraisers continue to process received renditions
Appraisers continue to work on discovery of property and appraisals
Chief Appraiser begins work on 2022 budget
Taxing units paying quarterly payments are due by March 31
Taxing units making monthly payments are due by the last day of each month
Continue transferring information from received renditions to list
Receive and key rendition extension requests
MIUP renditions and/or extension requests are faxed, mailed or emailed to P&A and the original filed in house
Contact agent if no appointment form on file for property rendered
Key rendered accounts, deleted exemptions, new exemptions, and new frozen accounts
Review edits and audits before notices run; correct or adjust accounts as needed
Proof all changes; print out change report and compare to appraisals
Coordinate with P&A on Notice of Appraised Value (NAV) mailings, protest deadline, protest hearing date and working on notices
Coordinate with the PC Group with wording on notice
Submit Tax Ceiling Calculator/Updater Authorization form to the PC Group

APRIL

Conduct 2nd Quarter BOD meeting
Chief Appraiser sends notices of appraised value on single family residences by April 1, or as soon thereafter, as practicable
Bids for Bank Depository every 2 years (even numbered)
Renditions due by April 15 unless extension requested; continue to receive and key rendition extension requests
Holiday – Good Friday – April 19
Chief Appraiser notifies taxing units the form in which the appraisal roll will be provided for them by April 1
Email legal requirements for filing a rendition to the Borden Star
Chief Appraiser sends certified estimates to entities by April 30
Appraisers continue to work renditions as received.
Appraiser works with property owners regarding proposed values and protests filed
Coordinate with CAD staff on hearing schedule and protests filed
MIUP appraisers continue to process received renditions.
Appraisers continue to work on discovery of property and appraisals
Chief Appraiser continues work on 2022 Budget
Taxing units making monthly payments are due by the last day of each month
Release local file for production of Notice of Appraised Values (NAVs)
Continue transferring information from received renditions to list
Review edits and audits before notices run; correct or adjust accounts as needed
Last day for application for special appraisal or notices to Chief Appraiser that property no longer qualifies for 1-d-1 or 1-d is April 30
MIUP renditions and/or extension request are faxed, mailed or emailed to P&A and the original filed in-house
Contact agent if no appointment form on file for property rendered or property protested

MAY

Chief Appraiser sends notices of appraised value on all other property by May 1, or as soon thereafter, as practicable
Renditions receiving 30-day extension are due April 15 unless Chief Appraiser extends deadline to May 15
Holiday – Memorial Day – May 27
Sand CISD support payment due – May 15

Appraiser continues to work renditions as received
MIUP appraisers continue to process received renditions
Coordinate MIUP download to CAD
Chief Appraiser continues work on 2022 budget
Taxing units making monthly payments are due by the last day of each month
Chief Appraiser begins update of USPAP report (Mass Appraisal Report)
Check that mapping updates have been processed as scheduled
Place Protest and Appeals Procedure ad in The Borden Star by May 15
Review edits and audits before notices run; correct or adjust accounts as needed
Mail out NAVs
Perdue will begin notifying delinquent taxpayers that taxes delinquent on July 1 will incur additional penalty for attorney collection cost
Receive MIUP load from P&A
Chief Appraiser works on hearing schedules and protest filed
Prepare hearing list and information on informal meetings and formal hearings to check on evidence and reason for changes in value
Print and mail personal property rendition penalty letters per Property Tax Code 22.28
Review and cross check list of late or non-rendered properties received from P&A, for penalty mailing
Compile information for evidence packets for property owners filing protest and requesting information
Chief Appraiser prepares appraisal records and submits to ARB by May 15, or as soon thereafter, as practicable
BOD annual evaluation of Chief Appraiser
Continue transferring information from received renditions to list
Receive and key rendition extension requests and accounts granted additional 15-day extension
MIUP renditions and/or extension requests are faxed, mailed or e-mailed to P&A and the original filed in-house
Contact agent if no Appointment of Agent form is on file for property rendered or property protested
Code returned NAV and research ownership and addresses

ARB

Ensure all ARB members have attended mandatory training and certificates of completion are on file
Coordinate scheduling of ARB meeting to receive appraisal records for review, review revisions needed for procedures and forms, sign affidavits regarding delinquent taxes and address any issues
Begin coordinating scheduling of protest hearings and mail Notice of Protest letters
Begin preparing cause folders for hearings
Begin coordinating with P&A on hearing schedule and protest filed
Chief Appraiser prepares appraisal records and submits to ARB by May 15, or as soon thereafter, as practicable

JUNE

MIUP appraisers continue to process received rendition
Appraisers continue to work on discovery of property and appraisals
Appraisers work with property owners regarding proposed values and protests filed
Coordinate with CAD staff on hearing schedule and protests filed
Submit completed Operations Survey to State Comptroller by requested date
Chief Appraiser begins update of USPAP Report (Mass Appraisal Report)
Chief Appraiser submits recommended 2022 Budget to CAD board and taxing units by June 15
Chief Appraiser submits estimated pro-rated budget shares to CAD board and taxing units
Taxing units making monthly payments are due by the last day of each month
Taxing units making quarterly payments are due by June 30
Schedule protest hearing and mail Notice of Protest letters
Prepare cause folders for hearings
Compile information for evidence packets for property owners filing protests and requesting evidence
Coordinate with P&A appraisers on hearing schedule and protests filed
Prepare hearing list and information on information meeting and formal hearing to check on evidence and reason for changes in value by contract appraisers
Code returned NAVs and research ownership and addresses
Print and mail personal property rendition penalty letters
Mail determination letters on received rendition penalty waiver request per PTC 22.30, mail protest form with denial
Check rendition list against Preliminary Appraisal Roll to verify properties are being picked up and appraised by P&A
Compile information for evidence packets for property owners filing protest and requesting evidence

ARB

Post ARB hearing Agenda as necessary
Continue scheduling protest hearings and mailing Notice of Protest hearing letters
Continue preparing cause folders for hearings
Continue working with P&A on hearing schedule and protest filed
Contact agent if no appointment form on file for property protested

JULY

Submit MIF & MICF to the PC Group
Holiday – Independence Day – July 4
Delinquent taxes incur total twelve 12% penalty on July 1
Appraisers work with property owners regarding proposed values and protests filed
Appraisers defend values at protest hearings
Submit to Chief Appraiser reasons and documentation, as requested, for changes to values after NAVs mailed
Enter into CAMA all changes ordered by ARB
Mineral appraiser submits list of new property to Chief Appraiser
MIUP personal property appraiser submits inventory owner total, changes and additions list to Chief Appraiser
Prepare for financial audit by independent CPA firm
Prepare hearing list and information on informal meetings and formal hearings to check on evidence and reason for changes in value by contract appraisers
Mail all approvals/denials on rendition penalty waiver requests
Submit appraisal records to ARB for review
Appraisers defend values at protest hearings
Chief Appraiser certifies Appraisal Roll to taxing units by July 25
Submit Certified Appraisal Roll to State Comptroller
Submit to taxing units the value loss due to property acquiring 1st time 1-d or 1-d-1 and value gain due to new improvements and recap of homesteads
Board of Directors hold budget workshop
Taxing units making monthly payments are due by the last day of each month
Place ¼ page Notice of Budget Hearing Ad in The Borden Star at least 10 days before the hearing date
Submit Notice of Budget Hearing to taxing units at least 10 days before hearing date
Chief Appraiser completes USPAP report
Coordinate with P&A that rendition penalties are correctly applied
Certify to TACs that rendition penalty has been applied and become final under PTC 22.29

ARB

Post ARB hearing agenda as necessary
Begin ARB hearings
Provide ARB support; make record of minutes during hearings, make copies as needed, supply forms and orders as needed, etc.
Mail ARB Notices and Orders certified, return receipt requested
ARB approves appraisal records by July 20

AUGUST

Notices sent by the 7th (or as soon thereafter as practicable) that the estimated amount of taxes may be found in the property tax database
Submit HB1010 (properties outside of county) to the PC Group
Appraisers continue to work on any pending protest hearings
Continue working with taxpayers
Coordinate with CAD that rendition penalties are applied correctly
Assessor submits appraisal roll and date that collector submits collection rate estimate for the current year to the governing body, or as soon after as practical
Coordinate with the PC Group submission of sales information and deed transactions to the State Comptroller's Office by August 1
Coordinate with the PC Group submission of Certified Appraisal Roll to State Comptroller by August 1
Hold Public Hearing on 2022 Budget
Taxing units making monthly payments are due by the last day of each month
Coordinate with P&A that rendition penalties are correctly applied
Continue ARB Hearing process for any rescheduled or newly scheduled protests

Check rendition list against certified roll to verify values by P&A
Mail letter to property owner filing late Ag application informing them of the 10% penalty for late filing.
Submit to Chief Appraiser reasons and documentation, as requested, for changes to value after NAVs mailed
CAD Board must pass resolution to change number of directors, methods for appointing, or both, and deliver the resolution to each taxing unit by August 14
Taxing units entitled to vote for appointment of CAD directors to file a resolution opposing a change by the CAD board in the number and selection of directors is due by August 31

SEPTEMBER

Holiday – Labor Day – September 2
Coordinate with CAD to assure tax load process is successful
Board of Directors must adopt 2022 budget by September 15
Taxing units making monthly payments are due by the last day of each month
Taxing units making quarterly payments are due by September 30
Begin work on reports of Property Value for State Comptroller's Office
Coordinate with P&A to assure tax load process is successful
Request copies of taxing units' resolutions or orders setting tax rates for IS support
After tax rates set, complete and submit Reports of Property Value form to the State Comptroller's office
After tax rates are set, files are updated for new tax rates
After tax rates, generate Ceiling Loss Report
Update in house listing of all taxing unit rates
Chief Appraiser schedules meeting for Ag Board
Complete Comptroller's Texas Farm & Ranch Survey by due date October 1
Check that all qualifying residences have homestead exemptions, if not send applications
After tax rates are set, files are updated for new tax rates
Update listing of all taxing unit rates
Check that mapping updates have been processed as scheduled
CAD board notifies taxing units in writing if a proposal to change the number or method of selecting CAD directors are rejected by voting taxing unit by September 14

ARB

Schedule ARB as needed for approval of supplemental records

OCTOBER

Assessor mails tax bill for the year
4th Quarter Board of Director's meeting
Submit County Indigent Health Care form to Comptroller's office
Holiday – Columbus Day – October 14
Mail Ag Survey Letters to owners Q-Z
Review and update Ag Survey Letter as needed
Check with contracted appraiser that Ag Survey is updated
Taxing units making monthly payments are due by the last day of each month
Submit completed Reports of Property Value to State Comptroller's Office
Process tax payments as they are received

NOVEMBER

Holiday – Thanksgiving – November 27 & 28
Begin Coordinating with Chief Appraiser on the next years' reappraisals
Coordinate with the PC Group to roll appraisal year in CAMA
Taxing units making monthly payments are due by the last day of each month
Begin keying in name/address changes, splits/combines and new property from county deed records in current file
Process tax payments as they are received

DECEMBER

Form 50-820 Notification to Serve as Chief Appraiser is due by January 1
Appraisal office may conduct a mail survey to verify homestead exemption eligibility
Submit Rendition Print Order Form to the PC Group
Holiday – Christmas – December 24-26
Continue working with Chief Appraiser on any reappraisal issues

Receive names of Chair and Secretary of ARB appointed by Board of Directors
Board of Directors appoints ARB members to 2-year term
Board of Directors appoints Ag Advisory Board members to 2-year term
Notify Comptroller of Chief Appraiser's eligibility to serve as Chief Appraiser under PTC 6.05(c)
Send all gather current sales data to contracted appraiser
Send all received appropriate Ag surveys to contracted appraiser
Review filed for any exemptions or special valuations needing reapplication
Process tax payments as they are received
Taxing units making monthly payments are due by the last day of each month
Taxing units making quarterly payments are due by December 31
Taxing units making a yearly payment are due by December 31

2022 CALENDAR OF KEY EVENTS

CAD staff training, and CE's as needed to be in compliance with TDLR
Gather documentation for CAD audit
Send website updates to Prichard & Abbott
Holidays
Research returned mail
Download new and updated Comptroller forms
Download taxpayer assistance information documents, pertinent to local taxpayers, from Comptroller's website for posting and distributing
Review and updated printed information provided for public use and education
Mail and process exemption applications (new homestead, disabled and 65 and over, disabled veterans and surviving spouse and open space applications due to ownership change, etc.)
Gather sales data from sales confirmation letters, deed records and other sales sources for sales files
Pick up copies of filed deeds from County Clerk's office
Research property ownership
Key name/address changes/splits/combines, new property and personal property into CAMA
Track value loss due to property acquiring 1st time exemptions and 1st time 1-d or 1-d-1 appraisal, value gain due to new improvements for taxing units
Send copies of associated mineral deeds to P&A
Send copies of splits/combine parcels to P&A mapping department
Update address change file as new addresses received and email to P&A
Process and sell digital copies of appraisal rolls to taxpayers
Prepare and post BOD agenda for quarterly meeting
Prepare and mail BOD packets for quarterly meeting
Maintain and keep updated permanent records and minutes of BOD, ARB and AG Board
Conflicts Disclosure statements filed by BOD members, Chief Appraiser
Prepare, update, balance and submit all financial reports for review and approval
Answer phone calls and assist walk-in customers

JANUARY

Oath of Office for new board members
Elect Board Officers
Conduct 1st quarter BOD meeting
BOD elects ARB Officers and District Judge appoints Board Chairperson & Secretary
Statutory appraisal date for most categories of taxable property – January 1
Mail statements to owners who have not paid their current taxes
Preliminary Property Value Study (PVS) findings are published and certify findings to the Texas Education Commissioner, and deliver findings to the school district (Gov't Code Section 403.301(g))
Chief Appraiser works on annual Operations Survey for the Comptroller's office
Last day for taxpayer to file 25.25 protest – January 31
Holiday – New Year's Day – January 1

Conduct field inspections on residential, land, mobile homes, commercial, industrial, pipelines and personal property:

- All real property visually inspected and checked for accuracy in class and depreciation
- Take pictures of improvements (as needed) and download to CAMA
- Check for new construction and demolition of improvements

Exemption applications mailed to property owners receiving exemptions in the prior tax year where annual application is required

BOD continue their terms

Post updated BOD General Policy and Policies for Public Access at post office, on county bulletin and CAD office

Deadline for Chief Appraiser to notify the Comptroller's office of eligibility to serve as Chief Appraiser is January 1

Rendition period starts January 2 and continues through April 15 for those property owners not requesting a filing extension

Taxing units making monthly payments are due by the last day of each month

Prepare and mail all Personal Property Renditions by January 15

Create list of renditions mailed and note date when rendition and/or extension request received

All real property "Township" visually inspected and checked for accuracy in class and depreciation

Take pictures of improvements and download to CAMA

Begin planning sales ratio studies and market analysis

Review schedules in comparison to available sales data to determine areas needing significant adjustment or close review

Review renditions as received

Meet with Chief Appraiser and agricultural advisory board to discuss agricultural issues

MIUP appraisers continue work on discovery of properties and appraisals

Submit 25.25(b) Quarterly Report to the BOD and ARB by January 10

Start preparing for general operations audit by an independent CPA

Print appraisal card worksheets for field appraiser to reapply for annual exemptions or special valuations by January 31

Chief Appraiser schedules 1st yearly meeting of Agricultural Advisory Board

Check for 65 and over homestead exemptions that need to be granted automatically

Qualification for certain exemptions determined by January 1

Check that mapping updates have been processed as scheduled

Post updated public service announcement at post office and in CAD office

Place ¼ page ad in The Borden Star on availability of exemptions, rendition requirements, special appraisals, and tax deferrals

Complete CAD's annual report & submit to entities, and post in CAD office

Submit MICF (Media Information and Certification Form) to the PC Group

ARB

Coordinate scheduling of ARB meeting to address any issues and have them sign the Statement of Officer and Oath of Office forms

Coordinate annual training with members when schedule is available from PTAD

ARB Members continue their 2-year terms

FEBRUARY

Place Ad's in Borden Star: Remember to Render & Homestead Exemptions

Submit Mobile Lien Form & 33.05 Limitations Form to the PC Group

Chief Appraiser continues working on Operations Survey for the Comptroller's office

Deadline for delivery applications for special appraisal and exemptions requiring annual applications – February 1

Holiday – Presidents Day – February 18

Taxes become delinquent February 1 if statement was mailed on or before January 10

Continue market analysis

Appraiser continue to work renditions as received

MIUP renditions and/or extension requests are faxed, mailed or emailed to P&A and the original filed in house

Email BPP renditions to Bryan Mathis & John Chancellor (P&A)

Transfer information from appraiser's Appraisal Card Worksheets to CAMA

Appraisers continue to work on discovery of property and appraisals

Coordinate with the PC Group on submission sales information and deed transactions to the State Comptroller's Office by February 1

Update rendition work list to current year and transfer information from received renditions to list

Receive and key rendition extension requests

Taxing units making monthly payments are due by the last day of each month

Contact agent if no Appointment of Agent form on file for property rendered
Board of Directors and Chief Appraiser sign affidavits regarding delinquent taxes

ARB

ARB members are signed up for annual training.

MARCH

Place Ad's in Borden Star: Comptrollers Homestead Exemptions & BCAD Render
Send Appraisal Roll Format letter to Borden County, BCISD, And Sands ISD
Operations Survey for the Comptroller's office due
Email or fax questionnaires to Gins, Insurance Companies and Jami.Williams@tx.usda.gov
Appraisers continue to work renditions as received
Complete field work on Cat A, C, D, E, M properties
Complete ratio studies on real property
Finalize market analysis and determine adjustments to schedules
Update residential schedules, Ag schedules, and mobile home depreciation schedules
Have AG meeting to go over values
MIUP appraisers continue to process received renditions
Appraisers continue to work on discovery of property and appraisals
Chief Appraiser begins work on 2022 budget
Taxing units paying quarterly payments are due by March 31
Taxing units making monthly payments are due by the last day of each month
Continue transferring information from received renditions to list
Receive and key rendition extension requests
MIUP renditions and/or extension requests are faxed, mailed or emailed to P&A and the original filed in house
Contact agent if no appointment form on file for property rendered
Key rendered accounts, deleted exemptions, new exemptions, and new frozen accounts
Review edits and audits before notices run; correct or adjust accounts as needed
Proof all changes; print out change report and compare to appraisals
Coordinate with P&A on Notice of Appraised Value (NAV) mailings, protest deadline, protest hearing date and working on notices
Coordinate with the PC Group with wording on notice
Submit Tax Ceiling Calculator/Updater Authorization form to the PC Group

APRIL

Conduct 2nd Quarter BOD meeting
Chief Appraiser sends notices of appraised value on single family residences by April 1, or as soon thereafter, as practicable
Bids for Bank Depository every 2 years (even numbered)
Renditions due by April 15 unless extension requested; continue to receive and key rendition extension requests
Holiday – Good Friday – April 19
Chief Appraiser notifies taxing units the form in which the appraisal roll will be provided for them by April 1
Email legal requirements for filing a rendition to the Borden Star
Chief Appraiser sends certified estimates to entities by April 30
Appraisers continue to work renditions as received.
Appraiser works with property owners regarding proposed values and protests filed
Coordinate with CAD staff on hearing schedule and protests filed
MIUP appraisers continue to process received renditions.
Appraisers continue to work on discovery of property and appraisals
Chief Appraiser continues work on 2022 Budget
Taxing units making monthly payments are due by the last day of each month
Release local file for production of Notice of Appraised Values (NAVs)
Continue transferring information from received renditions to list
Review edits and audits before notices run; correct or adjust accounts as needed
Last day for application for special appraisal or notices to Chief Appraiser that property no longer qualifies for 1-d-1 or 1-d is April 30
MIUP renditions and/or extension request are faxed, mailed or emailed to P&A and the original filed in-house
Contact agent if no appointment form on file for property rendered or property protested

MAY

Chief Appraiser sends notices of appraised value on all other property by May 1, or as soon thereafter, as practicable
Renditions receiving 30-day extension are due April 15 unless Chief Appraiser extends deadline to May 15
Holiday – Memorial Day – May 27
Sand CISD support payment due – May 15
Appraiser continues to work renditions as received
MIUP appraisers continue to process received renditions
Coordinate MIUP download to CAD
Chief Appraiser continues work on 2022 budget
Taxing units making monthly payments are due by the last day of each month
Chief Appraiser begins update of USPAP report (Mass Appraisal Report)
Check that mapping updates have been processed as scheduled
Place Protest and Appeals Procedure ad in The Borden Star by May 15
Review edits and audits before notices run; correct or adjust accounts as needed
Mail out NAVs
Perdue will begin notifying delinquent taxpayers that taxes delinquent on July 1 will incur additional penalty for attorney collection cost
Receive MIUP load from P&A
Chief Appraiser works on hearing schedules and protest filed
Prepare hearing list and information on informal meetings and formal hearings to check on evidence and reason for changes in value
Print and mail personal property rendition penalty letters per Property Tax Code 22.28
Review and cross check list of late or non-rendered properties received from P&A, for penalty mailing
Compile information for evidence packets for property owners filing protest and requesting information
Chief Appraiser prepares appraisal records and submits to ARB by May 15, or as soon thereafter, as practicable
BOD annual evaluation of Chief Appraiser
Continue transferring information from received renditions to list
Receive and key rendition extension requests and accounts granted additional 15-day extension
MIUP renditions and/or extension requests are faxed, mailed or e-mailed to P&A and the original filed in-house
Contact agent if no Appointment of Agent form is on file for property rendered or property protested
Code returned NAV and research ownership and addresses

ARB

Ensure all ARB members have attended mandatory training and certificates of completion are on file
Coordinate scheduling of ARB meeting to receive appraisal records for review, review revisions needed for procedures and forms, sign affidavits regarding delinquent taxes and address any issues
Begin coordinating scheduling of protest hearings and mail Notice of Protest letters
Begin preparing cause folders for hearings
Begin coordinating with P&A on hearing schedule and protest filed
Chief Appraiser prepares appraisal records and submits to ARB by May 15, or as soon thereafter, as practicable

JUNE

MIUP appraisers continue to process received rendition
Appraisers continue to work on discovery of property and appraisals
Appraisers work with property owners regarding proposed values and protests filed
Coordinate with CAD staff on hearing schedule and protests filed
Submit completed Operations Survey to State Comptroller by requested date
Chief Appraiser begins update of USPAP Report (Mass Appraisal Report)
Chief Appraiser submits recommended 2022 Budget to CAD board and taxing units by June 15
Chief Appraiser submits estimated pro-rated budget shares to CAD board and taxing units
Taxing units making monthly payments are due by the last day of each month
Taxing units making quarterly payments are due by June 30
Schedule protest hearing and mail Notice of Protest letters
Prepare cause folders for hearings
Compile information for evidence packets for property owners filing protests and requesting evidence
Coordinate with P&A appraisers on hearing schedule and protests filed
Prepare hearing list and information on information meeting and formal hearing to check on evidence and reason for changes in value by contract appraisers

Code returned NAVs and research ownership and addresses
Print and mail personal property rendition penalty letters
Mail determination letters on received rendition penalty waiver request per PTC 22.30, mail protest form with denial
Check rendition list against Preliminary Appraisal Roll to verify properties are being picked up and appraised by P&A
Compile information for evidence packets for property owners filing protest and requesting evidence

ARB

Post ARB hearing Agenda as necessary
Continue scheduling protest hearings and mailing Notice of Protest hearing letters
Continue preparing cause folders for hearings
Continue working with P&A on hearing schedule and protest filed
Contact agent if no appointment form on file for property protested

JULY

Submit MIF & MICF to the PC Group
Holiday – Independence Day – July 4
Delinquent taxes incur total twelve 12% penalty on July 1
Appraisers work with property owners regarding proposed values and protests filed
Appraisers defend values at protest hearings
Submit to Chief Appraiser reasons and documentation, as requested, for changes to values after NAVs mailed
Enter into CAMA all changes ordered by ARB
Mineral appraiser submits list of new property to Chief Appraiser
MIUP personal property appraiser submits inventory owner total, changes and additions list to Chief Appraiser
Prepare for financial audit by independent CPA firm
Prepare hearing list and information on informal meetings and formal hearings to check on evidence and reason for changes in value by contract appraisers
Mail all approvals/denials on rendition penalty waiver requests
Submit appraisal records to ARB for review
Appraisers defend values at protest hearings
Chief Appraiser certifies Appraisal Roll to taxing units by July 25
Submit Certified Appraisal Roll to State Comptroller
Submit to taxing units the value loss due to property acquiring 1st time 1-d or 1-d-1 and value gain due to new improvements and recap of homesteads
Board of Directors hold budget workshop
Taxing units making monthly payments are due by the last day of each month
Place ¼ page Notice of Budget Hearing Ad in The Borden Star at least 10 days before the hearing date
Submit Notice of Budget Hearing to taxing units at least 10 days before hearing date
Chief Appraiser completes USPAP report
Coordinate with P&A that rendition penalties are correctly applied
Certify to TACs that rendition penalty has been applied and become final under PTC 22.29

ARB

Post ARB hearing agenda as necessary
Begin ARB hearings
Provide ARB support; make record of minutes during hearings, make copies as needed, supply forms and orders as needed, etc.
Mail ARB Notices and Orders certified, return receipt requested
ARB approves appraisal records by July 20

AUGUST

Notices sent by the 7th (or as soon thereafter as practicable) that the estimated amount of taxes may be found in the property tax database
Submit HB1010 (properties outside of county) to the PC Group
Appraisers continue to work on any pending protest hearings
Continue working with taxpayers
Coordinate with CAD that rendition penalties are applied correctly
Assessor submits appraisal roll and date that collector submits collection rate estimate for the current year to the governing body, or as soon after as practical
Coordinate with the PC Group submission of sales information and deed transactions to the State Comptroller's Office by August 1

Coordinate with the PC Group submission of Certified Appraisal Roll to State Comptroller by August 1
Hold Public Hearing on 2022 Budget
Taxing units making monthly payments are due by the last day of each month
Coordinate with P&A that rendition penalties are correctly applied
Continue ARB Hearing process for any rescheduled or newly scheduled protests
Check rendition list against certified roll to verify values by P&A
Mail letter to property owner filing late Ag application informing them of the 10% penalty for late filing.
Submit to Chief Appraiser reasons and documentation, as requested, for changes to value after NAVs mailed
CAD Board must pass resolution to change number of directors, methods for appointing, or both, and deliver the resolution to each taxing unit by August 14
Taxing units entitled to vote for appointment of CAD directors to file a resolution opposing a change by the CAD board in the number and selection of directors is due by August 31

SEPTEMBER

Holiday – Labor Day – September 2
Coordinate with CAD to assure tax load process is successful
Board of Directors must adopt 2022 budget by September 15
Taxing units making monthly payments are due by the last day of each month
Taxing units making quarterly payments are due by September 30
Begin work on reports of Property Value for State Comptroller's Office
Coordinate with P&A to assure tax load process is successful
Request copies of taxing units' resolutions or orders setting tax rates for IS support
After tax rates set, complete and submit Reports of Property Value form to the State Comptroller's office
After tax rates are set, files are updated for new tax rates
After tax rates, generate Ceiling Loss Report
Update in house listing of all taxing unit rates
Chief Appraiser schedules meeting for Ag Board
Complete Comptroller's Texas Farm & Ranch Survey by due date October 1
Check that all qualifying residences have homestead exemptions, if not send applications
After tax rates are set, files are updated for new tax rates
Update listing of all taxing unit rates
Check that mapping updates have been processed as scheduled
CAD board notifies taxing units in writing if a proposal to change the number or method of selecting CAD directors are rejected by voting taxing unit by September 14

ARB

Schedule ARB as needed for approval of supplemental records

OCTOBER

Assessor mails tax bill for the year
4th Quarter Board of Director's meeting
Submit County Indigent Health Care form to Comptroller's office
Holiday – Columbus Day – October 14
Mail Ag Survey Letters to owners Q-Z
Review and update Ag Survey Letter as needed
Check with contracted appraiser that Ag Survey is updated
Taxing units making monthly payments are due by the last day of each month
Submit completed Reports of Property Value to State Comptroller's Office
Process tax payments as they are received

NOVEMBER

Holiday – Thanksgiving – November 27 & 28
Begin Coordinating with Chief Appraiser on the next years' reappraisals
Coordinate with the PC Group to roll appraisal year in CAMA
Taxing units making monthly payments are due by the last day of each month
Begin keying in name/address changes, splits/comboes and new property from county deed records in current file
Process tax payments as they are received

DECEMBER

Form 50-820 Notification to Serve as Chief Appraiser is due by January 1

Appraisal office may conduct a mail survey to verify homestead exemption eligibility

Submit Rendition Print Order Form to the PC Group

Holiday – Christmas – December 24-26

Continue working with Chief Appraiser on any reappraisal issues

Receive names of Chair and Secretary of ARB appointed by Board of Directors

Board of Directors appoints ARB members to 2-year term

Board of Directors appoints Ag Advisory Board members to 2-year term

Notify Comptroller of Chief Appraiser's eligibility to serve as Chief Appraiser under PTC 6.05(c)

Send all gather current sales data to contracted appraiser

Send all received appropriate Ag surveys to contracted appraiser

Review filed for any exemptions or special valuations needing reapplication

Process tax payments as they are received

Taxing units making monthly payments are due by the last day of each month

Taxing units making quarterly payments are due by December 31

Taxing units making a yearly payment are due by December 31

LIMITING CONDITIONS

The appraised value estimates provided by the District are subject to the following conditions:

- The appraisals were prepared exclusively for ad valorem tax purposes.
- The property characteristic data upon which the appraisals are based is assumed correct. Exterior inspections of the property appraised were performed as staff resources and time allowed. Dome interior inspections of property appraised will be performed at the request of the property owner and required by the District for clarification purposes and to correct property descriptions.
- Validation of sales transactions was attempted through questionnaires to buyer and seller, telephone survey and field review.
- Tyler Halfmann, RPA, TLDR #72311 with Prichard & Abbott provides significant mass appraisal assistance to the person signing this certificate.
- Judy Harris, RPA, TDLR #68604 with Prichard & Abbott provides significant mineral appraisal assistance to the person signing this certificate.
- Brian Mathis, RPA, TDLR #73448 with Prichard & Abbott provides significant business personal property appraisal assistance to the person signing this certificate.
- John Chancellor RPA, TDLR #75480 with Prichard & Abbott provides significant business personal property appraisal assistance to the person signing this certificate.

"I, Tracy Cooley, Chief Appraiser for the Borden County Appraisal District, solemnly swear that I have made or caused to be made a diligent inquiry to ascertain all property in the district subject to appraisal by me, and that I have included in the records all property that I am aware of at an appraised value which, to the best of my knowledge and belief, was determined as required by law."



Chief Appraiser
Borden County Appraisal District



Chairman
Borden County Appraisal District Board of Directors



Secretary
Borden County Appraisal District Board of Directors



Date

REVALUATION DECISION

The Borden County Appraisal District by policy adopted by the Chief Appraiser, with the approval from the Borden County Appraisal District Board of Directors, implements an annual reappraisal cycle. All property in the district is on a three-year cycle. While all properties are updated annually to reflect market values, one-third of the district is re-inspecting every year. The appraisers performing the re-appraisals are given appraisal cards for each property and they physically inspect each property.

In addition to appraisals, all exemptions and special valuations for properties in the appraisal area are reviewed to verify qualification.

The re-appraisal for 2021 will be all real property (rural property North of US Hwy 180), for 2022 all real property (rural property In-Town).

These yearly plans are designed to be flexible within the overall reappraisal plan. The specific workload within and between plan years may need to be adjusted to provide for complete and accurate appraisals.

**Note: All income producing personal property within the CAD are appraised on an annual basis, regardless of its location

APPRAISAL / TAX YEAR 2021

The property categories to be included in the reappraisal include:

A, C, D, E, F, G, J, M and, verification by visual inspection, L.
G & J are covered in the reappraisal plan from Prichard & Abbott

All new construction and demolitions will be picked up; all adjustments in property characteristics that affect value will be applied for all property types and classes within the district.

APPRAISAL / TAX YEAR 2022

The property categories to be included in the reappraisal include:

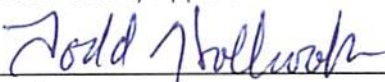
A, C, D, E, F, G, J, M and, verification by visual inspection, L.
G & J are covered in the reappraisal plan from Prichard & Abbott

All new construction and demolitions will be picked up; all adjustments in property characteristics that affect value will be applied for all property types and classes within the district.

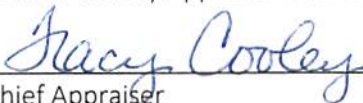
Submitted for review and approval to the Borden County Appraisal District Board of Directors on by:



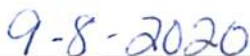
Chairman
Borden County Appraisal District Board of Directors



Secretary
Borden County Appraisal District Board of Directors



Chief Appraiser
Borden County Appraisal District



Date

Borden CAD

RESOLUTION NO. 2020 - 05

RESOLUTION FOR THE REAPPRAISAL FOR THE PROPERTY WITHIN
THE BORDEN COUNTY APPRAISAL DISTRICT

WHEREAS according to Section 25.18(c) and Section 6.05(i) of the Texas Property Tax Code requires that board to adopt its biennial reappraisal plan no later than September 15 of even-numbered years to ensure adherence with generally accepted reappraisal practices; and

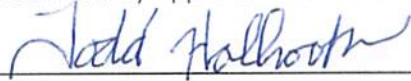
WHEREAS a reappraisal plan may only be adopted after the board of directors holds a public hearing to consider the proposed plan; and

WHEREAS the board of directors did conduct such a public hearing on DATE to receive the public comment regarding said plan, now therefore

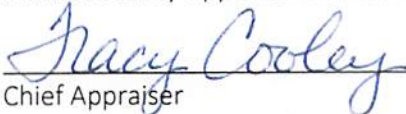
BE IT RESOLVED by the Board of Directors of the Borden County Appraisal District that they do hereby adopt the attached plan for the periodic reappraisal of property within the boundaries of the district for the taxable years 2021 and 2022.



Chairman
Borden County Appraisal District Board of Directors



Secretary
Borden County Appraisal District Board of Directors



Chief Appraiser
Borden County Appraisal District



Date

PROPERTY TAX LAW DEADLINES

JANUARY

1

- Date that the taxable values (except for inventories appraised Sept. 1) and qualification for certain exemptions are determined for the tax year – Secs. 11.42(a), 23.01(a), 23.12(f)
- Date for tax lien attaches to property to secure payments of taxes, penalties and interest that will be imposed for the year – Sec. 32.01(a)
- Date that members of county appraisal district (CAD) board of directors begin two-year terms; half the members begin two-year terms if the CAD has staggered terms – Secs. 6.03(b), 6.034(a)and(e)
- Date that half of the appraisal review board (ARB) members begin two-year terms and the ARB commissioners begin one-year terms – Sec. 6.41(d-8)
- Date by which ARB commissioners, if appointed in the county, are required to return a list of proposed ARB members to local administrative district judge – Sec. 6.41 (d-7)
- Deadline for the Chief Appraiser to notify the Comptroller's office of eligibility to serve as a Chief Appraiser – Sec. 6.05(c)
- Date the temporary exemption for qualified property damaged by disaster expires as a qualified property of the first tax year in which the property is reappraised under – Sec. 25.18 and Sec. 31.04(a)

2

- Date rendition period begins – Sec. 22.23(a)

10

- If a tax bill from the previous year is mailed after this date, the delinquency date is postponed – Sec. 31.04(a)

31

- Deadline for the Comptroller's office to publish the preliminary Property Value Study (PVS) findings, certify findings to the Texas Education Commissioner, and deliver findings to each school district – Gov't Code Sec. 403.303(a)

NOTE: A qualified school district or property owner may protest preliminary findings by filing a petition with the Comptroller not later than the 40th day after the date (whether Jan 31 or an earlier date) on which the Comptroller's findings are certified to the Texas Commissioner of Education – Gov't Code Sec. 403.303(a)

- Last day for Chief Appraiser to deliver applications for agricultural designation and exemptions requiring annual applications – Secs. 11.44(a), 23.43(e)
- Last day for disabled or age 65 or older homeowners or disabled veterans and their surviving spouses qualifies for Sec. 11.22 exemptions to provide notice of intent to pay the first installment of homestead property taxes if the delinquency date is Feb. 1. Other delinquency dates have different installment notice and payment deadlines. This deadline also applies to partially disabled veterans and their living spouses with homesteads donated from charitable organizations – Sec. 31.031(a-1)
- Last day for homeowners or qualified businesses whose properties were damaged in a disaster within the designated disaster area to pay the first installment for taxes with Feb. 1 delinquency dates if using installment payment option. Other delinquency dates have different notice and payment deadlines – Sec. 31.032(b)
- Last day for CAD to give public notice of the capitalization rate to be used in that year to appraise property with low-and moderate-income housing exemption – Sec. 11.1825(r)

FEBRUARY

1

- Last day for motor vehicle, vessel and outboard motors, heavy equipment and manufactured housing dealers to file dealer's inventory declarations – Secs. 23.12(f), 23.124(f), 23.1241(f), 23.127(f)
- Date the taxes imposed the previous year become delinquent if a bill was mailed on or before Jan. 10 of the current year – Secs. 31.02(a), 31.04(a)

- Rollback tax and interest for change of use of 1-d, 1-d-1, timber and restricted-use timber land become delinquent if taxing unit delivered a bill to the owner at least 20 days before this date – Secs. 23.46(c), 23.55(e), 23.76(e), 29.9807(f)
- Deadline for Chief Appraisers in certain counties to provide notice regarding the availability of agreement forms authorizing electronic communication, on or before this date (or as soon as practicable) – Sec. 1.085(h)

15

- Last day for tax collectors to disburse motor vehicle, vessel and outboard motor, heavy equipment and manufactured housing inventory taxes from escrow accounts to taxing units – Secs. 23.122(k), 23.1242(j), 23.125(k), 23.128(j)

28 (29 if Leap Year)

- Last day to request separate appraisals for interest in a cooperative housing corporation – Sec. 23.19(c)

MARCH

31

- Last day for taxing units' second quarterly payment for the current year CAD budget – Sec. 6.06(e)
- Last day for disabled or age 65 or older homeowners or disabled veterans and their surviving spouses qualify for Sec. 11.22 exemptions to pay second installment on taxes with Feb. 1 delinquency dates have different installment payment deadlines. The deadline also applies to partially disabled veterans and their surviving spouses with homesteads donated to charitable organizations Sec. 31.031(a) and (a-1)
- Last day for homeowners or qualified businesses whose properties were damaged in a disaster to pay second installment for taxes with Feb. 1 delinquency dates if using installment payment option. Other delinquency dates have different notice and payment deadlines – Sec. 31.032(b)
- Last day for qualified community housing development organizations to file listing of property acquired or sold during the past year with the Chief Appraiser – Sec. 11.185(i)

APRIL

1

- Last day for qualifying local governments to submit completed applications to the Comptroller's office to receive disabled veteran's assistance payments for previous fiscal year – Local Gov't Code Sec. 140.011(e)
- Last day (or as soon as practicable thereafter) for Chief Appraiser to mail notices of appraised value for single-family residence homestead properties – Sec. 25.19(a)
- Last day (or as soon thereafter as practicable) for the chief appraiser to deliver a clear and understandable written notice to property owner of a single-family residence that qualifies for an exemption under Sec. 11.13 if an exemption or partial exemption that was approved for the preceding year was canceled or reduced for the current year – Sec. 25.193(a)
- Last day for the Chief Appraiser to notify taxing units of the form in which the appraisal roll will be provided to them – Sec. 26.01(a)

15

- Last day for property owners, or secured parties if applicable, to file renditions and property reports on most property types in counties in which no taxing unit exempts Freeport property. Chief Appraiser may extend deadline to May 15 upon written request – Sec. 22.23 (a)(b)

NOTE: The Comptroller and each Chief Appraiser are required to publicize the legal requirements for filing rendition statements and the availability of the forms in a manner reasonably designed to notify all property owners of the law – Sec. 22.21. Chief Appraisers need to check with their legal council to determine the manner and timing of this notice to meet the legal requirement.

- Last day for property owners to file these applications or reports with the CAD:
 - Some exemptions applications – Sec. 11.43(d)
 - Notice to Chief Appraiser that property is no longer entitled to an exemption not requiring annual application – Sec. 11.43(g)
 - Certain applications for special appraisal or notices to Chief Appraiser that property no longer qualifies for 1-d agricultural land, 1-d-1 agricultural land, timber, restricted-use timber, recreational-park-scenic land and public access airport property – Secs. 23.43 (b), 23.54(d)(h), 23.75(d)(h), 23.84(b)(d), 23.94(d)(h), 23.9804(e)(i)
 - Railroad rolling stock reports – Sec. 24.32(e)
 - Requests for separate listing of separately owned land and improvements – Sec. 25.08(c)
 - Requests for proportionate taxing of a planned unit development property – Sec. 25.09(b)
 - Requests for separate listing of separately-owned standing timber and land – Sec. 25.10(c)
 - Requests for separate listing of undivided interests – Sec. 25.11(b)
 - Request for joint taxation of separately-owned mineral interest – Sec. 25.12(b)
- Last day for Chief Appraiser to certify estimate of the taxable value for counties, municipalities and school districts (counties and municipalities can choose to waive the estimate) – Sec. 26.01(e). A school district with a fiscal year beginning July 1 may use this certified estimate when preparing the notices of public meetings to adopt the budget and discuss proposed tax rate – Educ. Code Sec. 44.004(g-j)
- Last day to file rendition statements and property regulated by the Texas Public Utility Commission, Texas Railroad Commission, Federal Surface Transportation Board or the Federal Energy Regulatory Commission. Chief Appraiser may extend deadline to fifteen days for good cause – Sec. 22.23(d)
- Last day for property owners to file applications for allocation under Sec. 21.03, 21.031, 21.05 or 21.055. for good cause, chief appraiser shall extend deadline up to 30 days. Other deadlines apply if the property was not on the appraisal roll in the previous year – Sec. 21.09(b)

*Exemption applications for cemeteries, certain charitable organizations, religious organizations, private schools, nonprofit water supply or wastewater service corporations and other nonprofit organizations must be filed within one year of acquiring the property – Secs. 11.42(d) and 11.43(d). Unless birth date information has been provided to the CAD, persons who become age sixty-five or qualify as disabled during a tax year must apply for the applicable homestead exemptions within one year of qualifying – Sec. 11.43(k)(m)

MAY

1

- Last day (or as soon as practicable thereafter) for Chief Appraiser to mail notices of appraised value for properties other than single-family residence homesteads – Sec. 25.19(a)
- Last day (or as soon thereafter as practicable) for the chief appraiser to deliver a clear and understandable written notice to the property owner of residence homestead that does not qualify for an exemption under Sec. 11.13 if an exemption or partial exemption that was approved for the preceding year was canceled or reduced for the current year – Sec.25.193(a)

1-14

- Period to file resolutions with Chief Appraiser to change CAD finance method – Sec. 6.061(c)

1-15

- Period when Chief Appraiser must publish notice about taxpayer protest procedures in local newspaper with general circulation – Sec. 41.70(a)(b)

NOTE: Chief Appraisers must annually publicize property owner rights and methods to protest to the ARB – Sec. 41.41(b). Chief Appraisers should consult legal council on the manner and timing to fulfill this requirement.

2

- Beginning of time period when taxing units must notify delinquent taxpayers that taxes delinquent on July 1 will incur additional penalty for attorney collection cost at least 30 days and not more than 60 days before July 1. Period ends on June 1 – Sec. 33.07(d)

15

- Last day to file renditions and property reports for most property types if an extension was requested in writing. Chief Appraiser may extend deadline and additional 15 days for good cause – Sec. 22.23(b)
- Date (or as soon as practicable thereafter) for Chief Appraiser to prepare appraisal records and submit to ARB – Secs. 25.01(a), 25.22(a)
- Last day to file most protests with ARB (or by 30th day after notice of appraised value is delivered, whichever is later) – Sec. 41.44(a)(1)

19

- Last day for Chief Appraiser to determine whether a sufficient number of eligible taxing units filed resolutions to change CAD's finance method – Sec. 6.061(d)

24

- Last day for Chief Appraiser to notify taxing units of change in the CAD's financial method – Sec. 6.061(d)

31

- Last day for taxing units to file challenges with ARB (or within 15 days after the date the appraisal records are submitted to ARB (whichever is later) – Sec. 41.04
- Last day for disabled or age 65 or older homeowners or disabled veterans and their surviving spouses qualify for Sec. 11.22 exemptions to pay third installment on taxes with Feb. 1 delinquency dates have different installment payment deadlines. The deadline also applies to partially disabled veterans and their surviving spouses with homesteads donated to charitable organizations Sec. 31.031(a) and (a-1)
- Last day for homeowners and qualified businesses whose properties were damaged in a disaster area to pay third installment on taxes with Feb 1 delinquency dates. Other delinquency dates have different installment payment deadlines – Sec. 31.032(a)(b)
- Last day for a religious organization that has been denied an 11.20 exemption because of its charter to amend the charter and file a new application (on or before the 60th day after the date of notification of the exemption denial, whichever is later) – Sec. 11.421(b)
- Last day for taxing unit to take official action to extend the date by which aircraft parts must be transported outside the state after acquired or imported up to seven hundred thirty (730) days for the aircraft parts to be exempt from taxation as freeport goods for the current and subsequent years – Sec. 11.251(l)

JUNE

14

- Last day for Chief Appraiser to submit proposed budget for next year to CAD board and taxing units (unless taxing units have changed CAD's fiscal year) – Sec. 6.06(a)(i)

15

- Last day (or the 60th day after the date on which the chief appraiser delivers notice to the property owner under Sec. 22.22, if applicable) for Chief Appraisers to accept and approve or deny late-filled freeport exemption applications – Sec. 11.4391(a)

16

- Beginning date that CAD board may pass resolution to change finance method, subject to taxing units' unanimous approval. Period ends before Aug. 15 – Sec 6.061(a)

30

- Last day to pay second half of split payment for taxes imposed last year – Sec. 31.03(a)
- Last day for taxing units' third quarter payment for CAD budget for the current year – Sec. 6.06(e)
- Last day to form a taxing unit to levy property taxes for the current year – Sec. 26.12(d)

- Last day for taxing units to adopt local option percentage homestead exemptions – Sec. 11.13(n)
- Last day for a private school that has been denied an 11.21 exemption because of the charter to amend the charter and file a new application (or the sixtieth (60th) day after the date of notification of the exemption denial, whichever is later) – Sec. 11.422(a)(1)

JULY

1

- Date the delinquent taxes incur total 12 percent penalty – Sec. 33.01(a)
- A taxing unit or CAD may provide that taxes that become delinquent on or after Feb 1 of a year but not later than May 1 of that year and that remain delinquent on July 1 of the year in which they become delinquent incur an additional penalty to defray costs of collection, if the unit or CAD or another unit that collects taxes for the unit has contracted with an attorney to enforce the collection of delinquent taxes – Sec. 33.07(a)

NOTE: Taxing units and CADs that have imposed the additional penalty for collection costs under Sec. 33.07 may provide for an additional penalty for attorney collection costs of taxes that become delinquent on or after June 1 under Secs. 26.07(f), 26.15(e), 31.03, 31.031, 31.032, 31.04 or 42.42. The penalty incurred on the first day of the first month that begins 21 days after the date the collector sends the property owner a notice of delinquency and penalty – Sec. 33.08(a)(c)

- Last day for review and protest of appraisals of railroad rolling stock values (or as soon as practicable thereafter); once the appraised value is approved, the Chief Appraiser certifies to the Comptroller's office the allocated market value – Secs. 24.35(b), 24.36

20

- Date ARB must approve appraisal records but may not do so if more than 5 percent of total appraised value remains under protest. The board of directors of a CAD in a county with a population of one million or more may postpone the deadline to Aug. 30 or increase the threshold percentage from five to ten percent of the appraised value of properties not under protest – Sec 41.12(a-c)

25

- Last day for Comptroller's office to certify apportionment of railroad rolling stock value to counties, with supplemental records after that date – Secs. 24.38 and 24.40
- Last day for Chief Appraiser to certify appraisal roll to each taxing unit – Sec. 26.01(a)
- Last day for chief appraiser to prepare and certify to the assessor for each taxing unit an estimate of the taxable value of the property if the ARB has not approved the appraisal records by July 20 – Sec. 26.01(a-1)

31

- Last day for disabled or age 65 or older homeowners or disabled veterans and their surviving spouses qualify for Sec. 11.22 exemptions to pay fourth installment on taxes with Feb. 1 delinquency dates have different installment payment deadlines. The deadline also applies to partially disabled veterans and their surviving spouses with homesteads donated to charitable organizations Sec. 31.031(a) and (a-1)
- Last day for homeowners and qualified businesses whose properties were damaged in a disaster area to pay fourth installment on taxes with Feb 1 delinquency dates. Other delinquency dates have different installment payment deadlines – Sec. 31.032(a)(b)
- Last day for property owners to apply for Sept 1 inventory appraisal for the next year – Sec. 23.12(f)

AUGUST

1

- Date taxing unit's assessor submits appraisal roll and date collector submits collection rate estimate for the current year to the governing body (or as soon as practical) – Sec 26.04(b)

7

- Date taxing units (other than school districts, small taxing units and water districts) must publicize no-new-revenue and voter-approval tax rates, unencumbered fund balances, debt obligation schedule and other applicable items (or as soon as practicable thereafter) – Sec. 26.04(e) and (e)(1), 26.052(b)

14

- Last day for CAD board to pass resolution to change CAD finance method, subject to taxing unit's unanimous consent – Sec. 6.061(a)
- last day for CAD board to pass resolution to change number of directors, method for appointing, or both, and deliver the resolution to each taxing unit – Sec. 6.031(a)

15

- Deadline for Comptroller's office to certify final PVS findings to Education Commissioner except as provided – Comptroller Rule Sec. 9.4317(d)

30

- Date ARB must approve appraisal records for CADs in counties with populations of one million or more where the board of directors has postponed the deadline from July 20 – Sec. 41.12(c)(1)

31

- If a tax bill is returned undeliverable to a taxing unit by the United States Postal Service, a taxing unit must waive penalties and interest if the taxing unit does not send another tax bill at least 21 days before the delinquency date to the current mailing address furnished by the property owner and the property owner establishes that a current mailing address was furnished to the CAD for the tax bill before Sept 1 of the year in which the tax is assessed – Sec. 33.011(b)(1)
- Last day taxing unit may file resolutions with the CAD board to oppose proposed change in the CAD finance method – Sec. 6.061(a)
- Last day for taxing unit entitled to vote for appointment of CAD directors to file a resolution opposing a change by the CAD board in the number and selection of directors – Sec. 6.031(a)
- Deadline to file form with Chief Appraiser and collector to elect not to be treated as a motor vehicle inventory dealer for the next year, if eligible – Sec. 23.12(a)(3)(D)(iii)

SEPTEMBER

1

- Date that taxable value of inventories may be determined at property owner's written option – Sec. 23.12(f)

14

- Last day for CAD board to adopt CAD budget for the next year, unless district has changed its fiscal year – Sec. 6.06(b)(i)
- Last day for CAD board to notify taxing units in writing if a proposal to change a finance method by taxing units' unanimous consent has been rejected – Sec. 6.061(a)
- Last day for CAD board to notify taxing units in writing if a proposal to change the number or method of selecting CAD directors is rejected by a voting taxing unit – Sec. 6.031(a)

29

- Last day for taxing units to adopt tax rate for the current year, or before the 60th day after the date the certified roll is received by a taxing unit, whichever is later. Failure to adopt these required dates result in a unit adopting the lower of its effective tax rate for this year or last year's tax rate; units' governing body must ratify new rate within five days of establishing rate – Sec. 26.05(a)(c)

30

- Last day for taxing units' fourth quarterly payment for CAD budget for the current year – Sec. 6.06(e)

OCTOBER

1

- Date tax assessor mails tax bills for the year (or soon after as practicable) – Sec. 31.01(a)

NOVEMBER

30

- First half of split payment of taxes is due on or before this date – Sec. 31.03(a)

DECEMBER

1-31

- Time when appraisal office may conduct a mail survey to verify homestead exemption – Sec. 11.47(a)

31

- Last day for taxing units' first quarterly payment for CAD budget for next year – Sec. 6.06(e)
- Last day for taxing units to take official action to tax goods-in-transit for the following year – Sec. 11.53(j)

TRUTH-IN-TAXATION IMPORTANT DATES

Date	Activity
April 1 ¹	Chief Appraisers send notices of appraised value on single family residences by this date or as soon thereafter as practicable.
April 30 ²	Chief Appraisers prepare and certify the estimate of the taxable value of property in counties, cities and school districts to tax assessors.
May 1 ³	Chief Appraisers send notices of appraised value on all other property by this date or as soon thereafter as practicable.
July 20 ⁴	Appraisal review boards approve the appraisal records. This date may extend to Aug. 30 for certain larger counties.
July 25 ⁵	Chief Appraisers certify the approved appraisal roll to the taxing units.
Aug. 7 ⁶	Certain taxing units publish notice of effective and rollback tax rates by this date or as soon thereafter as practicable.
August – September ⁷	Taxing units adopt their budgets according to their fiscal years. School districts must publish a <i>Notice of Public Meeting to Discuss Budget and Proposed Tax Rate</i> 10 to 30 days before the public meeting date. (School districts with a July 1 fiscal year adopt budgets in June and follow a different schedule). Most taxing units adopt a tax rate after adopting their budgets.
Before Sept. 30 ⁸	Taxing units other than water districts must adopt their tax rate before this date or 60 days after receiving the appraisal roll, whichever date is later. The governing body must adopt a tax rate that exceeds the voter-approval tax rate no later than the 71 st day before the next uniform election date that occurs in November of that year
Oct. 1 ⁹	Tax assessors prepare and mail tax bills by this date or as soon thereafter as practicable.

¹ Tex. Tax Code § 25.19(a)

² Tex. Tax Code § 26.01(e)

³ Tex. Tax Code § 25.19(a)

⁴ Tex. Tax Code § 41.12(a)

⁵ Tex. Tax Code § 26.01(a)

⁶ Tex. Tax Code § 26.04(e)

⁷ Tex. Ed. Code §44.004(b)

⁸ Tex. Tax Code §26.05(a) and
Tex. Election Code §3.005(c)

⁹ Tex. Tax Code §26.05(a)

STANDARDS RULE 6: MASS APPRAISAL, DEVELOPMENT AND REPORTING

In reporting the results of a mass appraisal, an appraiser must communicate each analysis, opinion, and conclusion in a manner that is not misleading.

Comment: STANDARD 6 addresses the content and level of information required in a report that communicates the results of a mass appraisal.

STANDARD 6 does not dictate the form, format or style of mass appraisal reports. The substantive content of a report determines its compliance.

STANDARDS RULE 6-1: GENERAL REPORTING REQUIREMENTS

Each written report of a mass appraisal must:

- a. Clearly and accurately set forth the appraisal in a manner that will not be misleading;
- b. Contain sufficient information to enable the intended user(s) of the appraisal to understand the report properly; and

Comment: Documentation for a mass appraisal for as valorem taxation may be in the form of (1) property records, (2) sales ratios and other statistical studies, (3) appraisal manuals and documentation, (4) market studies, (5) model building documentation, (6) regulations, (7) statutes and (8) other acceptable forms.

- c. Clearly and accurately disclose all assumptions, extraordinary assumptions, hypothetical conditions and limiting conditions used in the assignment.

STANDARDS RULE 6-2: CONTENT OF A MASS APPRAISAL REPORT

The content of a mass appraisal report must be appropriate for the intended use of the appraisal and, at a minimum:

- a. State the identity of the client, or if the client has requested anonymity, state that the identity is withheld at the client's request but is retained in the appraiser's work file; state the identity of any intended user(s) by name or type,

Comment: Because the client is an intended user, they must be identified in the report as such. However, if the client has requested anonymity the appraiser must use care when identifying the client to avoid violations of the Confidentiality section of the ETHICS RULE.

- b. State the intended use of the appraisal;
- c. Disclose any assumption or limiting conditions that result in deviation from recognized methods and techniques or that affect analyses, opinions and conclusions;
- d. State the effective date of the appraisal and the date of the report;
- e. State the type and definition of the value and cite the source of the definition;

Comment: Stating the type and definition of value also requires any comments needed to clearly indicate to intended users how the definition is being applied.

When reporting an opinion of value, state whether the opinion is:

- In terms of cash or financing terms equivalent to cash; or
- Based on non-market financing with unusual conditions or incentives.

When an opinion of value is based on non-market financing terms or financing with unusual conditions or incentives, summarize the terms of such financing and any influences on value.

- f. State the properties appraised including the property rights; and, when the property rights to be appraised are specified in a statute or court ruling, reference the law;

Comment: The report documents the sources for location, describing and listing the property. When applicable, include the references to legal descriptions, addresses, parcel identifiers, photos and building sketches. In mass appraisal this information is often included in property records.

- g. Summarize the scope of work used to develop the appraisal , and explain the exclusion of the sales comparison approach, cost approach or income approach;

Comment: Summarizing the scope of work includes disclosure of research and analyses performed and might also include disclosure of research and analyses not performed.

- h. When any portion of the work involves significant mass appraisal assistance, summarize the extent of that assistance,
- i. Summarize and support the model specification(s) considered, data requirements and the model(s) chosen; provide sufficient information to enable the client and intended user(s) to have confidence that the process and procedures used conform to accepted methods and result in creditable value conclusions; and include a summary of the rationale for each model, the calibration techniques to be used, and the performance measures to be used;

Comment: In the case of mass appraisal for ad valorem taxation, stability and accuracy are important to the credibility of value opinions.

- j. Summarize the procedure for collecting, validating and reporting data; and summarize the sources of data and the data collection and validation process;

Comment: Reference to detailed data collection manuals or electronic records must be made, as appropriate, including where they may be found for inspection.

- k. Summarize calibration methods considered and chosen, including the mathematical form of the final model(s); summarize how value conclusions were reviewed; and, if necessary, state the availability and location of individual value conclusions;
- l. When an opinion of highest and best use, or the appropriate market or market level was developed, summarize how that opinion was determined, and reference case law, statute or public policy that describes highest and best use requirements;

Comment: When actual use is the requirement, the report must summarize how use-value opinions were developed. The appraiser's reasoning in support of the highest and best use opinion must be provided in the depth and detail required by its significance to the appraisal.

- m. Identify the appraisal performance tests used and the performance measures attained;
- n. Summarize the reconciliation performed, in accordance with Standards Rule 5-7; and
- o. Include a signed certification in accordance with Standards Rule 6-3

STANDARDS RULE 6-3: MASS CERTIFICATION

A Signed certification is an integral part of the appraisal report.

- a. The wording of a certification does not have to match the following verbatim, but each of the elements must be addressed:

I certify that, to the best of my knowledge and belief:

- The statements of fact contained in this report are true and correct.
- The reported analyses, opinions and conclusions are limited only by the reported assumptions and limiting conditions, and are my personal, impartial and unbiased professional analyses, opinions and conclusions.
- I have no (or the specified) present or prospective interest in the property that is the subject of this report, and no (or the specified) personal interest with respect to the parties involved.
- I have performed no (or the specified) services, as an appraiser or in any other capacity, regarding the property that is the subject of this report within the three-year period immediately preceding the agreement to perform this assignment.

- I have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.
- My engagement in this assignment was not contingent upon developing or reporting predetermined results.
- My compensation for completing this assignment is not contingent upon the reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result or the occurrence of a subsequent event directly related to the intended use of this appraisal.
- My analyses, opinions and conclusions were developed, and this report has been prepared, in conformity with the Uniform Standards of Professional Appraisal Practice.
- I have (or have not) made a personal inspection of the properties that are the subject of this report. (If more than one person signs this certification, the certification must clearly specify which individuals did and which individuals did not make a personal inspection of the appraised property.)
- No one provided significant mass appraisal assistance to the person signing this certification. (If there are exceptions, the name of each individual providing significant mass appraisal assistance must be stated.)

Comment: the above certification is not intended to disturb an elected or appointed assessor's work plans or oaths of office.

- b. An appraiser who signs any part of the appraisal report, including a letter of transmittal, must also sign a certification.**

Comment: in an assignment that includes only assignment results developed by the real property appraiser, any appraiser who signs the certification accepts full responsibility for all elements of the certification, for the assignment results, and for the contents of the appraisal report. In an assignment that includes personal property assignment results not developed by the real property appraiser(s), any real property appraiser who signs a certification accepts full responsibility for the real property elements of the certification, for the real property assignment results, and for the real property contents of the appraisal report.

In an assignment that includes only assignment results developed by the personal property appraiser(s), any appraiser who signs a certification accepts full responsibility for all the elements of the certification, for the assignment results, and for the contents of the appraisal report. In an assignment that includes real property assignment results not developed by the personal property appraiser(s), any personal property appraiser who signs a certification accepts full responsibility for the personal property elements of the certification, for the personal property assignment result and for the personal property contents of the appraisal report.

- c. When a signing appraiser has relied on work done by appraisers and others who do not sign the certification, the signing appraiser is responsible for the decision to rely on their work.**
- i. The signing appraiser is required to have a reasonable basis for believing that those individuals performing the work are competent; and
 - ii. The signing appraiser must have no reason to doubt that the work of those individuals is credible.

Comment: Although a certification must contain the names of individuals providing significant appraisal assistance, it is not required that a summary of the extent of their assistance be located in a certification. This disclosure may be in any part(s) of the report.

STATE COMPTROLLER RATIO STUDY SUMMARY

The findings of the State Comptroller's 2019 Property Value Study for Borden County can be viewed at the following website:

<https://comptroller.texas.gov/taxes/property-tax/pvs/2019f/017index.php>

Category	Number of Ratios **	2019 CAD Rept Appraised Value	Median Level of Appr	Coefficient of Dispersion	% Ratios w /in (+/-) 10 % of Median	% Ratios w /in (+/-) 25 % of Median	Price - Related Differential
A. SINGLE-FAMILY RESIDENCES	0	1,997,240	*	*	*	*	*
C1. VACANT LOTS	0	524,600	*	*	*	*	*
D2. FARM/RANCH IMP	0	2,280,210	*	*	*	*	*
E. RURAL-NON-QUAL	0	6,345,180	*	*	*	*	*
F1. COMMERCIAL REAL	0	1,024,180	*	*	*	*	*
F2. INDUSTRIAL REAL	0	219,423,970	*	*	*	*	*
G. OIL, GAS, MINERALS	22	294,562,670	1.00	3.05	90.91	100.14	1.00
J. UTILITIES	4	196,386,640	0.94	14.63	47.00	75.25	0.95
L1. COMMERCIAL PERSONAL	0	1,376,690	*	*	*	*	*
L2. INDUSTRIAL PERSONAL	0	21,557,570	*	*	*	*	*
M. OTHER PERSONAL	0	52,100	*	*	*	*	*
OVERALL	26	745,531,050	1.00	5.00	84.15	96.31	0.98

RESOURCES ATTACHED TO THIS PLAN

Prichard & Abbott's Reappraisal Plan
2021 Budget
Standard on Ratio Studies

WEBSITES

www.tdlr.texas.gov
www.comptroller.texas.gov/taxe/property-tax/
www.bordencad.org
<https://borden.countytaxrates.com/tax>
www.pandai.com/home.aspx

Borden CAD

RESOLUTION NO. 2020 - 05

RESOLUTION FOR THE APPROVAL OF THE 2021-2022 REAPPRAISAL PLAN

WHEREAS, the Board of Directors of the Borden County Appraisal District, Borden County, Texas, a Political Subdivision of the State of Texas, through the Board's vested authority provides by law: and

WHEREAS, the Board of Directors of the Borden County Appraisal District recognizes that under Texas Property Tax Code Section 6.05(i) they have the responsibility and authority to approve the Biennial Reappraisal Plan; and

WHEREAS, the Chief Appraiser has provided written notice to the presiding office of the governing body of each taxing unit served by the District of the date, time and location of a public hearing; and

WHEREAS, the Board of Directors held a public hearing on September 8, 2020 to consider the Biennial Reappraisal Plan; and

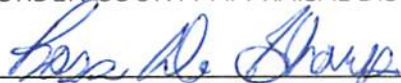
WHEREAS, the Board of Directors recognizes that that all requirements established under the Property Tax Code Section 6.05(i) have been met;

NOW, THEREFORE, BE IT RESOLVED THAT THE BORDEN COUNTY APPRAISAL BOARD OF DIRECTORS does hereby approve and adopt the 2021-2022 Biennial Reappraisal Plan; and

FURTHERMORE, BE IT RESOLVED that the Board of Directors hereby directs the Chief Appraiser to deliver copies of the approved Biennial Reappraisal Plan to the presiding officer of the governing body of each taxing unit served by the District and to the State Comptroller of Public Account, Property Tax Assistance Division office within 60 days of the approval date.

PASSED AND APPROVED this 8th day of September 2020.

BORDEN COUNTY APPRAISAL DISTRICT



Ross Sharp, Board of Directors Chairman

Attest:



Todd Holbrooks, Board of Directors Secretary



**PRITCHARD & ABBOTT, INC.
VALUATION CONSULTANTS**

S.B. 1652* BIENNIAL REAPPRAISAL PLAN

**FOR THE ANNUAL APPRAISAL FOR
AD VALOREM TAX PURPOSES OF
MINERAL, INDUSTRIAL, UTILITY AND
RELATED PERSONAL PROPERTY**

For Tax Years:

2021 and 2022

Originally Printed: June 29, 2020

*Senate Bill 1652 passed by the Texas Legislature, 79th Regular Session in 2005, amending Section 6.05 of the Texas Property Tax Code, adding Subsection (i) as follows:

"To ensure adherence with generally accepted appraisal practices, the board of directors of an appraisal district shall develop biennially a written plan for the periodic reappraisal of all property within the boundaries of the district according to the requirements of Section 25.18 and shall hold a public hearing to consider the proposed plan. Not later than the 10th day before the date of the hearing, the secretary of the board shall deliver to the presiding officer of the governing body of each taxing unit participating in the district a written notice of the date, time, and place for the hearing. Not later than September 15 of each even-numbered year, the board shall complete its hearings, make any amendments, and by resolution finally approve the plan. Copies of the approved plan shall be distributed to the presiding officer of the governing body of each taxing unit participating in the district and to the comptroller within 60 days of the approval date."



Table of Contents

<u>Item</u>	<u>Page</u>
P&A POLICY STATEMENT	2
PREAMBLE	5
ETHICS RULE	7
RECORD KEEPING RULE	10
SCOPE OF WORK RULE.....	11
JURISDICTIONAL EXCEPTION RULE.....	13
STANDARDS 5 & 6: MASS APPRAISAL, DEVELOPMENT AND REPORTING (General).....	14
STANDARDS 5, 6-1, 6-2: MINERAL INTERESTS.....	17
STANDARDS 5, 6-1, 6-2: INDUSTRIAL, UTILITY, AND RELATED PERSONAL PROPERTY... 	23

POLICY STATEMENT OF PRITCHARD & ABBOTT, INC., ON THE UNIFORM STANDARDS OF PROFESSIONAL APPRAISAL PRACTICE

Pritchard & Abbott, Inc., (P&A), a privately held company engaged primarily, but not wholly, in the ad valorem tax valuation industry endorses Uniform Standards of Professional Appraisal Practice (USPAP) as the basis for the production of sound appraisals. Insofar as the statutory requirement to appraise groups (or a “universe”) of real and personal property within an established period of time using standardized procedures—and subjecting the resulting appraisals to statistical measures—is the definition of mass appraisal, P&A subscribes to USPAP Standards 5 and 6 (Mass Appraisal, Development and Reporting) whenever applicable in the development and defense of values. When circumstances clearly dictate the use of single property appraisal procedures, P&A adheres to the spirit and intent of the remaining USPAP Standards within all appropriate, practical, and/or contractual limitations or specifications.

A biennial reappraisal plan is, at its core, a discussion of the CAD’s intended implementation of the Scope of Work Rule in USPAP. This plan provides general information about this rather comprehensive USPAP rule, as well as the specific steps P&A takes in the actual appraisal of various property types per our contractual obligations. This Biennial Reappraisal Plan should not be confused or conflated with an “appraisal manual” or other “how-to” guide which may or may not exist within P&A for any particular property type we appraise.

This reappraisal plan discusses a few other USPAP rules that interact with the Scope of Work Rule, such as the Ethics Rule, the Record Keeping Rule, and Jurisdictional Exception Rule. For further information regarding other sections of USPAP, including the Competency Rule, definitions, and appraisal reports, please reference P&A’s “USPAP report” which accompanies our appraisals and supporting documentation provided to clients per Property Tax Code, Sec. 25.01(c) at the completion of each tax year. *An appraisal season thus begins with an appraisal plan (approved by the CAD’s Board of Directors) and ends with appraisal reports.* Providing these reports is definitely part of the plan. Likewise, much of the verbiage in the “USPAP report” is a reiteration of the Biennial Reappraisal Plan.

USPAP defines “appraisal” as the act or process of developing an opinion of value or pertaining to appraising and related functions such as appraisal practice or appraisal services. Valuation services is defined as services pertaining to an aspect of property value, regardless of the type of service and whether it is performed by appraisers or by others. The USPAP definition of “appraiser” is one who is expected to perform valuation services competently and in a manner that is *independent, impartial, and objective*. USPAP Advisory Opinion 21: *USPAP Compliance* states that this expectation (by clients and intended users of appraisal reports) is the basis that creates an ethical obligation to comply with USPAP, even if not legally required. Advisory opinions do not establish new standards or interpret existing standards, but instead are issued to illustrate the applicability of appraisal standards in specific situations.

The majority of property types that P&A typically appraises for ad valorem tax purposes are categorized as unique, complex, and/or “special purpose” properties (mineral interests, industrial, utility, and related personal property). These categories of properties do not normally provide sufficient market data of reliable quality and/or quantity to support the rigorous use of all USPAP-prescribed mass appraisal development mandates (Standard 5: Mass Appraisal, Development), particularly with regards to some, but not all, of the *model calibration* and *statistical performance testing* confines. However, P&A does strive to employ all or most elements of mass appraisal techniques with regards to the *definition* and *identification of property characteristics* and *model specification* and application.

Per USPAP Advisory Opinion 32: *Ad Valorem Property Tax Appraisal and Mass Appraisal Assignments*, in the

interests of equity, the scope of work in mass appraisal assignments for ad valorem taxation can include consideration of appraisal level (the overall proximity between appraised values and actual prices) and the uniformity of property values (equity within groups of like properties). The appraiser is responsible for recognizing when the concepts of appraisal level and appraisal uniformity are necessary for credible assignment results in a mass appraisal assignment for ad valorem taxation.

Residential real estate property appraisers most frequently apply mass appraisal methods within the sales comparison (market) approach to value. Through the use of standardized data collection (i.e., actual market sales), specification and calibration of mass appraisal models, tables, and schedules are possible. Through ratio study analysis and other performance measures, a cumulative summary of valuation accuracy can thus be produced in order to calibrate the appraisal model(s). Where sufficient data of reliable quality exists, mass appraisal is also used for other types of real estate property such as farms, vacant lots, and some commercial uses (e.g., apartments, offices, and small retail).

Regarding mass appraisal reports due the client and other intended users per USPAP (Standard 6 (Mass Appraisal, Reporting), a written report of the mass appraisal as described in Standards 6-2 is not provided for each individual property. An individual property record or worksheet may describe the valuation of the specific property after the application of the mass appraisal model. To understand the individual property result developed in a mass appraisal requires the examination of all the information and analysis required by Standards 6-2.

P&A will clearly state or otherwise make known all extraordinary assumptions, hypothetical conditions, limitations imposed by assignment conditions, and/or jurisdictional exceptions in its appraisal reports as they are conveyed to our clients. *Intended users of our reports are typically the client(s) for which we are under direct contract.* Although taxpayers or their agents who own and/or represent the subject property being appraised often receive these reports either by law or as a courtesy of the client or P&A, this receipt does not mean these parties automatically become Intended Users as defined by USPAP. *A party receiving a copy of a report in order to satisfy disclosure requirements does not become an intended user of the appraisal or mass appraisal unless the appraiser specifically identifies such party as an intended user.* Potential other users include parties involved in adjudication of valuation disputes (review board members, lawyers, judges, etc.), governmental agencies which periodically review our appraisals for various statutory purposes (such as the Texas Comptroller's Office) and private parties who may obtain copies of our appraisals through Open Records Requests made to governmental agencies.

USPAP does not currently address communications of assignment results prior to completion of the assignment, thus such communications have no requirements other than to comply with the general requirements in the ETHICS RULE, the COMPETENCY RULE, and the JURISDICTIONAL EXCEPTION RULE. The client and all intended users should be aware that mass appraisals, as opposed to most "fee" appraisals, are somewhat inherently "limited" versus "complete" and that appraisal reports, unless otherwise contracted for by the client, will most often be of a "restricted" nature whereas explanations of appraisal methods and results are more concise versus lengthy in order to promote brevity, clarity, and transparency to the intended user(s).

Per USPAP, the appropriate reporting option and level of information in a report are dependant on the intended use and the intended users. Although the reporting verbiage in USPAP Standard 6 does not specifically offer or promulgate a "Restricted Appraisal Report" such as in Standard 2 (Real Property Appraisal, Reporting) and Standard 8 (Personal Property Appraisal, Reporting), it should be noted that: a) all mass appraisals and mass appraisal reports deal with real and personal property in some form or fashion; and b) P&A is a private consulting firm, a fact which may necessitate the withholding of certain data and/or appraisal models/techniques which are deemed confidential, privileged and/or proprietary in nature. The use of "limited" appraisals in conjunction with "restricted" reports in no way implies non-compliance with USPAP. *The substantive content of a report*

determines its compliance.

P&A believes that, with its vast experience and expertise in these areas of appraisal, all concluded values and reports thereof are credible, competent, understandable, uniform and consistent; and most importantly for ad valorem tax purposes, accomplished in a cost-efficient and timely manner.

Per previous ASB comments under Standard 6-2(b) [*scope of work... special limiting conditions*]:

“Although appraisers in ad valorem taxation should not be held accountable for limitations beyond their control, they are required by this specific requirement to identify cost constraints and to take appropriate steps to secure sufficient funding to produce appraisals that comply with these standards. Expenditure levels for assessment administration are a function of a number of factors. Fiscal constraints may impact data completeness and accuracy, valuation methods, and valuation accuracy. Although appraisers should seek adequate funding and disclose the impact of fiscal constraints on the mass appraisal process, they are not responsible for constraints beyond their control.”

In any event, however, it is not P&A’s intent to allow constraints, fiscal or otherwise, to limit the scope of work to such a degree that the mass appraisal results provided to our clients are not credible within the context of the intended use(s) of the appraisal.

PREAMBLE

The purpose of USPAP is to establish requirements and conditions for ethical, thorough, and transparent property valuation services. Valuation services pertain to all aspects of property value and include services performed by appraisers and other professionals including attorneys, accountants, insurance estimators, auctioneers, or brokers. Valuation services include appraisal, appraisal review, and appraisal consulting. The primary intent of these Standards is to promote and maintain a high level of public trust in professional appraisal practice.

It is essential that professional appraisers develop and communicate their analyses, opinions, and conclusions to intended users of their services in a manner that is meaningful and not misleading. The importance of the role of the appraiser places ethical obligations upon those who serve in this capacity. These USPAP Standards reflect the current standards of the appraisal profession.

These Standards are for both appraisers and users of appraisal services. To maintain a high level of professional practice, appraisers observe these Standards. However, these Standards do not in themselves establish which individuals or assignments must comply. The Appraisal Foundation nor its Appraisal Standards Board is not a government entity with the power to make, judge, or enforce law. Compliance with USPAP is only required when either the service or the appraiser is obligated to comply by law or regulation, or by agreement with the client or intended users. When not obligated, individuals may still choose to comply.

USPAP addresses the ethical and performance obligations of appraisers through DEFINITIONS, Rules, Standards, Statements (if any), and Advisory Opinions. USPAP Standards deal with the procedures to be followed in performing an appraisal or appraisal review and the manner in which each is communicated. A brief description of the USPAP Standards are as follows:

- **Standards 1 and 2:** establish requirements for the development and communication of a real property appraisal.
- **Standards 3 and 4:** establishes requirements for the development and communication of an appraisal review.
- **Standards 5 and 6:** establishes requirements for the development and communication of a mass appraisal.
- **Standards 7 and 8:** establish requirements for the development and communication of a personal property appraisal.
- **Standards 9 and 10:** establish requirements for the development and communication of a business or intangible asset appraisal.

Section 23.01(b) [*Appraisals Generally*] of the Texas Property Tax Code states:

“The market value of property shall be determined by the application of generally accepted appraisal methods and techniques. If the Appraisal District determines the appraised value of a property using mass appraisal standards, the mass appraisal standards must comply with the Uniform Standards of Professional Appraisal Practice....” (underline added for emphasis)

Consequently, USPAP Standards 5 and 6 are assumed to be the applicable standard for ad valorem tax purposes in Texas, if mass appraisal practices are in fact being used to appraise the subject property. USPAP Advisory Opinion 32 suggests several USPAP standards other than Standards 5 or 6 can apply in ad valorem tax work. It appears that an appraiser engaged in ad valorem tax work in Texas is not specifically required by law to follow these USPAP standards if in fact mass appraisal practices have not been used to appraise the subject property. In this case it could be deemed appropriate to invoke the Jurisdictional Exception Rule which is applicable when

there is a contradiction between the requirements of USPAP and the law or regulation of a jurisdiction. Please see the P&A Policy Statement on USPAP as provided elsewhere in this report for a more detailed discussion regarding this matter.

ETHICS RULE

Because of the fiduciary responsibilities inherent in professional appraisal practice, the appraiser must observe the highest standards of professional ethics. This Ethics Rule is divided into three sections:

- Conduct;
- Management;
- Confidentiality.

This Rule emphasizes the personal obligations and responsibilities of the individual appraiser. However, it should be noted that groups and organizations *which are comprised of individual appraisers engaged in appraisal practice* effectively share the same ethical obligations. To the extent the group or organization does not follow USPAP Standards when legally required, individual appraisers should take steps that are appropriate under the circumstances to ensure compliance with USPAP.

Compliance with these Standards is required when either the service or the appraiser is obligated by law or regulation, or by agreement with the client or intended users, to comply. *Compliance is also required when an individual, by choice, represents that he or she is performing the service as an appraiser.*

An appraiser must not misrepresent his or her role when providing valuation services that are outside of appraisal practice.

Honesty, impartiality, and professional competency are required of all appraisers under USPAP Standards. To document recognition and acceptance of his or her USPAP-related responsibilities in communicating an appraisal or appraisal review completed under USPAP, an appraiser is required to certify compliance with these Standards.

CONDUCT

An appraiser must perform assignments with impartiality, objectivity, and independence, and without accommodation of personal interests.

An appraiser:

- must not perform an assignment with bias;
- must not advocate the cause or interest of any party or issue;
- *must not accept an assignment that includes the reporting of predetermined opinions and conclusions;*
- must not misrepresent his or her role when providing valuation services that are outside of appraisal practice;
- must not communicate assignment results with the intent to mislead or to defraud;
- must not use or communicate a report or assignment results known by the appraiser to be misleading or fraudulent;
- must not knowingly permit an employee or other person to communicate a report or assignment results that are misleading or fraudulent report;
- must not use or rely on unsupported conclusions relating to characteristics such as race, color, religion, national origin, gender, marital status, familial status, age, receipt of public assistance income, handicap, or an unsupported conclusion that homogeneity of such characteristics is necessary to maximize value;
- must not engage in criminal conduct;

- must not willfully or knowingly violate the requirements of the RECORD KEEPING RULE; and must not perform an assignment in a grossly negligent manner.

If known prior to accepting an assignment, and/or if discovered at any time during the assignment, an appraiser must disclose to the client, and in each subsequent report certification:

- any current or prospective interest in the subject property or parties involved; and
- any services regarding the subject property performed by the appraiser within the three year period immediately preceding acceptance of the assignment, as an appraiser or in any other capacity.

The appraiser can agree with the client to keep the mere occurrence of a prior appraisal assignment confidential. If an appraiser has agreed with the client not to disclose that he or she has appraised a property, the appraiser must decline all subsequent assignment that fall with the three year period. In assignments in which there is no report, only the initial disclosure to the client is required.

Presumably all parties in ad valorem tax appraisal will be aware of the ongoing yearly nature of the appraisal assignments performed by valuation consulting firms like Pritchard & Abbott, Inc.—i.e., it will not be confidential—so that this particular conduct instruction is more or less a moot point (regarding the three year period discussed) if the prior service is in fact the ad valorem tax appraisals performed in previous tax years.

MANAGEMENT

The payment of a fee, commission, or a thing of value by the appraiser in connection with the procurement of an assignment must be disclosed. This disclosure must appear in the certification and in any transmittal letter in which conclusions of value are stated; however, the disclosure of the amount paid is not required. Intra-company payments to employees of groups or organizations involved in appraisal practice for business development do not require disclosure.

It is unethical for an appraiser to accept compensation for performing an assignment when it is contingent upon the reporting of a *predetermined result, a direction in assignment results that favors the cause of the client, the amount of a value opinion, the attainment of a stipulated result*, or the occurrence of a subsequent event directly related to the appraiser's opinions and specific to the assignment's purpose.

Advertising for or *soliciting assignments in a manner that is false, misleading, or exaggerated* is unethical. Decisions regarding finder or referral fees, contingent compensation, and advertising may not be the responsibility of an individual appraiser, but for a particular assignment it is the responsibility of the individual appraiser to ascertain that there has been no breach of ethics, that the assignment consulting assignment has been prepared in accordance with USPAP Standards, and that the report can be properly certified when required by USPAP Standards 2-3, 4-3, 6-3, 8-3, or 10-3.

An appraiser must affix, or authorize the use of, his or her signature to certify recognition and acceptance of his or her USPAP responsibilities in an appraisal or appraisal review assignment. An appraiser may authorize the use of his or her signature only on an assignment-by-assignment basis.

In addition, an appraiser must not affix the signature of another appraiser without his or her consent. An appraiser must exercise due care to prevent unauthorized use of his or her signature. However, an appraiser exercising such care is not responsible for unauthorized use of his or her signature.

CONFIDENTIALITY

An appraiser must protect the confidential nature of the appraiser-property owner relationship.

An appraiser must act in good faith with regard to the legitimate interests of the client in the use of confidential information and in the communication of assignment results.

An appraiser must be aware of, and comply with, all confidentiality and privacy laws and regulations applicable in an assignment.

An appraiser must not disclose confidential factual data obtained from a property owner to anyone other than:

1. The client;
2. Parties specifically authorized by the client;
3. State appraiser regulatory agencies;
4. Third parties as may be authorized by due process of law; or
5. A duly authorized professional peer review committee except when such disclosure to a committee would violate applicable law or regulation.

An appraiser must take reasonable steps to safeguard access to confidential information and assignment results by unauthorized individuals, whether such information or results are in physical or electronic form. In addition, an appraiser must ensure that employees, coworkers, subcontractors, or others who may have access to confidential information or assignments results, are aware of the prohibitions on disclosure of such information or results.

It is unethical for a member of a duly authorized professional peer review committee to disclose confidential information presented to the committee.

When all confidential elements of confidential information are removed through redaction or the process of aggregation, client authorization is not required for the disclosure of the remaining information, as modified.

RECORD KEEPING RULE

An appraiser must prepare a workfile for each appraisal or appraisal review assignment. A workfile must be in existence prior to the issuance of any report or other communication of assignment results. A written summary of an oral report must be added to the workfile within a reasonable time after the issuance of the oral report.

The workfile must include the name of the client and the identity, by name or type, of any other intended users, and true copies of all written reports, documented on any type of media. (A true copy is a replica of the report transmitted to the client. A photocopy or an electronic copy of the entire report transmitted to the client satisfies the requirement of a true copy.) A workfile must contain summaries of all oral reports or testimony, or a transcript of testimony, including the appraiser's signed and dated certification; and all other data, information, and documentation necessary to support the appraiser's opinions and conclusions and to show compliance with USPAP, or references to the location(s) of such other data, information, and documentation.

A workfile in support of a Restricted Appraisal Report or an oral appraisal report must be sufficient for the appraiser to produce an Appraisal Report. A workfile in support of an oral appraisal review report must be sufficient for the appraiser to produce an Appraisal Review Report.

An appraiser must retain the workfile for a period of at least *five years after preparation* or at least two years after final disposition of any judicial proceeding in which the appraiser provided testimony related to the assignment, whichever period expires last.

An appraiser must have custody of the workfile, or make appropriate workfile retention, access, and retrieval arrangements with the party having custody of the workfile. This includes ensuring that a workfile is stored in a medium that is retrievable by the appraiser throughout the prescribed record retention period. An appraiser having custody of a workfile must allow other appraisers with workfile obligations related to an assignment appropriate access and retrieval for the purpose of:

- submission to state appraiser regulatory agencies;
- compliance with due process of law;
- submission to a duly authorized professional peer review committee; or
- compliance with retrieval arrangements.

A workfile must be made available by the appraiser when required by a state appraiser regulatory agency or due process of law.

An appraiser who willfully or knowingly fails to comply with the obligations of this Record Keeping Rule is in violation of the Ethics Rule.

SCOPE OF WORK RULE

For each appraisal or appraisal review assignment, an appraiser must:

1. Identify the problem to be solved;
2. Determine and perform the scope of work necessary to develop credible assignment results; and
3. Disclose the scope of work in the report.

An appraiser must properly identify the problem to be solved in order to determine the appropriate scope of work. The appraiser must be prepared to demonstrate that the scope of work is sufficient to produce credible assignment results.

Scope of work includes, but is not limited to:

- the extent to which the property is identified;
- the extent to which tangible property is inspected;
- the type and extent of data researched; and
- the type and extent of analyses applied to arrive at opinions or conclusions.

Appraisers have broad flexibility and significant responsibility in determining the appropriate scope of work for an appraisal or appraisal review assignment. Credible assignment results require support by relevant evidence and logic. *The credibility of assignment results is always measured in the context of the intended use.*

PROBLEM IDENTIFICATION

An appraiser must gather and analyze information about those assignment elements that are necessary to properly identify the appraisal, appraisal review or appraisal consulting problem to be solved. The assignment elements necessary for problem identification are addressed in the Standard 6-2:

- client and any other intended users;
- intended use of the appraiser's opinions and conclusions;
- type and definition of value;
- effective date of the appraiser's opinions and conclusions;
- subject of the assignment and its relevant characteristics; and
- assignment conditions.

This information provides the appraiser with the basis for determining the type and extent of research and analyses to include in the development of an appraisal. Similar information is necessary for problem identification in appraisal review and appraisal consulting assignments. Assignment conditions include:

- assumptions;
- extraordinary assumptions;
- hypothetical conditions;
- laws and regulations;
- jurisdictional exceptions; and
- other conditions that affect the scope of work.

SCOPE OF WORK ACCEPTABILITY

The scope of work must include the research and analyses that are necessary to develop credible assignment results. The scope of work is acceptable when it meets or exceeds:

- the expectations of parties who are regularly intended users for similar assignments; and
- what an appraiser's peers' actions would be in performing the same or a similar assignment.

Determining the scope of work is an ongoing process in an assignment. Information or conditions discovered during the course of an assignment might cause the appraiser to reconsider the scope of work. An appraiser must be prepared to support the decision to exclude any investigation, information, method, or technique that would appear relevant to the client, another intended user, or the appraiser's peers.

An appraiser must not allow assignment conditions to limit the scope of work to such a degree that the assignment results are not credible in the context of the intended use. In addition, the appraiser must not allow the intended use of an assignment or a client's objectives to cause the assignment results to be biased.

DISCLOSURE OBLIGATIONS

The report must contain sufficient information to allow intended the client and other intended users to understand the scope of work performed. Proper disclosure is required because clients and other intended users may rely on the assignment results. Sufficient information includes disclosure of research and analyses performed or not performed. *The information disclosed must be appropriate for the intended use of the assignment results.*

Sufficient information includes disclosure of research and analyses performed and might also include disclosure of research and analyses not performed. *The appraiser has broad flexibility and significant responsibility in the level of detail and manner of disclosing the scope of work in the appraisal report or appraisal review report.* The appraiser may, but is not required to, consolidate the disclosure in a specific section or sections of the report, or use a particular label, heading or subheading. An appraiser may choose to disclose the scope of work as necessary throughout the report.

JURISDICTIONAL EXCEPTION RULE

If any applicable law or regulation precludes compliance with any part of USPAP, only that part of USPAP becomes void for that assignment. When compliance with USPAP is required by federal law or regulation, no part of USPAP can be voided by a law or regulation of a state or local jurisdiction. *When an appraiser properly follows this Rule in disregarding a part of USPAP, there is no violation of USPAP.*

In an assignment involving a jurisdictional exception, an appraiser must:

- identify the law or regulation that precludes compliance with USPAP;
- comply with that law or regulation;
- clearly and conspicuously disclose in the report the part of USPAP that is voided by that law or regulation; and
- cite in the report the law or regulation requiring this exception to USPAP compliance.

The purpose of the Jurisdictional Exception Rule is strictly limited to providing a saving or severability clause intended to preserve the balance of USPAP if one or more of its parts are determined as contrary to law or public policy of a jurisdiction. By logical extension, there can be no violation of USPAP by an appraiser who disregards, with proper disclosure, only the part or parts of USPAP that are void and of no force and effect in a particular assignment by operation of legal authority.

It is misleading for an appraiser to disregard a part or parts of USPAP as void and of no force and effect in a particular assignment without identifying the part or parts disregarded and the legal authority justifying this action in the appraiser's report.

“Law” includes constitutions, legislative and court-made law, and administrative rules (such as from the Office of the Texas Comptroller of Public Accounts) and ordinances. “Regulations” include rules or orders having legal force, issued by an administrative agency. *Instructions from a client or attorney do not establish a jurisdictional exception.*

A jurisdictional exception prevalent in Texas is that appraisers are seeking to establish “fair market value” as defined by the Texas Property Tax Code instead of “market value” as found in the USPAP definitions section.

USPAP STANDARDS 5 AND 6: MASS APPRAISAL, DEVELOPMENT AND REPORTING (General Discussion)

In developing a mass appraisal, an appraiser must be aware of, understand, and correctly employ those recognized methods and techniques necessary to produce and communicate credible mass appraisals.

Standards 5 and 6 apply to all mass appraisals of real and personal property regardless of the purpose or use of such appraisals. It is directed toward the substantive aspects of developing and communicating competent analyses, opinions, and conclusions in the mass appraisal of properties, whether real property or personal property. Standard 5 is directed toward the substantive aspects of developing credible analyses, opinions, and conclusions in the mass appraisal of properties, while Standard 6 addresses the content and level of information required in a report that communicates the results of a mass appraisal. The reporting and jurisdictional exceptions applicable to public mass appraisals prepared for purposes of ad valorem taxation do not apply to mass appraisals prepared for other purposes.

A mass appraisal includes:

- identifying properties to be appraised;
- defining market areas of consistent behavior that applies to properties;
- identifying characteristics (supply and demand) that affect the creation of value in that market area;
- developing (specifying) a model structure that reflects the relationship among the characteristics affecting value in the market area;
- calibrating the model structure to determine the contribution of the individual characteristics affecting value;
- applying the conclusions reflected in the model to the characteristics of the properties being appraised; and
- reviewing the mass appraisal results.

The Jurisdictional Exception Rule may apply to several sections of Standards 5 and 6 because ad valorem tax administration is subject to various state, county, and municipal laws.

As previously stated in the P&A Policy Statement (page 2), it may not be possible or practicable for all the mass appraisal attributes listed above to be rigorously applied to the many types of complex and/or unique properties that P&A typically appraises. Often there are contractual limitations on the scope of work needed or required. More prevalently, these types of properties do not normally provide a reliable database of market transactions (or details of transactions) necessary for statistically supportable calibration of appraisal models and review of appraisal results. Generally these two functions are effectively accomplished through annual extended review meetings with taxpayers (and clients) who provide data, sometimes confidentially, that allows for appraisal models to be adjusted where necessary. Nevertheless, and notwithstanding whether P&A implicitly or explicitly employs or reports all attributes listed above, in all cases P&A at the minimum employs tenants of “generally accepted appraisal methods” which are the genesis of USPAP Standards.

Per USPAP guidelines, P&A will make known all departures and jurisdictional exceptions when invoked (if an appraisal method or specific requirement is applicable but not necessary to attain credible results in a particular assignment).

The various sections of Standard 5 (development of mass appraisal) and Standard 6 (communication of the mass appraisal results) are briefly summarized below:

- **Standard 5-1:** Establishes the appraiser's technical and ethical framework. Specifically, appraisers must recognize and use established principles, methods and techniques of appraisal in a careful manner while not committing substantial errors of fact or negligence that would materially affect the appraisal results and not give a credible estimate of fair market value. To this end appraisers must continuously improve his or her skills to maintain proficiency and keep abreast of any new developments in the real and personal property appraisal profession. This Standards does not imply that competence requires perfection, as perfection is impossible to attain. Instead, it requires appraisers to employ every reasonable effort with regards to due diligence and due care.
- **Standard 5-2:** Defines the introductory framework requirements of developing a mass appraisal, focusing on the identification and/or definition of: client(s), intended users, effective date, appraisal perspective, scope of work, extraordinary assumptions, hypothetical conditions, the type and definition of value being developed (typically "fair market value" for ad valorem tax purposes), characteristics of the property being appraised in relation to the type and definition of value and intended use, the characteristics of the property's market, the property's real or personal attributes, fractional interest applicability, highest and best use analysis along with other land-related considerations, and any other economic considerations relevant to the property.
- **Standard 5-3:** Defines requirements for developing and specifying appropriate mass appraisal data and elements applicable for real and personal property. For real property, the data and elements include: existing land use regulations, reasonably probable modification of such regulations, economic supply and demand, the physical adaptability of the real estate, neighborhood trends, and highest and best use analysis. For personal property, the relevant data and elements include: identification of industry trends, trade level, highest and best use, and recognition of the appropriate market consistent with the type and definition of value.
- **Standard 5-4:** Further defines requirements for developing mass appraisal models, focusing on development of standardized data collection forms, procedures, and training materials that are used uniformly on the universe of properties under consideration. This rule specifies that appraisers employ recognized techniques for specifying and calibrating mass appraisal models. Model specification is the formal development of a model in a statement or mathematical equation, including all due considerations for physical, functional, and external market factors as they may affect the appraisal. These models must accurately represent the relationship between property value and supply and demand factors, as represented by quantitative and qualitative property characteristics. Models must be calibrated using recognized techniques, including, but not limited to, multiple linear regression, nonlinear regression, and adaptive estimation. Models may be specified incorporating the income, market, and/or cost approaches to value and may be tabular, mathematical, linear, nonlinear, or any other structure suitable for representing the observable property characteristics such as adaptive estimation. Model calibration refers to the process of analyzing sets of property and market data to determine the specific parameters of a model.
- **Standard 5-5:** Defines requirements for collection of sufficient factual data, in both qualitative and quantitative terms, necessary to produce credible appraisal results. The property characteristics collected must be contemporaneous with the effective date of the appraisal. The data collection program should incorporate a quality control procedure, including checks and audits of the data to ensure current and consistent records. This rule also calls for calls for an appraiser, in developing income and expense statements and cashflow projections, to weigh historical information and trends, current market factors affecting such trends, and reasonably anticipated events, such as competition from developments either planned or under construction. Terms and conditions of any leases should be analyzed, as well as the need for and extent of any physical inspection of the properties being appraised.

- **Standard 5-6:** Defines requirements for application of a calibrated model to the property being appraised. This rule calls for: the appraiser to recognize methods or techniques based on the cost, market, and income approaches for improved parcels; the appraiser to value sites by recognized methods or techniques such as allocation method, abstraction method, capitalization of ground rent, and land residual; the appraiser to develop value of leased fee or leasehold estates with consideration for terms and conditions of existing leases, and, when applicable by law, as if held in fee simple whereas market rents are substituted for actual contract rents; the appraiser to analyze the effect on value, if any, of the assemblage of the various parcels, divided interests, or component parts of a property; the appraiser to analyze anticipated public or private improvements located on or off the site, and analyze the effect on value, if any, of such anticipated improvements to the extent they are reflected in market actions.
- **Standard 5-7:** Defines the reconciliation process of a mass appraisal. Specifically, appraisers must analyze the results and/or applicability of the various approaches used while ensuring that, on an overall basis, standards of reasonableness and accuracy are maintained with the appraisal model selected (underline added for emphasis). It is implicit in mass appraisal that, even when properly specified and calibrated models are used, some individual value conclusions will not meet standards of reasonableness, consistency, and accuracy. Appraisers have a professional responsibility to ensure that, on an overall basis, models produce value conclusions that meet attainable standards of accuracy.
- **Standard 6-1:** Defines general requirements of a mass appraisal written report by addressing the level of information required that will allow the report to be non-misleading, clearly understood, and sufficiently qualified with any assumptions and conditions (elements of which are further detailed in the next three sections of this report that discuss P&A appraisal procedures with regards to specific categories of property).
- **Standard 6-2:** Defines specific content required to be included in a mass appraisal written report.
- **Standard 6-3:** Defines the certification of the mass appraisal written report.

The following sections of this report discuss in more detail the various elements of the development of P&A's mass appraisals and associated written reports as required by USPAP Standards 5 and 6, with regards to P&A appraisal of Mineral Interests, Industrial, Utility, Related Personal Property, and Real Estate.

USPAP STANDARDS 5, 6-1, 6-2: MASS APPRAISAL OF MINERAL INTERESTS

INTRODUCTION

Definition of Appraisal Responsibility (Scope of Effort): The Mineral Valuation Department of Pritchard & Abbott, Inc. ("P&A" hereinafter), is responsible for developing credible values for mineral interests (full or fractional percentage ownership of oil and gas leasehold interest, the amount and type of which are legally and/or contractually created and specified through deeds and leases, et.al.) associated with producing (or capable of producing) leases. Mineral interests are typically considered real property because of their derivation from the bundle of rights associated with original fee simple ownership of land. Typically all the mineral interests that apply to a single producing lease are consolidated by type (working vs. royalty) with each type then appraised for full value which is then distributed to the various fractional decimal interest owners prorata to their individual type and percentage amount.

P&A's typical client is a governmental entity charged with appraisal responsibility for ad valorem tax purposes, although other types of clients (private businesses, individuals, etc.) occasionally contract for appraisal services which are strictly for various non-ad valorem tax purposes so that no conflicts of interest are created with P&A's core ad valorem tax work.

P&A hereby makes the assumption that, in all appraisal assignments performed for governmental entities in satisfaction of contractual obligations related to ad valorem tax, the client does not wish to or cannot legally request the appraisal report not identify the client.

Intended users of our reports are typically the client(s) for which we are under direct contract. Although taxpayers or their agents who own and/or represent the subject property being appraised often receive these reports either by law or as a courtesy of the client or P&A, this receipt does not mean these parties automatically become Intended Users as defined by USPAP. **A party receiving a copy of a report in order to satisfy disclosure requirements does not become an intended user of the appraisal or mass appraisal unless the appraiser specifically identifies such party as an intended user.** Potential other users include parties involved in adjudication of valuation disputes (review board members, lawyers, judges, etc.), governmental agencies which periodically review our appraisals for various statutory purposes (such as the Texas Comptroller's Office) and private parties who may obtain copies of our appraisals through Open Records Requests made to governmental agencies.

This section of P&A's USPAP report is not applicable to any mineral or mineral interest property that an appraisal district appraises outside of P&A's appraisal services, in which case the appraisal district's overall USPAP report should be referenced.

P&A makes the **Extraordinary Assumption** that all properties appraised for ad valorem tax purposes are marketable whereas ownership and title to property are free of encumbrances and other restrictions that would affect fair market value to an extent not obvious to the general marketplace. If and/or when we are made aware of any encumbrances, etc., these would be taken into account in our appraisal in which case the extraordinary assumption stated above would be revoked.

P&A is typically under contract to determine current market value or "fair market value" of said mineral interests. Fair market value is typically described as the price at which a property would sell for if:

- exposed in the open market with a reasonable time for the seller to find a purchaser;

- both the buyer and seller know of all the uses and purposes to which the property is, or can be, adapted and of the enforceable restrictions on its use; and
- both the buyer and seller seek to maximize their gains and neither is in a position to take advantage of the exigencies of the other. [Exigencies are pressing or urgent conditions that leave one party at a disadvantage to the other.]

For ad valorem tax purposes the effective date is usually legislatively specified by the particular State in which we are working - for example, in Texas the lien date is January 1 per the Texas Property Tax Code. For ad valorem tax purposes, the date of the appraisals and reports are typically several months past the effective date, thereby leaving open the possibility that a retrospective approach is appropriate under limited and prescribed circumstances (information after the effective date being applicable only if it confirms a trend or other appraisal condition that existed and was generally known as of the effective date).

P&A believes this section of this report, in conjunction with any attached or separately provided P&A-generated report(s), meets the USPAP definition of “typical practice”; i.e., it satisfies a level of work that is consistent with:

- the expectations of participants in the market for the same or similar appraisal services; and
- what P&A’s peers’ actions would be in performing the same or similar appraisal services in compliance with USPAP.

Legal and Statutory Requirements: In Texas, the provisions of the Texas Property Tax Code and other relevant legislative measures involving appraisal administration and procedures control the work of P&A as an extension of the Appraisal District. Other states in which P&A is employed will have similar controlling legislation, regulatory agencies, and governmental entities. P&A is responsible for appraising property on the basis of its fair market value as of the stated effective date (January 1 in Texas) for ad valorem tax purposes for each taxing unit that imposes ad valorem taxes on property in the contracted Appraisal District. All mineral properties (interests) are reappraised annually. The definition of Fair Market Value is provided and promulgated for use in ad valorem tax work in Texas by the Texas Property Tax Code, and therefore as a **Jurisdictional Exception** supercedes the definition of “market value” as found in USPAP definitions.

NOTE: IN TEXAS, P&A BELIEVES THE PROPERTY BEING APPRAISED AND PLACED ON THE TAX ROLL IS THE INTEREST AND NOT THE OIL OR GAS MINERAL ITSELF, PER PROPERTY TAX CODE SECTION 1.04(2)(F). WHILE OIL AND GAS RESERVES CERTAINLY HAVE VALUE, THE FACT IS THAT IT IS THE INTERESTS IN THESE MINERALS THAT ARE BOUGHT AND SOLD, NOT THE MINERALS THEMSELVES. THE SALE OF MINERALS AS THEY ARE EXTRACTED FROM THE SUBSURFACE OF THE LAND WHERE THEY RESIDE AS MINERALS IN PLACE “MONETIZES” THE INTEREST AND THUS GIVES THE INTEREST ITS VALUE. WHENEVER P&A REFERS TO “MINERAL PROPERTIES” IN THIS REPORT OR IN ANY OTHER SETTING, IT IS THE MINERAL INTEREST, AND NOT THE MINERAL ITSELF, THAT IS THE SUBJECT OF THE REFERENCE.

Administrative Requirements: P&A endorses the principals of the International Association of Assessing Officers (IAAO) regarding its appraisal practices and procedures. P&A also endorses, and follows when possible, the standards promulgated by the Appraisal Foundation known as the Uniform Standards of Professional Appraisal Practice (USPAP). In all cases where IAAO and/or USPAP requirements cannot be satisfied for reasons of practicality or irrelevancy, P&A subscribes to “generally accepted appraisal methods and techniques” so that its value conclusions are credible and defensible. P&A submits annual or biannual contract bids to the Appraisal District Board of Directors or the Office of the Chief Appraiser and is bound to produce appraisal estimates on mineral properties within the cost constraints of said bid. Any appraisal practices and procedures followed by P&A not explicitly defined or allowed through IAAO or USPAP requirements are specified by the Texas Property Tax Code or at the specific request or direction of the Office of the Chief Appraiser.

Appraisal Resources

Personnel: The Mineral Valuation Division staff consists of competent Petroleum Engineers, Geologists, and Appraisers. All personnel are Registered Professional Appraisers with the State of Texas, or are progressing towards this designation within the allowable time frames prescribed by the Texas Department of Licensing and Regulation (TDLR) and/or other licensing and regulatory agencies as applicable.

Data: For each mineral property a common set of data characteristics (i.e. historical production, price and expense data) is collected from various sources and entered into P&A's mainframe computer system. Historical production data and price data is available through state agencies (Texas Railroad Commission, Texas Comptroller, et al.) or private firms who gather, format and repackage such data for sale commercially. Each property's characteristic data drives the computer-assisted mass appraisal approach to valuation.

Information Systems: The mainframe systems are augmented by the databases that serve the various in-house and 3rd-party applications on desktop personal computers. In addition, communication and dissemination of appraisals and other information is available to the taxpayer and client through electronic means including internet and other phone-line connectivity. The appraiser supervising any given contract fields many of the public's questions or redirects them to the proper department personnel.

VALUATION APPROACH (MODEL SPECIFICATION)

Concepts of Value: The valuation of oil and gas properties is not an exact science, and exact accuracy is not attainable due to many factors. Nevertheless, standards of reasonable performance do exist, and there are usually reliable means of measuring and applying these standards.

Petroleum properties are subject to depletion, and capital investment must be returned before economic exhaustion of the resource (mineral reserves). The examination of petroleum properties involves understanding the geology of the resource (producing and non-producing), type of reservoir energy, the methods of secondary and enhanced recovery (if applicable), and the surface treatment and marketability of the produced petroleum product(s).

Evaluation of mineral properties is a continuous process; the value as of the lien date merely represents a "snapshot" in time. The potential value of mineral interests derived from sale of minerals to be extracted from the ground change with mineral price fluctuation in the open market, changes in extraction technology, costs of extraction, and other variables such as the value of money.

Approaches to Value for Petroleum Property

Cost Approach: The use of cost data in an appraisal for market value is based upon the economic principle of substitution. The cost approach typically derives value by a model that begins with replacement cost new (RCN) and then applies depreciation in all its forms (physical depreciation, functional and economic obsolescence). This method is difficult to apply to oil and gas properties since lease acquisition and development may bear no relation to present worth. Though very useful in the appraisal of many other types of properties, the cost approach is not readily applicable to mineral properties. [Keep in mind that the property actually being appraised is the mineral interest and not the oil and gas reserves themselves. Trying to apply the cost approach to evaluation of mineral interests is like trying to apply the cost approach to land; it is a moot point because both are real properties that are inherently non-replaceable.] **As a general rule, and for the reasons stated above, Pritchard & Abbott, Inc., does not employ the cost approach in the appraisal of mineral interests.**

Market Approach: This approach may be defined as one which uses data available from actual transactions recorded in the market place itself; i.e., sales of comparable properties from which a comparison to the subject property can be made. Ideally, this approach's main advantage involves not only an opinion but an opinion supported by the actual spending of money. Although at first glance this approach seems to more closely incorporate the aspects of fair market value per its classical definition, there are two factors that severely limit the usefulness of the market approach for appraising oil and gas properties. First, oil and gas property sales data is seldom disclosed (in non-disclosure states such as Texas); consequently there is usually a severe lack of market data sufficient for meaningful statistical analysis. Second, all conditions of each sale must be known and carefully investigated to be sure one does have a comparative indicator of value per fair market value perquisites.

Many times when these properties do change hands, it is generally through company mergers and acquisitions where other assets in addition to oil and gas reserves are involved; this further complicates the analysis whereby a total purchase price must be allocated to the individual components - a speculative and somewhat arbitrary task at best. In the case of oil and gas properties, a scarcity of sales requires that every evidence of market data be investigated and analyzed. Factors relative to the sale of oil and gas properties are:

- current production and estimated declines forecast by the buyer;
- estimated probable and potential reserves;
- general lease and legal information which defines privileges or limitation of the equity sold;
- undeveloped potential such as secondary recovery prospects;
- proximity to other production already operated by the purchaser;
- contingencies and other cash equivalents; and
- other factors such as size of property, gravity of oil, etc.

In the event that all these factors are available for analysis, the consensus effort would be tantamount to performing an income approach to value (or trying to duplicate the buyer's income approach to value), thereby making the market approach somewhat moot in its applicability. **As a general rule, and for the reasons stated above, Pritchard & Abbott, Inc., rarely employs a rigorous application of the market approach in the appraisal of mineral interests.**

Income Approach: This approach to value most readily yields itself to the appraisal of mineral interests. Data is readily available whereby a model can be created that reasonable estimates a future income stream to the property. This future income may then be converted (discounted) into an estimate of current value. Many refer to this as a capitalization method, because capitalization is the process of converting an income stream into a capital sum (value). As with any method, the final value is no better than the reliability of the input data. The underlying assumption is that people purchase the property for the future income the property will yield. If the land or improvements are of any residual value after the cessation of oil and gas production, that value should also be included (if those components are also being appraised).

The relevant income that should be used is the expected future net income. Assumptions of this method are:

- Past income and expenses are not a consideration, except insofar as they may be a guide to estimating future net income.
- That the producing life as well as the reserves (quantity of the minerals) are estimated for the property.
- Future income is less valuable than current income, and so future net income must be discounted to make it equivalent to the present income. This discount factor reflects the premium of present money over future money, i.e., interest rate, liquidity, investment management, and risk.

As a general rule, and for the reasons stated above, Pritchard & Abbott, Inc., relies predominantly on the income approach to value in the appraisal of mineral interests.

DATA COLLECTION/VALIDATION

Sources of Data: The main source of P&A's property data is data from the Railroad Commission of Texas as reported by operators. As a monthly activity, the data processing department receives data tapes or electronic files which have updated and new well and production data. Other discovery tools are fieldwork by appraisers, financial data from operators, information from chief appraisers, tax assessors, trade publications and city and local newspapers. Other members of the public often provide P&A information regarding new wells and other useful facts related to property valuation.

Another crucial set of data to obtain is the ownership of these mineral interests. Typically a mineral lease is fractionated and executed with several if not many owners. This information is typically requested (under a promise of confidentiality concerning owners' personal information) from pipeline purchasers and/or other entities (such as operators) who have the responsibility of disbursing the income to the mineral interest owners. Another source of ownership information is through the taxpayers themselves who file deeds of ownership transfer and/or correspond with P&A or the appraisal district directly.

Data Collection Procedures: Electronic and field data collection requires organization, planning and supervision of the appraisal staff. Data collection procedures for mineral properties are generally accomplished globally by the company; i.e., production and price data for the entire state is downloaded at one time into the computer system. Appraisers also individually gather and record specific and particular information to the appraisal file records, which serves as the basis for the valuation of mineral properties. P&A is divided into four district offices covering different geographic areas. Each office has a district manager, appraisal and ownership maintenance staff, and clerical staff as appropriate. While overall standards of performance are established and upheld for the various district offices, quality of data is emphasized as the goal and responsibility of each appraiser.

VALUATION ANALYSIS (MODEL CALIBRATION)

Appropriate revisions and/or enhancements of schedules or discounted cash flow software are annually made and then tested prior to the appraisals being performed. Calibration typically involves performing multiple discounted cash flow tests for leases with varying parameter input to check the correlation and relationship of such indicators as: Dollars of Value Per Barrel of Reserves; Dollars of Value Per Daily Average Barrel Produced; Dollars of Expense Per Daily Average Barrel Produced; Years Payout of Purchase Price (Fair Market Value). In a more classical calibration procedure, the validity of values by P&A's income approach to value is tested against actual market transactions, if and when these transactions and verifiable details of these transactions are disclosed to P&A. Of course these transactions must be analyzed for meeting all requisites of fair market value definition. Any conclusions of this analysis are then compared to industry benchmarks for reasonableness before being incorporated into the calibration procedure.

INDIVIDUAL VALUE REVIEW PROCEDURES

Individual property values are reviewed several times in the appraisal process. P&A's discounted cashflow software dynamically generates various benchmark indicators that the appraiser reviews concurrent with the value being generated. These benchmarks often prompt the appraiser to reevaluate some or all of the parameters of data

entry so as to arrive at a value more indicative of industry standards. Examples of indicators are dollars of value per barrel of oil reserve, years payout, etc. In addition to appraiser review, taxpayers are afforded the opportunity to review the appraised values, either before or after Notices of Appraised Value are prepared. Operators routinely meet with P&A's appraisers to review parameters and to provide data not readily available to P&A through public or commercial sources, such as individual lease operating expense and reserve figures. And of course, all property values are subject to review through normal protest and Appraisal Review Board procedures, with P&A acting as an extension of the Office of the Chief Appraiser.

PERFORMANCE TESTS

An independent test of the appraisal performance of properties appraised by P&A is conducted by the State of Texas Comptroller's Office through the annual Property Value Study for school funding purposes. This study determines the degree of uniformity and the median level of appraisal for mineral properties. School jurisdictions are given an opportunity to appeal any preliminary findings. After the appeal process is resolved, the Comptroller publishes a report of the findings of the study, including in the report the median level of appraisal, the coefficient of dispersion around the median level of appraisal and any other standard statistical measures that the Comptroller considers appropriate.

USPAP STANDARDS 5, 6-1, 6-2: MASS APPRAISAL OF INDUSTRIAL, UTILITY AND RELATED PERSONAL PROPERTY

INTRODUCTION

Definition of Appraisal Responsibility: The Engineering Services Department of Pritchard & Abbott, Inc. (P&A) is responsible for developing fair and uniform market values for industrial, utility and personal properties.

P&A's typical client is a governmental entity charged with appraisal responsibility for ad valorem tax purposes, although other types of clients (private businesses, individuals, etc.) occasionally contract for appraisal services which are strictly for various non-ad valorem tax purposes so that no conflicts of interest are created with P&A's core ad valorem tax work.

P&A hereby makes the assumption that, in all appraisal assignments performed for governmental entities in satisfaction of contractual obligations related to ad valorem tax, the client does not wish to or cannot legally request the appraisal report not identify the client.

Intended users of our reports are typically the client(s) for which we are under direct contract. Although taxpayers or their agents who own and/or represent the subject property being appraised often receive these reports either by law or as a courtesy of the client or P&A, this receipt does not mean these parties automatically become Intended Users as defined by USPAP. **A party receiving a copy of a report in order to satisfy disclosure requirements does not become an intended user of the appraisal or mass appraisal unless the appraiser specifically identifies such party as an intended user.** Potential other users include parties involved in adjudication of valuation disputes (review board members, lawyers, judges, etc.), governmental agencies which periodically review our appraisals for various statutory purposes (such as the Texas Comptroller's Office) and private parties who may obtain copies of our appraisals through Open Records Requests made to governmental agencies.

P&A believes this section of this report, in conjunction with any attached or separately provided P&A-generated report(s), meets the USPAP definition of "typical practice"; i.e., it satisfies a level of work that is consistent with:

- the expectations of participants in the market for the same or similar appraisal services; and
- what P&A's peers' actions would be in performing the same or similar appraisal services in compliance with USPAP.

This section of P&A's USPAP report is not applicable to any Industrial, Utility, or related Personal Property that an appraisal district appraises outside of P&A's appraisal services, in which case the appraisal district's overall USPAP report should be referenced.

P&A makes the **Extraordinary Assumption** that all properties appraised for ad valorem tax purposes are marketable whereas ownership and title to property are free of encumbrances and other restrictions that would affect fair market value to an extent not obvious to the general marketplace. If and/or when we are made aware of any encumbrances, etc., these would be taken into account in our appraisal in which case the extraordinary assumption stated above would be revoked.

Legal and Statutory Requirements: The provisions of the Texas Property Tax Code and relevant legislative measures involving appraisal administration and procedures control the work of P&A as a subcontractor to the

Appraisal District. P&A is responsible for appraising property on the basis of its market value as of January 1 for ad valorem tax purposes for each taxing unit that imposes ad valorem taxes on property in the contracted Appraisal District. All industrial, utility and personal properties are reappraised annually. The definition of Fair Market Value is provided and promulgated for use in ad valorem tax work in Texas by the Texas Property Tax Code, and therefore as a **Jurisdictional Exception** supercedes the definition of "market value" as found in USPAP definitions.

Administrative Requirements: P&A follows generally accepted and/or recognized appraisal practices and when applicable, the standards of the International Association of Assessing Officers (IAAO) regarding its appraisal practices and procedures. P&A, when applicable, also subscribes to the standards promulgated by the Appraisal Foundation known as the Uniform Standards of Professional Appraisal Practice (USPAP). P&A submits annual or biannual contract bids to the Office of the Chief Appraiser and is bound to produce appraisal estimates on industrial, utility and personal properties within the cost constraints of said bid. Any appraisal practices and procedures followed by P&A not explicitly defined through IAAO or USPAP requirements are specified by the Texas Property Tax Code and/or at the specific request or direction of the Office of the Chief Appraiser.

Appraisal Resources

Personnel: The Engineering Services Department and P&A's appraisal staff consists of appraisers with degrees in engineering, business and accounting. All personnel are Registered Professional Appraisers with the State of Texas, or are progressing towards this designation as prescribed by the Texas Department of Licensing and Regulation (TDLR).

Data: A set of data characteristics (i.e. original cost, year of acquisition, quantities, capacities, net operating income, property description, etc.) for each industrial, utility and personal property is collected from various sources. This data is maintained in either hard copy or computer files. Each property's characteristic data drives the appropriate computer-assisted appraisal approach to valuation.

Information Systems: P&A's mainframe computer system is composed of in-house custom software augmented by schedules and databases that reside as various applications on personal computers (PC). P&A offers a variety of systems for providing property owners and public entities with information services.

VALUATION APPROACH (MODEL SPECIFICATION)

Concepts of Value: The valuation of industrial, utility and personal properties is not an exact science, and exact accuracy is not attainable due to many factors. These are considered complex properties and some are considered Special Purpose properties. Nevertheless, standards of reasonable performance do exist, and there are reliable means of measuring and applying these standards.

The evaluation and appraisal of industrial, utility and personal property relies heavily on the discovery of the property followed by the application of recognized appraisal techniques. The property is subject to inflation and depreciation in all forms. The appraisal of industrial and personal property involves understanding petroleum, chemical, steel, electrical power, lumber and paper industry processes along with a myriad of other industrial processes. Economic potential for this property usually follows either the specific industry or the general business economy. The appraisal of utility properties involves understanding telecommunications, electrical transmission and distribution, petroleum pipelines and the railroad industry. Utility properties are subject to regulation and

economic obsolescence. The examination of utility property involves the understanding of the present value of future income in a regulated environment.

The goal for valuation of industrial, utility and personal properties is to appraise all taxable property at "fair market value". The Texas Property Tax Code defines Fair Market value as the price at which a property would transfer for cash or its equivalent under prevailing market conditions if:

- exposed for sale in the open market with a reasonable time for the seller to find a purchaser;
- both the seller and the purchaser know of all the uses and purposes to which the property is adapted and for which it is capable of being used and of the enforceable restrictions on its use; and
- both the seller and purchaser seek to maximize their gains and neither is in a position to take advantage of the exigencies of the other.

Approaches to Value for Industrial, Utility, and Personal Property

Cost Approach: The use of cost data in an appraisal for market value is based upon the economic principle of substitution. This method is most readily applicable to the appraisal of industrial and personal property and some utility property. Under this method, the market value of property equals the value of the land plus the current cost of improvements less accrued depreciation. An inventory of the plant improvements and machinery and equipment is maintained by personally inspecting each facility every year. **As a general rule, and for the reasons stated above, Pritchard & Abbott, Inc., relies predominantly on the cost approach to value in the appraisal of industrial, utility, and personal property.**

Market Approach: This approach is characterized as one that uses sales data available from actual transactions in the market place. There are two factors that severely limit the usefulness of the market approach for appraising industrial, utility and personal properties. First, the property sales data is seldom disclosed; consequently there is insufficient market data for these properties available for meaningful statistical analysis. Second, all conditions of sale must be known and carefully investigated to be sure one does have a comparative indicator of value. Many times when these properties do change hands, it is generally through company mergers and acquisitions where other assets and intangibles in addition to the industrial, utility and personal property are involved. The complexity of these sales presents unique challenges and hindrances to the process of allocation of value to the individual components of the transaction.

In the case of industrial, utility and personal properties, a scarcity of sales requires that all evidence of market data be investigated and analyzed. Factors relative to the sale of these properties are:

- plant capacity and current production; terms of sale, cash or equivalent;
- complexity of property;
- age of property;
- proximity to other industry already operated by the purchaser; and
- other factors such as capital investment in the property.

As a general rule, and for the reasons stated above, Pritchard & Abbott, Inc., rarely employs a rigorous application of the market approach in the appraisal of industrial, utility, and personal property.

Income Approach: This approach to value most readily yields itself to all income generating assets, especially utility properties. Data for utility properties is available from annual reports submitted to regulatory agencies

whereby future income may be estimated, and then this future income may be converted into an estimate of value. The valuation of an entire company by this method is sometimes referred to as a Unit Value. Many refer to this as a capitalization method, because capitalization is the process of converting an income stream into a capital sum (value). As with any method, the final value estimate is no better than the reliability of the input data. The underlying assumption is that people purchase the property for the future income the property will yield.

The relevant income that should be used in the valuation model is the expected future net operating income after depreciation but before interest expense (adjustments for Federal Income Taxes may or may not be required). Assumptions of this method are:

- Past income and expenses are a consideration, insofar as they may be a guide to future income, subject to regulation and competition.
- The economic life of the property can be estimated.
- The future production, revenues and expenses can be accurately forecasted. Future income is less valuable than current income, and so future net income must be discounted to make it equivalent to the present income. This discount factor reflects the premium of present money over future money, i.e., interest rate, liquidity, investment management, and risk.

As a general rule, and for the reasons stated above, Pritchard & Abbott, Inc., employs the income approach in the appraisal of industrial and utility property only when quantifiable levels of income are able to be reliably determined and/or projected for the subject property. P&A does not employ the income approach in the appraisal of personal property.

DATA COLLECTION/VALIDATION

Sources of Data: The main source of P&A's property data for industrial and personal property is through fieldwork by the appraisers and commercially/publicly available schedules developed on current costs. Data for performing utility appraisals is typically provided by the taxpayer or is otherwise available at various regulatory agencies (Texas Railroad Commission, Public Utilities Commission, FERC, et. al.). Other discovery tools are financial data from annual reports, information from chief appraisers, renditions, tax assessors, trade publications and city and local newspapers. Other members of the public often provide P&A information regarding new industry and other useful facts related to property valuation.

Data Collection Procedures: Electronic and field data collection requires organization, planning and supervision of the appraisal staff. Data collection procedures have been established for industrial and personal properties. Appraisers gather and record information in the mainframe system, where customized programs serve as the basis for the valuation of industrial, utility and personal properties. P&A is divided into multiple district offices covering different geographic zones. Each office has a district manager and field staff. While overall standards of performance are established and upheld for the various district offices, quality of data is emphasized as the goal and responsibility of each appraiser. Additionally, P&A's Engineering Services Department provides supervision and guidance to all district offices to assist in maintaining uniform and consistent appraisal practices throughout the company.

VALUATION ANALYSIS (MODEL CALIBRATION)

The validity of the values by P&A's income and cost approaches to value is tested against actual market transactions, if and when these transactions and verifiable details of the transactions are disclosed to P&A. These transactions are checked for meeting all requisites of fair market value definition. Any conclusions from this analysis are also compared to industry benchmarks before being incorporated in the calibration procedure. Appropriate revisions of cost schedules and appraisal software are annually made and then tested for reasonableness prior to the appraisals being performed.

INDIVIDUAL VALUE REVIEW PROCEDURES

Individual property values are reviewed several times in the appraisal process. P&A's industrial, utility, personal property programs and appraisal spreadsheets afford the appraiser the opportunity to review the value being generated. Often the appraiser is prompted to reevaluate some or all of the parameters of data entry so as to arrive at a value more indicative of industry standards. Examples of indicators are original cost, replacement cost, service life, age, net operating income, capitalization rate, etc. In addition to appraiser review, taxpayers are afforded the opportunity to review the appraised values either before or after Notices of Appraised Value are prepared. Taxpayers, agents and representatives routinely meet with P&A's appraisers to review parameters and to provide data not readily available to P&A through public or commercial sources, such as investment costs and capitalization rate studies. And of course, all property values are subject to review through normal protest and Appraisal Review Board procedures, with P&A acting as a representative of the Office of the Chief Appraiser.

PERFORMANCE TESTS

An independent test of the appraisal performance of properties appraised by P&A is conducted by the State of Texas Comptroller's Office through the annual Property Value Study for school funding purposes. This study determines the degree of uniformity and the median level of appraisal for utility properties. School jurisdictions are given an opportunity to appeal any preliminary findings. After the appeal process is resolved, the Comptroller publishes a report of the findings of the study, including in the report the median level of appraisal, the coefficient of dispersion around the median level of appraisal and any other standard statistical measures that the Comptroller considers appropriate.

**BORDEN COUNTY APPRAISAL DISTRICT
2021 ADOPTED BUDGET - COMBINED**

Line Items	2020	2021 Adopted
Professional Services		
Appraisal Review Board	\$1,700.00	\$1,700.00
Audit Services	\$6,000.00	\$6,000.00
Real Property Contract	\$34,650.00	\$35,650.00
Mapping Software Contract	\$6,134.00	\$4,634.00
TNT Website Contract	\$0.00	\$2,400.00
Collection Software License	\$11,750.00	\$12,100.00
CAMA Contract	\$20,900.00	\$21,350.00
MIUP Contract	\$50,500.00	\$51,500.00
Appraisal Notices	\$3,000.00	\$3,000.00
Tax Statements	\$6,000.00	\$6,000.00
Legal Services	\$2,000.00	\$2,000.00
IT Maintenance/Hardware/Support	\$2,500.00	\$7,900.00
Office Temps	\$5,000.00	\$5,000.00
Salaries		
Chief Appraiser	\$55,000.00	\$55,000.00
Deputy Chief Appraiser	\$38,000.00	\$40,000.00
Insurance & Benefits		
Health Insurance	\$27,120.00	\$27,600.00
Retirement	\$7,200.00	\$7,200.00
Unemployment Compensation	\$550.00	\$550.00
Worker's Compensation	\$500.00	\$500.00
FICA & Medicare	\$7,600.00	\$7,600.00
Longevity	\$960.00	\$960.00
December Increment	\$1,000.00	\$1,000.00
Liability Insurance	\$780.00	\$780.00
Bond Premium	\$600.00	\$600.00
Supplies & Services		
Advertising	\$300.00	\$600.00
Office Equipment	\$1,250.00	\$1,250.00
Office Furniture	\$1,250.00	\$1,250.00
Office Supplies	\$6,000.00	\$6,000.00
Postage	\$4,000.00	\$4,000.00
Post Office Box Rent	\$95.00	\$95.00
Office Rent	\$6,000.00	\$6,000.00
QuickBooks/Software Updates	\$1,500.00	\$1,500.00
Telephone/Internet	\$1,950.00	\$2,450.00
Books & Subscriptions	\$500.00	\$500.00
Other Operating Expenses		
Contingency Fund	\$2,000.00	\$2,000.00
Travel	\$3,000.00	\$3,000.00
Lodging/Meals	\$5,000.00	\$5,000.00
Training/Education	\$2,500.00	\$2,500.00
Membership Dues	\$1,500.00	\$1,500.00
	\$326,289.00	\$338,669.00

**BORDEN COUNTY APPRAISAL DISTRICT
2021 ADOPTED BUDGET - APPRAISAL**

Expenditures	2020	2021 Adopted
Professional Services		
Appraisal Review Board	\$1,700.00	\$1,700.00
Audit Services	\$3,000.00	\$3,000.00
Real Property Contract	\$34,650.00	\$35,650.00
Mapping Software Contract	\$6,134.00	\$4,634.00
TNT Website	\$0.00	\$1,200.00
CAMA Contract	\$20,900.00	\$21,350.00
MIUP Contract	\$50,500.00	\$51,500.00
Appraisal Notices	\$3,000.00	\$3,000.00
Legal Services	\$1,000.00	\$1,000.00
Technical Support	\$1,250.00	\$3,950.00
Office Temps	\$5,000.00	\$5,000.00
Salary		
Chief Appraiser	\$55,000.00	\$55,000.00
Insurance & Benefits		
Health Insurance	\$13,560.00	\$13,800.00
Retirement	\$4,250.00	\$4,250.00
Unemployment Compensation	\$275.00	\$275.00
Worker's Compensation	\$250.00	\$250.00
FICA & Medicare	\$5,000.00	\$5,000.00
Longevity	\$480.00	\$480.00
December Increment	\$500.00	\$500.00
Liability Insurance	\$780.00	\$780.00
Bond Premium	\$300.00	\$300.00
Supplies & Services		
Advertising	\$300.00	\$600.00
Office Equipment	\$625.00	\$625.00
Office Furniture	\$625.00	\$625.00
Office Supplies	\$3,000.00	\$3,000.00
Postage	\$2,000.00	\$2,000.00
Post Office Box Rent	\$95.00	\$95.00
Office Rent	\$6,000.00	\$6,000.00
Quickbooks/Software Updates	\$750.00	\$750.00
Telephone/Internet	\$975.00	\$1,225.00
Books & Subscriptions	\$250.00	\$250.00
Other Operating Expenses		
Contengency Fund	\$2,000.00	\$2,000.00
Travel	\$1,500.00	\$1,500.00
Lodging/Meals	\$2,500.00	\$2,500.00
Training/Education	\$1,250.00	\$1,250.00
Membership Dues	\$1,000.00	\$1,000.00
	\$230,399.00	\$236,039.00

**BORDEN COUNTY APPRAISAL DISTRICT
2021 ADOPTED BUDGET - COLLECTION**

Expenditures	2020	2021 Adopted
Professional Services		
Audit Services	\$3,000.00	\$3,000.00
TNT Website	\$0.00	\$1,200.00
Collection Software License	\$11,750.00	\$12,100.00
Tax Statements	\$6,000.00	\$6,000.00
Legal Services	\$1,000.00	\$1,000.00
Technical Support	\$1,250.00	\$3,950.00
Salary		
Deputy Chief Appraiser	\$38,000.00	\$40,000.00
Insurance & Benefits		
Health Insurance	\$13,560.00	\$13,800.00
Retirement	\$2,950.00	\$2,950.00
Unemployment Compensation	\$275.00	\$275.00
Worker's Compensation	\$250.00	\$250.00
FICA & Medicare	\$2,600.00	\$2,600.00
Longevity	\$480.00	\$480.00
December Increment	\$500.00	\$500.00
Bond Premium	\$300.00	\$300.00
Supplies & Services		
Office Equipment	\$625.00	\$625.00
Office Furniture	\$625.00	\$625.00
Office Supplies	\$3,000.00	\$3,000.00
Postage	\$2,000.00	\$2,000.00
Quickbooks/Software Updates	\$750.00	\$750.00
Telephone/Internet	\$975.00	\$1,225.00
Books & Subscriptions	\$250.00	\$250.00
Other Operating Expenses		
Travel	\$1,500.00	\$1,500.00
Lodging/Meals	\$2,500.00	\$2,500.00
Training/Education	\$1,250.00	\$1,250.00
Membership Dues	\$500.00	\$500.00
	\$95,890.00	\$102,630.00

**BORDEN COUNTY APPRAISAL DISTRICT
2021 ADOPTED BUDGET ALLOCATIONS**

Entity	2020	2021 Support	Difference
Borden County	\$80,863	\$90,543	\$9,680
Borden ISD	\$241,639	\$244,593	\$2,954
Sands CISD	\$3,787	\$3,533	-\$254
	\$326,289	\$338,669	\$12,380

Entity	2019 Levy Totals	Support %
Borden County	\$4,292,213	26.73%
Borden ISD	\$11,594,989	72.22%
Sands CISD	\$167,479	1.04%
	16,054,681	100.00%

Proposed Support	Total	Payment	Amount
Borden County	\$90,543	Quarterly	\$22,636
Borden ISD	\$244,593	Monthly	\$20,383
Sands CISD	\$3,533	Annually	\$3,533
	\$338,669		

Borden County's support payment will be due by the last day of each quarter

Borden ISD's support payment will be due by the last Friday of each month

Sands CISD's support payment will be due by January 31st of each year

Penalties and Interest have been waived on late payments per Resolution No. 2020-04 of the Board of Directors Policy and Procedures Manual

Standard on Ratio Studies

Approved April 2013

INTERNATIONAL ASSOCIATION OF ASSESSING OFFICERS

IAAO assessment standards represent a consensus in the assessing profession and have been adopted by the Executive Board of the International Association of Assessing Officers (IAAO). The objective of the IAAO standards is to provide a systematic means for assessing officers to improve and standardize the operation of their offices. IAAO standards are advisory in nature and the use of, or compliance with, such standards is voluntary. If any portion of these standards is found to be in conflict with national, state, or provincial laws, such laws shall govern. Requirements found in the *Uniform Standards of Professional Appraisal Practice (USPAP)* also have precedence over technical standards.

Acknowledgements

At the time of the adoption of the standard by the IAAO Executive Board, the IAAO Technical Standards Committee was composed of Chair Bill Marchand; Alan Dornfest, AAS; Mary Reavey; Michael Prestridge, Dennis Deegear, Doug Warr, AAS; Chris Bennett, Staff Liaison.

The standard benefited from revisions by Robert Gloudemans and the 2011 and 2012 Technical Standard Committees.

The standard benefited from review and comment by Robert Denne, Patrick O'Connor, and Pete Davis.

Published by
International Association of Assessing Officers
314 W 10th St
Kansas City, Missouri 64105-1616

816/701-8100
Fax: 816/701-8149
<http://www.iaao.org>

ISBN 978-0-88329-208-2
Copyright © 2013 by the International Association of Assessing Officers
All rights reserved.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher. However, assessors wishing to use this standard for educating legislators and policymakers may photocopy it for limited distribution.

Printed in the United States of America.

Part 1. Guidance for Local Jurisdictions	7
1. Scope	7
2. Overview	7
2.1 The Concepts of Market Value and Appraisal Accuracy	7
2.2 Aspects of Appraisal Performance	7
2.3 Uses of Ratio Studies	7
2.4 Applicability	8
3. Steps in Ratio Studies	8
3.1 Definition of Purpose, Scope and Objectives	8
3.2 Design (rev. March-2013)	8
3.2.1 Level of Sophistication and Detail.....	8
3.2.2 Sampling.....	8
3.2.2.1 Limitations of Sale Samples.....	8
3.2.2.2 Data Accuracy and Integrity.....	9
3.3 Stratification	9
3.4 Collection and Preparation of Market Data	9
3.5 Matching of Appraisal and Market Data (rev. Jan-2010).....	9
3.6 Statistical Analysis (rev. March-2013)	9
3.7 Evaluation and Use of Results (rev. March-2013)	10
4. Timing and Sample Selection	10
4.1 Data Requirements and Availability	10
4.1.1 Nature of the Population	10
4.1.2 Assessment Information	10
4.1.3 Indicators of Market Value	10
4.1.4 Property Characteristics	10
4.2 Frequency of Ratio Studies	10
4.3 Date of Analysis	10
4.4 Period from Which Sales Are Drawn	10
4.5 Sample Representativeness (rev. March-2013)	11
4.6 Acquisitions and Validation of Sales Data	11
5. Ratio Study Statistics and Analyses (rev. March-2013).....	11
5.1 Data Displays	11
5.2 Outlier Ratios (rev. March-2013)	12
5.3 Measures of Appraisal Level	13
5.3.1 Median	13
5.3.2 Arithmetic Mean	13
5.3.3 Weighted Mean	13
5.3.4 Contrasting Measures of Appraisal Level	13
5.4 Measures of Variability	13
5.4.1 Coefficient of Dispersion	13
5.4.2 Other Measures of Variability	14
5.5 Measures of Reliability	14
5.6 Vertical Inequities (rev. March-2013)	14
5.7 Tests of Hypotheses (rev. March-2012)	15
5.8 The Normal Distribution	15
5.9 Parametric and Distribution-Free (Nonparametric) Statistics	15
6. Sample Size	16
6.1 Importance of Sample Size	16
6.2 Adequacy of a Given Sample Size	16
6.3 Required Sample Size	16
6.4 Remedies for Inadequate Samples	16
6.5 Other Sample Size-Related Representativeness Problems	16
7. Reconciliation of Ratio Study Performance Measures	16
8. Presentation of Findings, Documentation, and Training	16
8.1 Text	16
8.2 Exhibits	16

8.3	Analyses and Conclusions	17
8.4	Documentation	17
8.5	Training and Education	17
9.	Ratio Study Standards	17
9.1	Level of Appraisal (rev. March-2012)	17
9.1.1	Purpose of Level-of-Appraisal Standard.....	18
9.1.2	Confidence Intervals in Conjunction with Performance Standards	18
9.2	Appraisal Uniformity (rev. March-2012).....	18
9.2.1	Uniformity among Strata.....	18
9.2.2	Uniformity among Single-Family Residential Properties.....	19
9.2.3	Uniformity among Income-Producing Properties.....	19
9.2.4	Uniformity among Unimproved Properties	19
9.2.5	Uniformity among Rural Residential and Seasonal Properties, Manufactured Housing, and Multifamily Dwellings.....	19
9.2.6	Uniformity among Other Properties	19
9.2.7	Vertical Equity.....	19
9.2.8	Alternative Uniformity Standards	19
9.3	Natural Disasters and Ratio Study Standards	19
10.	Personal Property Ratio Studies	20
Part 2. Equalization and Performance Monitoring		21
1.	Scope	21
2.	Oversight Ratio Studies	21
2.1	Monitoring of Appraisal Performance	21
2.2	Equalization	21
2.2.1	Direct Equalization	21
2.2.2	Indirect Equalization	22
3.	Steps in Ratio Studies	22
3.1	Definition of Purpose, Scope and Objectives	22
3.2	Design of Study	22
3.2.1	Level of Sophistication and Detail.....	22
3.2.2	Sampling.....	23
3.2.3	Determining the Composition of Samples.....	23
3.2.3.1	Sale Samples	23
3.2.3.2	Independent Appraisal Samples.....	23
3.2.3.3	Samples Combining Sales and Independent Appraisals	23
3.3	Collection and Preparation of Market Data	23
3.4	Stratification	23
3.5	Matching Appraisal Data and Market Data (rev. Jan-2010).....	24
3.5.1	Stratification for Equalization Studies	24
3.5.2	Stratification for Direct Equalization	24
3.5.3	Stratification for Indirect Equalization.....	24
3.6	Statistical Analysis	25
3.7	Evaluation and Use of Results	25
4.	Timing and Sample Selection	25
4.1	Date of Analysis	25
4.2	Representativeness of Samples	25
4.2.1	Maximizing Representativeness with Independent Appraisals	26
4.2.2	Very-High-Value Properties.....	26
5.	Acquisition and Analysis of Sales Data	26
5.1	Sale Adjustments for Statutorily Imposed Value Constraints	26
5.2	Outlier Ratios (rev. March-2013)	27
5.2.1	Value Outliers	27
5.2.2	Outlier Trimming	27
6.	Ratio Study Statistics and Analyses	27
6.1	Measures of Appraisal Level	27
6.2	Overall Ratio for Combined Strata (rev. March-2012).....	27
6.3	Contrasting Measures of Appraisal Level	28

6.4	Measures of Variability	28
6.5	Measures of Reliability	29
6.6	Vertical Inequities (rev. March-2013)	29
6.7	Test of Hypotheses	29
6.8	The Normal Distribution	29
7.	Sample Size	30
7.1	Importance of Sample Size	30
7.2	Adequacy of a Given Sample Size	30
7.3	Required Sample Size	30
7.4	Remedies for Inadequate Samples	30
7.5	History of Sales Reporting	30
8.	Appraisal Ratio Studies	30
8.1	Rationale	30
8.2	Advantages and Disadvantages	30
8.3	Sample Selection and Resource Requirements	31
8.4	Data Requirements and Appraisal Techniques	31
8.5	Appraisal Chasing	32
8.6	Reviewing of Appraisals	32
8.7	Combining of Sales and Appraisals	32
8.8	Average Unit Value Comparisons	32
9.	Estimating Performance for Unsold Properties	32
10.	Presentation of Findings, Documentation, and Training (rev. Jan-2010)	33
11.	Ratio Study Standards (rev. March-2012)	33
11.1	Level of Appraisal	33
11.1.1	Purpose of Level-of-Appraisal Standard.....	33
11.1.2	Recommended Appraisal Level Standards for Direct and Indirect Equalization	34
11.1.3	Confidence Intervals in Conjunction with Performance Standards	34
11.1.4	Decision Model.....	34
11.1.5	Adjustments for High Variability and Small Samples.....	35
11.1.6	Calculating Equalization Adjustments.....	35
11.2	Appraisal Uniformity (rev. March-2013).....	35
11.2.1	Oversight Uniformity Standards.....	35
11.2.2	Multi-level Uniformity Standards.....	35
11.2.3	Uniformity among Strata.....	36
11.2.4	Vertical Equity	36
11.3	Natural Disasters and Ratio Study Standards	36
12.	Personal Property Studies	37
12.1	The Performance Review	37
12.1.1	Discovery	37
12.1.2	Valuation	37
12.1.3	Verification.....	37
12.1.4	Forms and Renditions	37
12.2	Appraisal Ratio Studies for Personal Property	37
12.2.1	Assessment Ratio for Personal Property	37
12.2.2	Stratification	37
12.2.3	Property Escaping Assessment.....	38
12.2.3.1	Identifying Personal Property Owners and Users Not in the Roll....	38
12.2.3.2	Identifying Personal Property Not Included in Taxpayer Returns/ Reports.....	38
12.2.4	Computing the Level of Appraisal.....	38
	Definitions (rev. March-2012)	39
	References (rev. March-2012).....	45
	Additional Resources	45
	Appendix A. Sales Validation Guidelines	47

A.1 Sources of Sales Data	47
A.2 Information Required	47
A.3 Confirmation of Sales	48
A.3.1 Importance of Confirmation	48
A.3.2 Methods of Confirmation	48
A.4 Screening Sales	48
A.4.1 Sales Generally Invalid for Ratio Studies	49
A.4.2 Sales with Special Conditions.....	49
A.4.3 Multiple-Parcel Sales	50
A.4.4 Acquisitions or Divestments by Large Property Owners.....	50
A.4.5 IRS 1031 Exchanges.....	50
A.4.6 Internet Marketing.....	50
A.4.7 Inaccurate Sale Data.....	50
A.5 Adjustments to Sale Prices (rev. Jan-2010)	50
A.5.1 Adjustments for Financing.....	50
A.5.2 Adjustments for Assumed Leases	51
A.5.3 Adjustments for Personal Property.....	51
A.5.4 Adjustments for Time	51
A.5.5 Other Adjustments	52
A.5.6 Special Assessments.....	52
Appendix B. Outlier Trimming Guidelines	53
B.1 Identification of Ratio Outliers (rev. March-2013).....	53
B.2 Scrutiny of Identified Outliers	53
B.3 Outlier Trimming	53
B.4 Trimming Limitations	54
B.5 Analytical Use of Identified Outliers	54
B.6 Reporting Trimmed Outliers and Results	54
Appendix C. Median Confidence Interval Tables for Small Samples	55
Appendix D. Coefficient of Price-Related Bias (revised March-2013)	56
Appendix E. Sales Chasing Detection Techniques	59
E.1 Comparison of Average Value Changes	59
E.2 Comparison of Average Unit Values	59
E.3 Split Sample Technique	59
E.4 Comparison of Observed versus Expected Distribution of Ratios	59
E.5 Mass Appraisal Techniques	60
Appendix F. Alternative Uses for Ratio Study Statistics	61
Appendix G. Legal Aspects of Ratio Studies	61
Appendix H. Sales Validation Questionnaire	62

Standard on Ratio Studies

Part 1. Guidance for Local Jurisdictions

This standard comprises two major parts. Part 1 focuses on the needs of local assessors. Part 2 presents guidelines for oversight agencies that use ratio studies for equalization and appraisal performance monitoring. The Definitions section explains the terms used in this standard. The appendixes present many technical issues in greater detail. More information on many topics addressed in this standard can be found in Property Appraisal and Assessment Administration (IAAO 1990, chapter 20) and in Gloude-mans (1999, chapter 5).

1. Scope

This part of the standard provides recommendations on the design, preparation, interpretation, and use of ratio studies for the real property quality assurance operations of an assessor's office. Quality assurance/control measures include data integrity review, assessment level and uniformity analysis, and computer-assisted mass appraisal (CAMA) system performance testing, among others.

Assessors may have the opportunity to utilize ratio study information at a greater depth than oversight agencies. These internal studies can help improve appraisal methods or identify areas within the jurisdiction that need attention. External ratio studies conducted by oversight agencies (Part 2) focus more upon testing the assessor's past performance in a few broad property categories.

2. Overview

For local jurisdictions, *ratio study* is used as a generic term for sales-based studies designed to evaluate appraisal performance. The term is used in preference to the term *assessment ratio study* because use of assessments can mask the true level of appraisal and confuse the measurement of appraisal uniformity when the legal assessment level is other than 100 percent of fair market value.

2.1 The Concepts of Market Value and Appraisal Accuracy

Market value is the major focus of most mass appraisal assignments. The major responsibility of assessing officers is estimating the market value of properties based on legal requirements or accepted appraisal definitions. The viability of the property tax depends largely on the accuracy of such value estimates. The accuracy of appraisals made for assessment purposes is therefore of concern, not only to assessors but also to taxing authorities, property taxpayers, and elected representatives. Appraisal accuracy refers to the degree to which properties are appraised at

market value, as defined by professional standards (see *Glossary for Property Appraisal and Assessment* [IAAO 1997]) and legal requirements. While a single sale may provide an indication of the market value of the property in question, it cannot form the basis for a ratio study, which provides information about the market values of groups of properties. Dividing the appraised value by the sale price forms the ratios. The ratio can be multiplied by 100 and expressed as a percentage.

Market value is a concept in economic theory and cannot be observed directly. However, market values can be represented in ratio studies by sales prices (market prices) that have been confirmed, screened, and adjusted as necessary (see Appendix A, "Sales Validation Guidelines"). Sales prices provide the most objective estimates of market values and under normal circumstances should provide good indicators of market value.

2.2 Aspects of Appraisal Performance

There are two major aspects of appraisal accuracy: level and uniformity. Appraisal level refers to the overall ratio of appraised values to market values. Level measurements provide information about the degree to which goals or certain legal requirements are met. Uniformity refers to the degree to which properties are appraised at equal percentages of market value.

2.3 Uses of Ratio Studies

Key uses of ratio studies are as follows:

- measurement and evaluation of the level and uniformity of mass appraisal models
- internal quality assurance and identification of appraisal priorities
- determination of whether administrative or statutory standards have been met
- determination of time trends
- adjustment of appraised values between reappraisals

Assessors, appeal boards, taxpayers, and taxing authorities can use ratio studies to evaluate the fairness of funding distributions, the merits of class action claims, or the degree of discrimination (see Appendix G). However, ratio study statistics cannot be used to judge the level of appraisal of an *individual* parcel. Such statistics can be used to adjust assessed values on appealed properties to the common level.

2.4 Applicability

Local jurisdictions should use ratio studies as a primary mass appraisal testing procedure and their most important performance analysis tool. The ratio study can assist such jurisdictions in providing fair and equitable assessment of all property. Ratio studies provide a means for testing and evaluating mass appraisal valuation models to ensure that value estimates meet attainable standards of accuracy; see *Uniform Standards of Professional Appraisal Practice (USPAP) Standard Rule 6-6* (Appraisal Foundation 2010-2011). Ratio study reports are typically included as part of the written documentation used to communicate results of a mass appraisal and to comply with *Standard Rule 6-7(b)*. Ratio studies also play an important role in judging whether constitutional uniformity requirements are met. Compliance with state or provincial performance standards should be verified by the local jurisdiction before value notices are sent to property owners.

3. Steps in Ratio Studies

Ratio studies generally involve the seven basic steps listed below.

1. define the purpose, scope and objectives
2. design
3. stratification
4. collection and preparation of market data
5. matching of appraisal and market data
6. statistical analysis
7. evaluation and use of results

3.1 Definition of the Purpose, Scope, and Objectives

The first step in any ratio study is to determine and state clearly the reasons for the study. This crucial step of identifying the purpose of the study determines the specific goals, scope, content, depth, and required flexibility.

3.2 Design

In the design of the study the assessor must consider the quantity of sale data and the resources available for conducting the ratio study. Although absolute accuracy cannot be ensured, all reasonable, cost-effective steps should be taken to maximize reliability.

The assessor should identify the following factors:

- the groups or classes of properties to be included in the study
- important legal, physical, and economic characteristics of the properties selected for study
- the quantity and quality of data available

- the values being tested and sales period being used
- available resources, such as the number and expertise of staff, computer hardware and software applications, and additional limiting conditions

3.2.1 Level of Sophistication and Detail

A basic design principle is to keep the study as simple as possible while consistent with its purpose. Ratio studies are not all alike and should be tailored to an intended use.

Data analysis has been made easier through computerization. Although every study does not require the same level of statistical detail, each ratio study should include measures of appraisal level, appraisal uniformity, and statistical reliability. Graphs, charts, or other pictorial representations can be useful tools for showing distributions and patterns in the data. There is no model ratio study design that can serve all jurisdictions or all situations equally well. Informed, reasoned judgment and common sense are required in the design of ratio studies.

3.2.2 Sampling

A ratio study is a form of applied statistics, because the analyst draws conclusions about the appraisal of the population (the entire jurisdiction) of properties based only on those that have sold during a given time period. The sales ratios constitute the sample that will be used to draw conclusions or inferences about the population.

To determine the accuracy of appraisals with absolute certainty, it would be necessary for all properties in the population to have been sold in arm's-length, open-market transfers near the appraisal date. Since this is not possible, ratio studies must use samples and draw inferences or conclusions about the population from these samples.

The number of parcels in the population (the jurisdiction or stratum) is not an important determinant of a statistically valid and reliable sample.

3.2.2.1 Limitations of Sale Samples

Users of sales ratio studies should be aware of the following cautions associated with use of sale samples:

- Depending on the circumstances, sales prices can provide either useful or poor indications of market values. Sales must be screened to eliminate those that don't meet the requirements of arm's-length, open-market sales (see *Standard on Verification and Adjustment of Sales* [IAAO 2010]).
- Sales are not "randomly selected" from the population, in the strict technical sense (see section 4.5, Sample Representativeness).
- Value-related characteristics of a sale sample may not represent all the value-related characteristics of the population.

- Adjustments to sale prices may be difficult to support or may be subjective.

3.2.2.2 Data Accuracy and Integrity

The findings of a ratio study can only be as accurate as the data used in the study. Personnel involved in collecting, screening, and adjusting sales data or making appraisals should be familiar with real estate conveyance practices in their region. They also should be proficient in the principles and practices of real estate appraisal and understand local market conditions.

Accuracy and integrity of data entered into or transferred through computer systems must be ensured. Design of computer programs should make it easy to verify data accuracy. Query tools should be accessible to users, so that data can be verified easily. Methods for checking the accuracy of assigned strata (such as school district, city, neighborhood, and category) as well as of assessed or appraised value, sale price, parcel identifier, and other fields must be established to reduce these and other nonsampling errors.

3.3 Stratification

Stratification divides all the properties within the scope of the study into two or more groups or strata. Stratification facilitates a more complete and detailed picture of appraisal performance and can enhance sample representativeness.

Each type of property subject to a distinct level of assessment could constitute a stratum. Other property groups, such as neighborhoods and age and size ranges, could constitute additional strata.

When the purpose of the study is to evaluate appraisal quality, flexibility in stratification is essential. The general goal is to identify areas in which the assessment levels are too low or lack uniformity and property groups for which additional reappraisal work may be required. In such cases, it also is highly desirable to stratify on the basis of more than one characteristic simultaneously.

Stratification can help identify differences in level of appraisal between property groups. In large jurisdictions, stratification by geographic areas is generally more appropriate for residential properties, while stratification of commercial properties by either geographic area or property subtypes (e.g., office, retail, and warehouse/industrial) can be more effective.

3.4 Collection and Preparation of Market Data

The reliability of a ratio study depends in part on how well the sales used in the study reflect market values. The underlying principle for review of sales data is to optimize the sample size, but at the same time to exclude sales that provide invalid indicators of market value. A ratio study

sample with fewer than five sales tends to have exceptionally poor reliability and is not very useful.

3.5 Matching of Appraisal and Market Data

The physical and legal characteristics of each property used in the ratio study must be the same as when sold. This implies two essential steps. First, the appraiser must ascertain whether the property descriptions match. If a parcel is split between the appraisal date and the sale date, a sale of any of its parts should not be used in the ratio study.

Second, the appraiser must ascertain whether the property rights transferred, the permitted use, and the physical characteristics of the property on the date of assessment are the same as those on the date of sale. If the physical characteristics of the property have changed since the last appraisal, adjustments may be necessary before including the property in a ratio study. Properties with significant differences in these factors should be excluded from the ratio study.

When statutory constraints are imposed on appraisal methods, the resulting assessment may be less than market value. In such cases a sales ratio study may not provide useful performance information. Constraints typically apply to land that qualifies for agricultural use value, subsidized housing, mineral land, and timberland.

Sales may include property of a type other than the type for which the ratio study analysis is intended. However, sales including more than minimal values of secondary categories are unlikely to be representative, even with adjustment.

For example, a property that is predominantly commercial may include residential components. This sale can be included as representative of the commercial category. In this case, the numerator in the ratio calculation would be the total appraised value including the value of both the commercial and residential components.

In a second example, for a ratio study of vacant land, the numerator in the ratio should reflect only the appraised value of the land. The sale price should be adjusted for the contributory value of the improvements or the sample should be excluded from further analysis.

3.6 Statistical Analysis

After sales have been screened and matched against assessed values, ratios computed, and outliers identified and removed if appropriate, measures of appraisal level, uniformity, and reliability for the entire jurisdiction and each group or stratum should be computed. The sample also could undergo exploratory data analysis to reveal patterns or features of the data (Hoaglin, Mosteller, and Tukey 1983).

3.7 Evaluation and Use of Results

A properly designed ratio study is a powerful tool for analyzing appraisal performance, evaluating CAMA system models, and suggesting strategies for improvement. A ratio study also can identify weaknesses in appraisal system performance. Unexpected study results may indicate a need to respecify or recalibrate an appraisal model or to reevaluate the data elements used in the valuation process. However, users of ratio studies should recognize the inherent limitations of this tool, as follows:

1. A ratio study cannot provide perfect information about appraisal performance. Lack of sufficient sales, outliers, or overrepresentation of one geographic area or type of property can distort results.
2. Ratio study validity requires that sold and unsold parcels be appraised at the same level and in the same manner. Violation of this condition seriously undermines the validity of the study.
3. Findings should be used only in ways that are consistent with the intended use(s) for which the study was designed.
4. Ratio study data are subject to statistical sampling errors and other processing (nonsampling) errors (see Lessler and Kalsbeek), but these limitations do not invalidate their use for informed decision-making.

4. Timing and Sample Selection

4.1 Data Requirements and Availability

The availability of data influences the design of the study and can call for revisions in the objectives of the study, limit the usefulness of the calculated statistics, or both.

4.1.1 Nature of the Population

The type of properties, market conditions, and composition of the population in terms of age, size, and value range are essential to the proper design of the study and interpretation of the results. Very large properties that rarely sell (e.g., a large power plant) can be ignored in a ratio study designed to evaluate local appraisal performance.

4.1.2 Assessment Information

Appraised values are the numerators in the ratios used in a ratio study. Information about appraisal dates, legal requirements concerning reappraisals, the dates on which the appraisals were originally set, and the period they remained in effect is required for establishing the date of analysis.

4.1.3 Indicators of Market Value

Sale price, as an indicator of market value, is the denominator in the calculation of the ratio. Specific information

about the date, amount, terms, and conditions of a sale is required for proper analysis.

4.1.4 Property Characteristics

Information on property characteristics is crucial for determining whether property that was assessed is essentially the same as what was sold. Data for both sold and unsold properties should be current, relevant, and collected in a consistent manner.

4.2 Frequency of Ratio Studies

The purpose of a ratio study dictates how often it should be conducted. Regardless of the reappraisal cycle, ratio studies made by assessors should be conducted at least annually. This frequency enables potential problems to be recognized and corrected before they become serious.

When there is a revaluation, assessors should conduct at least four ratio studies to establish the following:

1. a baseline of current appraisal performance
2. preliminary values so that any major deficiency can be corrected
3. values used in assessment notices sent to taxpayers
4. final values after completion of the first, informal phase of the appeals process

The final study can be used in planning for the following year. In addition, ratio studies can be conducted as needed to evaluate appraisal procedures, investigate a discrimination complaint, or answer a specific question.

4.3 Date of Analysis

The date of analysis depends on the purpose of the study, but generally is the assessment date of the tax year being studied, which can be the current, the next, or a past year. The assessment date of the next tax year should be used when the purpose of the study is to evaluate preliminary values in a reappraisal.

4.4 Period from Which Sales Are Drawn

This period depends on the purpose of the study and on sales activity. In general, the period should be as short as possible and, ideally, no more than one year. A longer period may be required to produce a representative sample for some strata within a jurisdiction.

To develop an adequate sample size, the sales used in ratio studies can span a period of as long as five years provided there have been no significant economic shifts or changes to property characteristics and sales prices have been adjusted for time as necessary.

4.5 Sample Representativeness

In general, a ratio study is valid to the extent that the sample is sufficiently *representative* of the population.

The distribution of ratios in the population cannot be ascertained directly and appraisal accuracy can vary from property to property. By definition, a ratio study sample would be representative when the distribution of ratios of properties in the sample reflects the distribution of ratios of properties in the population. Representativeness is improved when the sample proportionately reflects major property characteristics present in the population of sold and unsold properties. As long as sold and unsold parcels are appraised in the same manner and the sample is otherwise representative, statistics calculated in a sales ratio study can be used to infer appraisal performance for unsold parcels.

However, if parcels that sell are selectively reappraised based on their sale prices and if such parcels are in the ratio study, uniformity inferences will not be accurate (appraisals appear more uniform than they are). In this situation, measures of appraisal level also will not be supportable unless similar unsold parcels are appraised by a model that produces the same overall percentage of market value (appraisal level) as on the parcels that sold (see Appendix E, "Sales Chasing Detection Techniques"). Assessing officials must incorporate a quality control program; including checks and audits of the data, to ensure that sold and unsold parcels are appraised at the same level.

Operationally, representativeness is improved when the following occur:

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

The first requirement generally is met unless sampled parcels are valued or updated differently from nonsampled parcels, or unless appraisals of sample parcels were done at a different time than appraisals of nonsampled parcels. For example, it is unlikely that the sample is representative of unsold parcels when the sample consists mostly of new construction, first-time sales of improved properties, condominium conversions, or newly platted lots.

The second requirement is met only if value-related property characteristics are updated uniformly for all property in a class as opposed to being updated only upon sale.

The third requirement relates to the extent to which appraisal performance for the sample reflects appraisal performance for the population.

The fourth requirement generally is met when the sales to be used in the sample are properly screened, adjusted if necessary, and validated.

4.6 Acquisition and Validation of Sales Data

Sales data are important in ratio studies and play a crucial role in any credible and efficient mass appraisal system. In some instances, it may be necessary to make adjustments to sales prices so they are more representative of the market. When there is more than one sale of the same property during a study period, only one of the transactions should be used in the ratio study. For guidelines on sales validation see Appendix A.

5. Ratio Study Statistics and Analyses

Once data have been properly collected, reviewed, assembled, and adjusted, outlier handling and statistical analysis can begin. This process involves the following steps.

1. A ratio should be calculated for each observation in the sample by dividing the appraised (or assessed) value by the sale price.
2. Graphs and exhibits can be developed that show the distribution of the ratios.
3. Exploratory data analysis, including outlier identification and screening, and tests of the hypotheses of normality may be conducted.
4. Ratio study statistics of both appraisal level and uniformity should be calculated.
5. Reliability measures should be calculated.

An example of a ratio study statistical analysis report is given in table 1-1.

5.1 Data Displays

Displays or exhibits that provide a profile or picture of ratio study data are useful for illustrating general patterns and trends, particularly to nonstatisticians. The particular form of the displays, as well as the data used (e.g., sales prices, sales ratios, and property characteristics) depends on the purposes of the particular display. Types of displays useful in ratio studies are arrays, frequency distributions, histograms, plots, and maps (Gloude-mans 1999).

Graphic displays can be used to

- indicate whether a sample is sufficiently representative of the properties in a stratum
- indicate the degree of nonnormality in the distribution of ratios
- depict the overall level of appraisal

Table 1-1. Example of Ratio Study Statistical Analysis Data Analyzed

Rank of ratio of observation	Appraised value (\$)	Sale Price (\$)	Ratio (AV/SP)
1	48,000	138,000	0.348
2	28,800	59,250	0.486
3	78,400	157,500	0.498
4	39,840	74,400	0.535
5	68,160	114,900	0.593
6	94,400	159,000	0.594
7	67,200	111,900	0.601
8	56,960	93,000	0.612
9	87,200	138,720	0.629
10	38,240	59,700	0.641
11	96,320	146,400	0.658
12	67,680	99,000	0.684
13	32,960	47,400	0.695
14	50,560	70,500	0.717
15	61,360	78,000	0.787
16	47,360	60,000	0.789
17	58,080	69,000	0.842
18	47,040	55,500	0.848
19	136,000	154,500	0.880
20	103,200	109,500	0.942
21	59,040	60,000	0.984
22	168,000	168,000	1.000
23	128,000	124,500	1.028
24	132,000	127,500	1.035
25	160,000	150,000	1.067
26	160,000	141,000	1.135
27	200,000	171,900	1.163
28	184,000	157,500	1.168
29	160,000	129,600	1.235
30	157,200	126,000	1.248
31	99,200	77,700	1.277
32	200,000	153,000	1.307
33	64,000	48,750	1.313
34	192,000	144,000	1.333
35	190,400	141,000	1.350
36	65,440	48,000	1.363

Note: Due to rounding, totals may not add to match those on following table, which reports results of statistical analysis of above data.

Results of statistical analysis	
Statistic	Result
Number of observations in sample	36
Total appraised value	\$3,627,040
Total sale price	\$3,964,620
Average appraised value	\$100,751
Average sale price	\$110,128
Mean ratio	0.900
Median ratio	0.864
Weighted mean ratio	0.915
Coefficient of dispersion (COD)	29.8%
Price-related differential (PRD)	0.98
Price-related bias (PRB) coefficient (t-value)	.232 (3.01)
95% median two-tailed confidence interval	(0.684, 1.067)
95% weighted mean two-tailed confidence interval	(0.806, 1.024)
Normal distribution of ratios (0.05 level of significance)	Reject— D’Agostino, Pearson K^2 , and Shapiro-Wilk W
Date of analysis	9/99/9999
Category or class being analyzed	Residential

- depict the degree of uniformity
- depict the degree of value bias (regressivity or progressivity)
- compare the level of appraisal or degree of uniformity among strata
- detect outlier ratios
- identify specific opportunities to improve mass appraisal performance
- track performance measures over time

5.2 Outlier Ratios

Outlier ratios are very low or high ratios as compared with other ratios in the sample. The validity of ratio study statistics used to make inferences about population parameters could be compromised by the presence of outliers that distort the statistics computed from the sample. One extreme outlier can have a controlling influence over some statistical measures. However, some statistical measures, such as the median ratio, are resistant to the influence of outliers and trimming would not be required. Although the coefficient of dispersion (COD) is affected by extreme ratios, it is affected to a lesser extent than the coefficient of variation (COV) and the mean. The weighted mean and price-related differential (PRD) are sensitive to sales with high prices even if the ratios on higher priced sales do not appear unusual relative to other sales. Regression analysis, sometimes used in assessment ratio analyses (e.g., when ratios are regressed on sales prices or property characteristics, such as lot size or living area), is also affected by outliers: both ratio outliers and outliers based on the comparison characteristics (an excellent treatment of the assumptions made in regression and deviations from can be found in Cook, R.D. and Weisberg, S. 1982).

Outlier ratios can result from any of the following:

1. an erroneous sale price
2. a nonmarket sale
3. unusual market variability
4. a mismatch between the property sold and the property appraised
5. an error in the appraisal of an individual parcel
6. an error in the appraisal of a subgroup of parcels
7. any of a variety of transcription or data handling errors

In preparing any ratio study, outliers should be

1. identified
2. scrutinized to validate the information and correct errors
3. trimmed if necessary to improve sample representativeness

For guidelines on outlier identification and trimming, see Appendix B, “Outlier Trimming Guidelines.”

5.3 Measures of Appraisal Level

Estimates of appraisal level are based on measures of central tendency. They should be calculated for each stratum and for such aggregations of strata as may be appropriate. Several common measures of appraisal level (central tendency) should be calculated in ratio studies, including the median ratio, mean ratio, and weighted mean ratio. When one of these measures is calculated on the data in a sample, the result is a point estimate, which is accurate for the sample but is only one indicator of the level of appraisal in the population. Confidence intervals around the measures of level provide indicators of the reliability of the sample statistics as predictors of the overall level of appraisal of the population. Note that noncompliance with appraisal level standards cannot be determined without the use of confidence intervals or hypothesis tests.

5.3.1 Median

The median ratio is the middle ratio when the ratios are arrayed in order of magnitude. If there is an even number of ratios, the median is the average of the two middle ratios.

The median always divides the data into two equal parts and is less affected by extreme ratios than the other measures of central tendency. Because of these properties, the median is the generally preferred measure of central tendency for evaluating overall appraisal level, determining reappraisal priorities, or evaluating the need for a reappraisal.

5.3.2 Arithmetic Mean

The arithmetic mean (aka mean or average) ratio is the average of the ratios. It is calculated by summing the ratios and dividing by the number of ratios. In a normal distribution the mean equals the median. In a distribution skewed to the right (typical of ratio study data), the mean is greater than the median. The mean is affected more by extreme ratios than the median.

5.3.3 Weighted Mean

The weighted mean ratio is the value-weighted average of the ratios in which the weights are proportional to the sales prices. The weighted mean also is the ratio of the average assessed value to the average sales price value. The weighted mean gives equal weight to each dollar of value in the sample, whereas the median and mean give equal weight to each parcel. The weighted mean is an important statistic in its own right and also is used in computing the PRD, a measure of uniformity between high- and low-value properties

The weighted mean also can be calculated by (1) summing the appraised values, (2) summing the sales prices, and

(3) dividing the first result by the second. The weighted mean also is called the *aggregate ratio*.

5.3.4 Contrasting Measures of Appraisal Level

Because it gives equal weight to each ratio and is unaffected by extreme ratios, the median is the preferred measure of central tendency for evaluating appraisal performance. Although the mean ratio is also a parcel-based measure, it can be affected appreciably by extreme ratios and can be relied upon only if the sample is of adequate size and contains few outliers.

5.4 Measures of Variability

Measures of dispersion or variability relate to the uniformity of the ratios and should be calculated for each stratum in the study. In general, the smaller the measure, the better the uniformity, but extremely low measures can signal one of the following:

acceptable causes

- extremely homogeneous properties
- very stable markets

unacceptable causes

- lack of quality control
- calculation errors
- poor sample representativeness
- sales chasing

Note that as market activity changes or as the complexity of properties increases, the measures of variability usually increase, even though appraisal procedures may be equally valid.

5.4.1 Coefficient of Dispersion

The most generally useful measure of variability or uniformity is the COD. The COD measures the average percentage deviation of the ratios from the median ratio and is calculated by the following steps:

1. subtract the median from each ratio
2. take the absolute value of the calculated differences
3. sum the absolute differences
4. divide by the number of ratios to obtain *the average absolute deviation*
5. divide by the median
6. multiply by 100

The COD has the desirable feature that its interpretation does *not* depend on the assumption that the ratios are normally distributed. In general, more than half the ratios

fall within one COD of the median. The COD should not be calculated about the mean ratio.

5.4.2 Other Measures of Variability

Other useful measures of variability or the distribution of ratio study data are as follows:

- range
- percentiles
- quartiles
- interquartile range
- median absolute deviation (MAD)
- median percent deviation
- coefficient of concentration
- standard deviation
- coefficient of variation (COV)
- weighted coefficient of dispersion
- weighted coefficient of variation

See *Property Appraisal and Assessment Administration* (IAAO 1990, chapter 20) and Gloudemans (1999, chapter 5) for further discussion on these statistical measures.

Note that the typical percentage error is not the COD, but is expressed by the median percentage deviation statistic. Also, it is the interquartile range, not the COD, that brackets the middle 50 percent of the assessment ratios.

5.5 Measures of Reliability

Reliability, in a statistical sense, concerns the degree of confidence that can be placed in a calculated statistic for a sample. (For example, how precisely does the sample median ratio approximate the population median appraisal ratio?) The primary measure of importance to the local assessor is the confidence interval. A confidence interval consists of two numbers (upper and lower limits) that bracket a calculated measure of central tendency for the sample; there is a specified degree of confidence that the calculated upper and lower limits bracket the true measure of central tendency for the population. See Appendix 20-4 in *Property Appraisal and Assessment Administration* (IAAO 1990) and Appendix C for guidelines on calculating small-sample confidence intervals.

New computer-intensive statistical methods, such as the “bootstrap” (Efron and Tibshirani 1993), now enable the development of confidence interval estimates for any statistic of interest, including measures of level and uniformity.

Measures of reliability explicitly take into account the errors inherent in a sampling process. In general, these measures are tighter (better) when samples are relatively large and the uniformity of ratios is relatively good.

Measures of reliability indicate whether there is a desired degree of confidence that a given level of appraisal has *not* been achieved. This does not mean that an appraiser should tolerate measures of central tendency that fail to meet goals whenever measures of reliability are wide due to small samples, poor uniformity, or both. Such cases require either additional data for proper analysis or alternative action, such as a reappraisal, if poor uniformity is the cause. Such correction might include reappraisal, trending of strata, and respecifying or recalibrating mass appraisal models (see section 9 in this part for a discussion of ratio study standards).

5.6 Vertical Inequities

The measures of variability discussed in section 5.4 relate to “horizontal,” or random, dispersion among the ratios in a stratum, regardless of the value of individual parcels. Another form of inequity can be systematic differences in the appraisal of low- and high-value properties, termed “vertical” inequities. When low-value properties are appraised at greater percentages of market value than high-value properties, assessment *regressivity* is indicated. When low-value properties are appraised at smaller percentages of market value than high-value properties, assessment *progressivity* is the result. Appraisals made for tax purposes of course should be neither regressive nor progressive.

An index statistic for measuring vertical equity is the PRD, which is calculated by dividing the mean ratio by the weighted mean ratio. This statistic should be close to 1.00. Measures considerably above 1.00 tend to indicate assessment regressivity; measures below 1.00 suggest assessment progressivity. When samples are small or the weighted mean is heavily influenced by several extreme sales prices, the PRD may not be a sufficiently reliable measure of vertical inequities. A scatter plot of ratios versus appraised values or sale prices is a useful diagnostic tool. A downward (or upward) trend to the data indicates systematic regressivity (or progressivity). Assuming representativeness, high PRDs generally indicate low appraisals on high-priced properties. If not sufficiently representative, extreme sales prices can be excluded in calculation of the PRD. Similarly, when samples are very large, the PRD may be too insensitive to show small pockets in which there is significant vertical inequity. Standards for evaluating the PRD are given in section 9.2.7 in this part. In addition, more powerful statistical tests for vertical inequities are available and should be employed to determine the significance of the indication provided by the PRD (see section 5.7 in this part and Twark, Everly and Downing [1989]).

The coefficient of price-related bias (PRB) provides a more meaningful and easily interpreted index of price-related bias than the PRD. It is obtained by regressing percentage difference from the median ratio on percentage differences in value (see Appendix D). A PRB of $-.045$

indicates, for example, that assessment ratios fall by 4.5% when values double and increase by 4.5% when values are halved. Like all regression coefficients, the statistical reliability of the PRB can be gauged by noting its *t*-value and related significance level, and by computing confidence intervals. In table 1-4 the PRB is -0.035 and is not statistically significant.

Unacceptable vertical inequities should be addressed through reappraisal or other corrective actions. In some cases, additional stratification can help isolate the problem. Measures of level computed for value strata should not be compared as a way of determining vertical inequity because of a boundary effect that is most pronounced in the highest and lowest strata (Schultz 1996).

5.7 Tests of Hypotheses

An appropriate test should be used whenever the purpose of a ratio study is implicitly or explicitly to test a hypothesis. A hypothesis is essentially a tentative answer to a question, such as, Are residential and commercial properties appraised at equal percentages of market value? A test is a statistical means of deciding whether the answer “yes” to such a question can be rejected at a given level of confidence. In this case, if the test leads to the conclusion that residential and commercial properties are not appraised at equal percentages of market value, some sort of corrective action on the part of assessing officials is clearly indicated.

Tests are available to determine whether the

- level of appraisal of a stratum fails to meet an established standard
- meaningful differences exist in the level of appraisal between two or more strata
- high-value properties are appraised at a different percentage of market value than low-value properties

Appropriate tests are listed in table 1-2 and discussed in Gloudemans (1999), *Property Appraisal and Assessment Administration* (IAAO 1990), and *Improving Real Property Assessment* (IAAO 1978, 137–54).

5.8 The Normal Distribution

Many conventional statistical methods assume the sample data conform to the shape of a bell curve, known as the normal (or Gaussian) distribution. Performance measures based on the mean or standard deviation can be misleading if the study sample does not meet the assumption of normality. As a first step in the analysis, the distribution of sample ratios should be examined to reveal the shape of the data and uncover any unusual features. Although ratio study samples typically do not conform to the normal distribution, graphical techniques and numerical tests can be used to explore the data thoroughly. Traditional choices are the binomial, chi-square, and Lilliefors tests. Newer and more powerful procedures are the Shapiro-Wilk *W*, the D’Agostino-Pearson K^2 , and the Anderson-Darling A^2 tests (D’Agostino and Stephens 1986).

5.9 Parametric and Distribution-Free (Non-parametric) Statistics

For every problem that might be solved by using statistics, there is usually more than one measure or test. These measures and tests can be divided into two broad categories: parametric and distribution-free (nonparametric). Parametric statistics assume the population data conform to a known family of probability distributions (such as the normal distribution). When the mean, weighted mean, and standard deviation are used in this context, they tend to be more meaningful. Distribution-free statistics make less restrictive assumptions and do not require knowledge about the shape of the underlying population distribution. Given similar distribution of ratios in the underlying populations, distribution free tests, such as the Mann-Whitney test, can determine the likelihood that the level of assessment

Table 1-2. Tests of Hypotheses

Null Hypothesis	Nonparametric Test	Parametric Test
1. Ratios are normally distributed.	Shapiro-Wilk <i>W</i> test D’Agostino-Pearson K^2 test Anderson-Darling A^2 test Lilliefors Test	N/A
2. The level of appraisal meets legal requirements.	Binomial test	<i>t</i> -test
3. Two property groups are appraised at equal percentages of market value.	Mann-Whitney test	<i>t</i> -test
4. Three or more property groups are appraised at equal percentages of market value.	Kruskal-Wallis test	Analysis of Variance
5. Low- or high-value properties are appraised at equal percentages of market value.	Spearman Rank test	PRB, correlation or regression analysis
6. Sold and unsold parcels are treated equally.	Mann-Whitney test	<i>t</i> -test

of property groups differ (Hart 2001). Distribution-free statistics are the median and the COD.

6. Sample Size

6.1 Importance of Sample Size

There is a general relationship between statistical reliability and the number of observations in a sample. The larger the sample size, the greater the reliability.

6.2 Adequacy of a Given Sample Size

The adequacy of a given sample size can be evaluated by computing measures of reliability. If the confidence interval is sufficiently narrow, the sample is large enough. If the confidence interval is too wide, the assessor must either accept less precision or enlarge the sample, if possible.

6.3 Required Sample Size

Formulas are available to compute the minimum sample size necessary to produce selected margins of error at a specified level of confidence. Such formulas depend crucially on the estimated variability of the ratios (Cochran 1977).

6.4 Remedies for Inadequate Samples

Small samples should be enlarged if the assessor desires to increase the reliability of statistical measures. Inadequate sample sizes are typically indicated by unacceptably wide confidence intervals. The following alternatives should be considered:

1. **Restratification.** If levels of appraisal are similar or properties are homogenous, broader strata containing larger samples can be created by combining existing strata or by stratifying on a different basis.
2. **Extending the period from which sales are drawn.** This is often the most practical and effective approach. Sales from prior years can be used; however, adjusting the sale price for time may be necessary and significant property characteristics must not change.
3. **Enlarging the sample by validating previously rejected sales.** Sales previously excluded from the analysis, because it was not administratively expedient to confirm them or to make adjustments, can be reevaluated.
4. **Imputing appraisal performance.** Ratio study statistics for strata with no or few sales can sometimes be imputed from the results obtained for other strata. These strata should be as similar as possible. Procedures and techniques used to appraise properties in the strata also should be similar.

6.5 Other Sample Size-Related Representativeness Problems

Sales from areas or substrata in which the number of sales is disproportionately large can distort ratio study results by weighting level and uniformity indicators toward whatever conditions exist in the overrepresented area. To alleviate this problem and create better representativeness, large samples can be further stratified by

- randomly selecting sales to be removed
- isolating the overrepresented groups into substrata
- redefining the time period for the overrepresented groups
- weighting the data

7. Reconciliation of Ratio Study Performance Measures

An important objective of a ratio study conducted by a local jurisdiction is the evaluation of model performance. This is a USPAP requirement in the reconciliation of a mass appraisal. Assessing officials must incorporate a quality control program, including checks and audits of the data, to ensure that sold and unsold parcels are appraised at the same level. This also requires characteristic data for both sold and unsold properties to be current, appropriate, relevant, and collected in a consistent manner.

8. Presentation of Findings, Documentation, and Training

The findings of a ratio study should be sufficiently detailed and documented to meet the needs of the users of the study. Documentation for internal ratio studies can be less detailed than for reports prepared for external uses. The following documentation should be provided in conjunction with any published ratio study.

8.1 Text

A brief text describing the purpose and the methods used should accompany a ratio study. This information can be incorporated in the report of the findings or be contained in a separate memorandum. The text should contain the statistics presented and outline the major procedural steps in completing the study. The text also should describe any rules for eliminating sales or extreme ratios and acknowledge any significant limitations in the data.

8.2 Exhibits

The body of the ratio study report should include for each stratum the statistical results intended to be used for decision-making purposes. All reports should contain the following information:

- date and tax year of the appraisals being evaluated
- number of parcels in each stratum
- number of sales
- number of sales trimmed from the study
- measures of central tendency (appraisal level)
- measures of uniformity (variability) and price-related biases
- confidence interval (measures of reliability) about the measures of central tendency
- summary of adjustments made to sales prices

In addition, there should be a description of the steps taken to ensure that sold and unsold properties were valued and described consistently. If the sold and unsold properties were not treated identically, the documentation should characterize the differences discovered between them.

8.3 Analyses and Conclusions

An objective statement of the results of the ratio study should be prepared. If the study is one in a series, a comparison of the results with those of previous studies can be helpful.

8.4 Documentation

Ratio study procedures should be documented thoroughly. This documentation should take three forms. First, a general guideline should explain the design of the study. This guideline should be updated whenever procedures are changed. Second, all software applications should be documented so that the program logic can be reviewed and modified as needed. Third, a user's manual should explain how to execute the study or run the software.

8.5 Training and Education

The effectiveness of ratio studies can be improved through education and training. Assessment supervisors should conduct seminars or workshops for the appraisal staff to explain how to interpret reports, how ratio studies can be used to improve appraisal performance, and how the results will be used in-house.

9. Ratio Study Standards

Each local jurisdiction should have ratio study performance standards. Local standards should be consistent with state or provincial standards. The standards summarized in table 1-3 are suggested for jurisdictions in which current market value is the legal basis for assessment. In general, when these standards or other local standards are not met, reappraisal or other corrective measures should be taken.

All standards recommended in this section are predicated on the assumption that steps have been taken to maximize representativeness and validity in the underlying ratio study.

9.1 Level of Appraisal

In analyzing appraisal level, ratio studies attempt to measure statistically how close appraisals are to market value (or to a required statutory constraint that can be expressed as a percentage of market value) on an overall basis. While the theoretically desired level of appraisal is 1.00, an appraisal level between 0.90 and 1.10 is considered acceptable for any class of property. However, each class of property must be within 5 percent of the overall level of appraisal of the jurisdiction (see Section 9.2.1 in this part). Both criteria must be met. By themselves, the calculated measures of central tendency provide only an indication, not proof, of whether the level meets the appropriate goal. Confidence intervals and statistical tests should be used

Table 1-3. Ratio Study Uniformity Standards indicating acceptable general quality*

Type of property—General	Type of property—Specific	COD Range**
Single-family residential (including residential condominiums)	Newer or more homogeneous areas	5.0 to 10.0
Single-family residential	Older or more heterogeneous areas	5.0 to 15.0
Other residential	Rural, seasonal, recreational, manufactured housing, 2–4 unit family housing	5.0 to 20.0
Income-producing properties	Larger areas represented by large samples	5.0 to 15.0
Income-producing properties	Smaller areas represented by smaller samples	5.0 to 20.0
Vacant land		5.0 to 25.0
Other real and personal property		Varies with local conditions

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

** Appraisal level for each type of property shown should be between 0.90 and 1.10, unless stricter local standards are required.*

PRD's for each type of property should be between 0.98 and 1.03 to demonstrate vertical equity.

PRD standards are not absolute and may be less meaningful when samples are small or when wide variation in prices exist. In such cases, statistical tests of vertical equity hypotheses should be substituted (see table 1-2).

*** CODs lower than 5.0 may indicate sales chasing or non-representative samples.*

to determine whether it can be reasonably concluded that appraisal level differs from the established goal in a particular instance. Additionally, when uniformity measures show considerable variation between ratios, level measurements may be less meaningful.

9.1.1 Purpose of Level-of-Appraisal Standard

Jurisdictions that follow the IAAO recommendation of annual revaluations (*Standard on Property Tax Policy* [IAAO 2010] and *Standard on Mass Appraisal of Real Property* [IAAO 2013]) and comply with USPAP standard rules should be able to develop mass appraisal models that maintain an overall ratio level of 100 percent (or very near thereto). However, the local assessor may be compelled to follow reappraisal cycles defined by a legal authority or public policy that can extend beyond one year. During extended cycles the influence of inflation or deflation can shift the overall ratio.

The purpose of a performance standard that allows reasonable variation from 100 percent of market value is to recognize uncontrollable sampling error and the limiting conditions that may constrain the degree of accuracy that is possible and cost-effective within an assessment jurisdiction. Further, the effect of performance standards on local assessors must be considered in light of public policy and resources available.

9.1.2 Confidence Intervals in Conjunction with Performance Standards

The purpose of confidence intervals and similar statistical tests is to determine whether it can be reasonably concluded that the appraisal level differs from the estab-

lished performance standard in a particular instance. A conclusion of noncompliance requires a high degree of confidence; thus, a 90 percent (two-tailed) or 95 percent (one-tailed) confidence level should be used, except for small or highly variable samples. The demonstration ratio study report in table 1-4 presents 95% two-tailed confidence interval estimates for the mean, median, and weighted mean ratio.

9.2 Appraisal Uniformity

Assuming the existence of an adequate and sufficiently representative sample, if the uniformity of appraisal is unacceptable, model recalibration and/or reappraisal should be undertaken. It is important to recognize that the COD is a point estimate and, especially for small samples, should not be accepted as proof of assessment uniformity problems. Proof can be provided by recognized statistical tests, including bootstrap confidence intervals.

In unusually homogeneous strata, low CODs can be anticipated. In all other cases, CODs less than 5 percent should be considered suspect and possibly indicative of nonrepresentative samples or selective reappraisal of selling parcels.

9.2.1 Uniformity among Strata

Although the goal is to achieve an overall level of appraisal equal to 100 percent of the legal requirement, ensuring uniformity in appraisal levels among strata also is important. The level of appraisal of each stratum (class, neighborhood, age group, market areas, and the like) should be within 5 percent of the overall level of appraisal of the jurisdiction. For example, if the overall level of appraisal of the jurisdiction is 1.00, but the appraisal

Table 1-4. Demonstration Ratio Study Report

Rank	Parcel #	Appraised value	Sale price*	Ratio	Statistic	Result
1	9	\$87,200	138,720	0.629	Number (n)	17
2	10	38,240	59,700	0.641	Total appraised value	\$1,455,330
3	11	96,320	146,400	0.658	Total sale price	\$1,718,220
4	12	68,610	99,000	0.693	Avg appraised value	\$85,608
5	13	32,960	47,400	0.695	Avg sale price	\$101,072
6	14	50,560	70,500	0.717		
7	15	61,360	78,000	0.787	Mean ratio	0.827
8	16	47,360	60,000	0.789	Median ratio	0.820
9	17	56,580	69,000	0.820	Weighted mean ratio	0.847
10	18	47,040	55,500	0.848		
11	19	136,000	154,500	0.880	Coefficient of dispersion	14.5
12	20	98,000	109,500	0.895	Price-related differential	0.98
13	21	56,000	60,000	0.933	PRB	-0.035
14	22	159,100	168,000	0.947	PRB coefficient (t-value)	0.135 (2.4)
15	23	128,000	124,500	1.028		
16	24	132,000	127,500	1.035	95% conf. int. mean (two-tailed)	0.754 to 0.901
17	25	160,000	150,000	1.067	95% conf. int. median (two-tailed)	0.695 to 0.933
					95% conf. int. wtd. mean (two-tailed)	0.759 to 0.935

Date: 0/0/00. No outlier trimming

* or adjusted sale price

level for residential property is 0.93 and the appraisal level for commercial property is 1.06, the jurisdiction is not in compliance with this requirement. This test should be applied only to strata subject to compliance testing. It can be concluded that this standard has been met if 95 percent (two-tailed) confidence intervals about the chosen measures of central tendency for each of the strata fall within 5 percent of the overall level of appraisal calculated for the jurisdiction. Using the above example, if the upper confidence limit for the level of residential property is 0.97 and the lower confidence limit for commercial property is 1.01, the two strata are within the acceptable range.

9.2.2 Uniformity among Single-Family Residential Properties

The COD for single-family homes and condominiums in older or more heterogeneous areas should be between 5.0 and 15.0. In areas of newer or fairly similar residences, it should be between 5.0 and 10.0.

9.2.3 Uniformity among Income-Producing Properties

The COD should be between 5.0 and 20.0. In larger, urban market areas, it should be between 5.0 and 15.0.

9.2.4 Uniformity among Unimproved Properties

The COD for vacant land should be between 5.0 and 20.0. The upper limit for an acceptable COD for vacant rural residential or seasonal land may be 25.0.

9.2.5 Uniformity among Rural Residential and Seasonal Properties, Manufactured Housing, and Multifamily Dwellings

The COD for heterogeneous rural residential property, recreational or seasonal homes, manufactured housing, and multifamily dwellings (2-4 units) should be between 5.0 and 20.0.

9.2.6 Uniformity among Other Properties

Target CODs for special-purpose real property and personal property should reflect the nature of the properties involved, market conditions, and the availability of reliable market indicators.

9.2.7 Vertical Equity

PRDs should be between 0.98 and 1.03. The reason this range is not centered on 1.00 relates to an inherent upward bias in the arithmetic mean (numerator in the PRD) that does not equally affect the weighted mean (denominator in the PRD). When samples are small, have high disper-

sion, or include properties with extreme values, the PRD may not provide an accurate indication of assessment regressivity or progressivity. When relying on the PRD to measure vertical equity, it is good practice to perform an appropriate statistical test for price-related biases before concluding that they exist (see table 1-2).

The PRB provides a measure of price-related bias that is more meaningful and less sensitive to extreme prices or ratios. As a general matter, the PRB coefficient should fall between -0.05 and 0.05 . PRBs for which 95% confidence intervals fall outside of this range indicate that one can reasonably conclude that assessment levels change by more than 5% when values are halved or doubled. PRBs for which 95% confidence intervals fall outside the range of -0.10 to 0.10 indicate unacceptable vertical inequities.

As an illustration of the above, assume that the PRB is -0.115 with a standard error of 0.02 and corresponding 95% confidence interval of -0.075 to -0.155 (-0.115 ± 0.04 approximately). One can conclude with 95% confidence that assessment levels change by at least 7.5% when values double or are halved but not that assessment levels change by at least 10%. This result would not be out of compliance with the ± 0.10 standard.

9.2.8 Alternative Uniformity Standards

The above standards may not be applicable to properties in unique, depressed, or rapidly changing markets. In such cases, assessment administrators may be able to develop target standards based on an analysis of past performance or results in similar markets elsewhere. Such an analysis can be based on ratio study results for the past five years or more.

9.3 Natural Disasters and Ratio Study Standards

Natural disasters such as earthquakes, floods, and hurricanes can have a substantial impact on the interpretation and use of ratio studies. In particular, they

- increase the difficulty of accurately identifying the physical and economic characteristics of property on the dates of sale and appraisal
- increase the difficulty of producing sufficiently reliable appraised values
- decrease the availability of usable sales and other market data
- disrupt the supply and demand equilibrium in the neighborhood community or region

As a result of these potential problems, a number of unreliable sample properties may need to be excluded and sample sizes may be unavoidably reduced. All these factors should be considered when ratio study standards are being

applied to study results from areas substantially affected by disasters. Such consideration must not result in unwarranted relaxation of applicable standards. When faced with such situations, assessors must use informed, reasoned judgment and common sense to produce a sufficiently reliable ratio study, based upon the best information available.

10. Personal Property Ratio Studies

Studies can be done by local assessors to determine the quality of assessments of personal property in their jurisdictions. For guidelines on conducting personal property ratio studies, see section 12 in Part 2.

Standard on Ratio Studies

Part 2. Equalization and Performance Monitoring

1. Scope

This part of the standard provides guidance and supplementary information to oversight agencies that perform ratio studies. Oversight or equalization ratio studies are designed to examine the overall degree of accuracy of assessments within or among categories of property, market areas, assessment jurisdictions or political subdivisions, such as school districts, municipalities, counties, states or provinces.

2. Oversight Ratio Studies

Oversight agencies are often required to monitor appraisal performance and take corrective actions when necessary. Equalization is a common tool used by oversight agencies to address problems associated with appraisal level. Reappraisal orders can be used to correct uniformity problems.

2.1 Monitoring of Appraisal Performance

Oversight agencies usually perform sales ratio studies, which can include independent appraisals, to monitor local assessment performance. The findings can serve as the basis for enforcement actions, such as reappraisal or equalization orders. State/provincial agencies also often perform ratio studies to advise assessors and the public about local appraisal conditions. Many state or provincial oversight agencies have a dual role. One role is to advise and assist local appraisal offices, and the other role is to measure local appraisal performance. These two roles can create a conflict of interest, which should be minimized.

2.2 Equalization

Oversight agencies can use the results of ratio studies to equalize, directly or indirectly, appraisals or assessments in taxing jurisdictions. Direct equalization is accomplished by an oversight agency which alters locally determined assessments by ordering appraisals within jurisdictions or property classes to be adjusted to market value or to the legally required level of assessment. Direct equalization can also involve adjusting appraisals of centrally assessed properties. When indirect equalization is used, appraisals are not adjusted. Instead, indirect equalization involves an oversight agency estimating total taxable value, given the legally required level of assessment or market value. Indirect equalization allows proper distribution of intergovernmental transfer payments between state or provincial and local governments despite different levels of appraisal among

jurisdictions or property classes. Equalization is not an appraisal or a substitute for reappraisal.

When equalization is based on ratio study samples, sampling error must be taken into account. When confidence intervals include an acceptable range, equalization cannot be supported statistically. When confidence intervals *fail* to bracket official requirements, equalization actions are supported (see section 6.5, “Measures of Reliability,” and section 11.1, “Level of Appraisal”).

Legal aspects of ratio studies, many of which relate to equalization, are discussed in Appendix G.

2.2.1 Direct Equalization

Many states and provinces have authority and specific procedures for direct equalization. The advantage of direct equalization is that it can be applied to specified strata, such as property classes, geographic areas, and political subdivisions that fail to meet appraisal level performance standards (Dornfest [Journal of Property Tax Assessment and Administration, 2004]). Direct equalization also produces results that are generally more visible to the taxpayer and more clearly reduces perceived inequities between classes (*Standard on Property Tax Policy* [IAAO 2010]). For example, direct equalization allows proper and equal application of debt and tax rate limits and equitable partial exemptions.

Direct equalization involves use of adjustment factors, which produce effects mathematically identical to those derived through the application of “trending” or “index” factors, which are commonly used for value updating by local assessing jurisdictions. The most significant differences typically are the level of the jurisdiction originating the adjustments and the stratification of property to which the factors are applied. Local jurisdictions with primary assessment responsibility can develop value adjustment factors as an interim step between complete reappraisals. Such factors commonly are applied to properties by property type, location, size, age and other characteristics (see *Property Appraisal and Assessment Administration* [IAAO 1990, p. 310]). It is rare for equalization factors developed by oversight agencies to be applied to strata more specific than property class or broad geographic area. Often such factors are applied jurisdiction-wide.

States and provinces that employ direct equalization techniques should understand that such equalization is not a substitute for appraisal or reappraisal. Direct equalization

applied at the stratum level improves equality in effective tax rates between strata and lessens the effect of assessment practices that improperly favor one stratum over another. For example, assuming that all classes of property are to be assessed at 100% of market value, without such equalization, in a case where residential property is assessed at a median of 80% of market value, while commercial property is assessed at a median of 90% of market value, residential property will pay 80% of its proper tax share and commercial property will pay 90% of its proper tax share. Other classes that may be assessed at 100% will pay more than their proper tax shares. Direct equalization mitigates this problem. However, such equalization cannot improve uniformity between properties within a given stratum. So, in the previous example, the median level of assessment for residential property can be adjusted from 80% to 100% of market value, assessment disparities between individual residential properties will not be addressed. For this reason, reappraisal orders should be considered as the primary corrective tool for uniformity problems, and direct equalization should be considered appropriate only if time or other constraints preclude such an approach.

2.2.2 Indirect Equalization

The most common use of indirect equalization is to enable proper funding distribution, particularly for school districts. Such equalization provides an estimation of the proper tax base (acknowledging statutory constraints such as agricultural use value) despite appraisals that are higher or lower than legally required levels in certain jurisdictions. For example, if the assessed value of residential property in a jurisdiction is \$750 million, but a residential ratio study shows an assessment level of 75 percent, while the legally required level of assessment is 100 percent, an equalized value of \$1,000 million could be computed ($\$750 \text{ million} / 0.75$). This adjusted or equalized value would then be used to apportion payments or requisitions between the state or province and associated local governments.

Indirect equalization results in fairer funding apportionment because the overall appraisal levels of the taxing jurisdictions tend to vary. If there were no equalization, the extent that a jurisdiction under- or overestimated its total tax base would result in over- or under-apportionment of funds. Indirect equalization does not correct under- or overvaluation between classes of property within a jurisdiction. It adjusts only a portion of the tax or sometimes only intergovernmental payments, is less visible to taxpayers, and often lacks checks and balances associated with direct equalization (see *Standard on Property Tax Policy* [IAAO 2010]). By adjusting governmental payments, tax rates, or partial exemptions, indirect equalization encourages taxing jurisdictions to keep their overall tax bases close to the required level.

Whether used to equalize shared funding or tax rates, the degree of equalization of the property tax is more limited than with direct equalization. Indirect equalization generally is applied to or affects only a portion of the funding or property tax levy (perhaps the school general levy or city levy). Indirect equalization usually is applied to the jurisdiction, rather than to a stratum, and therefore resolves interjurisdictional discrepancies in assessment level. In addition, properties in strata with poor uniformity are affected disproportionately. For this reason, indirect equalization also is not a substitute for reappraisal.

3. Steps in Ratio Studies

Ratio studies conducted by oversight agencies generally follow the basic steps described for the assessor's office in Part 1, except that it is more important to adopt uniform procedures and be consistent in their application.

3.1 Definition of the Purpose, Scope, and Objectives

The first step in any ratio study is to determine and state clearly the reasons for the study. This crucial step of identifying the purpose of the study determines the specific goals, scope, content, depth, and required flexibility.

3.2 Design of Study

The most important design consideration is that the study sample be sufficiently representative of the population of properties or the distribution of values in the jurisdiction under review. For direct equalization the level of appraisal for property classes or strata subject to such equalization is the primary area of interest and the sample must be designed accordingly. Indirect equalization seeks to estimate the overall dollar value of the population, so the sample must be representative of that overall value and must reflect the disproportionate influences of high value properties. Performance monitoring is concerned with both level and uniformity, but typically involves sample design similar to that required in direct equalization.

3.2.1 Level of Sophistication and Detail

A basic design principle is to keep the study as simple as possible consistent with its purpose. Ratio studies are not all alike and should be tailored to an intended use.

Data analysis has been made easier through computerization. Although every study does not require the same level of statistical detail, each ratio study should include measures of appraisal level, appraisal uniformity, and statistical reliability. Graphs, charts, or other pictorial representations can be useful tools for showing distributions and patterns in the data. There is no model ratio study design that can serve all jurisdictions or all situations equally well. Informed, reasoned judgment and common sense are required in the design of ratio studies.

3.2.2 Sampling

A ratio study is a form of applied statistics, because the analyst draws conclusions about the appraisal of the universe (the entire jurisdiction) of properties based only on those that have sold during a given time period or appraisals selected for a random sample. The ratios constitute the sample that will be used to draw conclusions or inferences about the population.

To determine the accuracy of appraisals within a jurisdiction with absolute certainty, it would be necessary for all properties in the population to have been sold in arm's-length, open-market transfers near the appraisal date or all properties would need to be appraised independently by the oversight agency. Since this is not possible, ratio studies must use samples and draw inferences or conclusions about the population from these samples.

The number of parcels in the population (the jurisdiction or stratum) is not an important determinant of a statistically valid and reliable sample.

3.2.3 Determining the Composition of Samples

In the design stage, the oversight agency must decide whether the ratio study sample should comprise sales (or asking prices when appropriate), independent appraisals, or a combination of the two. Each sample type has its advantages and disadvantages, as described below.

3.2.3.1 Sale Samples

The advantages of using sale samples include the following:

- Properly validated sales provide more objective indicators of market value than independent appraisals.
- Using sales is much less expensive than producing independent appraisals.

The disadvantages include the following:

- Difficulty in collecting sales data in jurisdictions without disclosure documents
- The oversight authority may not have control over the sales data collection and validation process
- Influence of sales chasing can be difficult to detect or prevent
- Samples of sales may not adequately represent the population of properties
- An adequate sample size may not be achieved if sales data are scarce
- Time adjustments are more critical when supplemental sales are included

3.2.3.2 Independent Appraisal Samples

Independent appraisals also can be used instead of or in addition to sales for ratio study samples. (See section 8, "Appraisal Ratio Studies," in this part.)

3.2.3.3 Samples Combining Sales and Independent Appraisals

The oversight agency can design and conduct ratio studies using samples comprised of sales and independent appraisals. In this approach, the combined advantages of sale samples and appraisal samples are realized. However, the disadvantage of combining sales and independent appraisals is the possible existence of some of the disadvantages of sale samples and/or appraisal samples (see Section 8.7).

3.3 Collection and Preparation of Market Data

The reliability of a ratio study depends in part on how accurately the sales or independent appraisals used in the study reflect market values. For sales-based studies, oversight agencies should conduct an independent sales verification and screening program if resources permit. Alternatively, oversight agencies should develop audit criteria to review data submitted to qualify sales, corroborate representativeness and confirm adequate sample size. Audit decisions should accommodate needs of the agency and resources available. Independent appraisals used in ratio studies must comply with the appropriate sections of the *Uniform Standards of Professional Appraisal Practice* (USPAP; Appraisal Foundation 2010–2011), and reflect market values as of the date being studied. Most oversight agencies use property data collected by the local jurisdiction to develop their independent appraisals. In order to produce credible appraisals, the oversight agency must be certain that the local jurisdiction accurately recorded the appropriate value-related property characteristics for each property it is independently appraising. Steps must be taken to ensure that errors in the database made by the local jurisdiction do not materially or significantly affect the conclusions or opinions of value developed by the oversight agency.

3.4 Stratification

Stratification divides all the properties within the scope of the study into two or more groups or strata. Stratification facilitates a more complete and detailed picture of appraisal performance and can enhance sample representativeness

Each type of property subject to a distinct level of assessment could constitute a stratum. Other property groups, such as market areas, school districts and tax units, could constitute additional strata.

Strata should be chosen to be consistent with factors in the mass appraisal model. When the purpose of the study is to evaluate appraisal quality, flexibility in stratification

is essential. The general goal is to identify areas in which the assessment levels are too low or lack uniformity and property groups for which additional reappraisal work may be required. In such cases, it also is highly desirable to stratify on the basis of more than one characteristic simultaneously.

Stratification can help identify differences in level of appraisal between property groups. In large jurisdictions, stratification by market areas is generally more appropriate for residential properties, while stratification of commercial properties by either geographic area or property subtypes (e.g., office, retail, and warehouse/industrial) can be more effective.

3.5 Matching Appraisal Data and Market Data

The physical and legal characteristics of each property used in the ratio study must be the same when appraised for tax purposes and when sold. This implies two essential steps. First, the property description for the sold parcel must match the appraised parcel. If a parcel is split between the appraisal date and the sale date, a sale of any of its parts should not be used in the ratio study.

Second, the property rights transferred, permitted use, and physical characteristics of the property on the date of assessment must be the same as those on the date of sale. Properties with significant differences in these factors should be excluded from the ratio study.

When statutory constraints are imposed on appraisal methods, the resulting assessment may be less than market value. In such cases a sales ratio study may not provide useful performance information. Constraints typically apply to land that qualifies for agricultural-use value, subsidized housing, mineral land, and timberland.

Sales may include property of a type other than the type for which the ratio study analyses is intended. However, sales including more than minimal values of secondary categories are unlikely to be representative, even with adjustment.

For example, a property that is predominantly commercial may include residential components. This sale can be included as representative of the commercial category. In this case, the numerator in the ratio calculation would be the total appraised value including the value of both the commercial and residential components.

In a second example, for a ratio study of vacant land, the numerator in the ratio should reflect only the appraised value of the land. The sale price should be adjusted for the contributory value of the improvements or the sample should be excluded from further analysis.

3.5.1 Stratification for Equalization Studies

Oversight agencies generally should define the strata prior to acquiring and compiling data for the ratio study.

Predefined stratification is more transparent and enhances cooperation between the oversight agency and the jurisdiction appraising the property subject to equalization. In general, oversight agencies should not redefine the strata once they have been defined for equalization purposes, especially in the case of direct equalization. It is appropriate, however, to collapse strata to compensate for otherwise inadequate samples sizes. In addition, a reappraisal or equalization order can be targeted for specific problem areas that cause noncompliance at a broader level of aggregation. If value stratification is necessary, predefined strata may not be practical.

3.5.2 Stratification for Direct Equalization

Strata should be chosen consistent with operational requirements for the required level of equalization. Statistical issues in the determination of strata include the size of the population and resulting strata and the likely variability of the ratios in each stratum. Care must be taken not to over-stratify, that is, to create strata that are too small to achieve statistical reliability (see section 6, Sample Size” in part 1 and Sherrill and Whorton [1991]). No conclusion about stratum level or uniformity should be made from stratum samples that are unreliably small (resulting in unacceptably large margins of error). Ultimately, the degree of stratification is determined largely by available sales data, unless it is cost-effective and practical to add sufficient independent appraisals. If sufficient sales or appraisals are not available for a given stratum, it should be combined with similar strata. When strata are combined, provided there is no reason to suspect dissimilar ratios as evidenced by different level or uniformity measures, such combinations permit broader applicability of ratio study results and prevent ratio study analysis from becoming too focused on substrata with few sales or appraisals. When jurisdiction or category wide equalization actions are required, reliability of component strata is not an issue.

3.5.3 Stratification for Indirect Equalization

Indirect equalization develops an estimate of full market value, but assessed values of individual properties are not altered. Such studies can use a substantially different approach to stratification than ratio studies intended for performance evaluation or direct equalization. The purpose of stratification in this case is to minimize distortions due to different assessment levels, which can vary by property type, value range, geographic area, and other factors. If stratification creates a more representative sample, equalization decisions may be based on results from individual stratum. . If the overall sample is representative of the population then equalization decisions should be based on overall sample results. A reasonable number of strata with small samples and larger margins of error can increase overall representativeness and may reduce the margin of error for the overall jurisdiction-wide sample.

The primary level of stratification should ordinarily be by major property type (e.g., residential, commercial, and vacant land). If circumstances permit, a secondary level of stratification also is recommended. When relying on the weighted mean, the secondary level of stratification (substrata) should normally be value range. Higher-value properties can sell with a different frequency than low-value properties, and appraisal levels can vary between high and low-value properties. As a result, high-value properties can be oversampled (or undersampled) and, because of their high value, can exert a disproportionate influence on the weighted mean and resulting estimated value. Value stratification reduces distortion of the weighted mean caused by over or under-representation of value strata with different levels of appraisal. To properly develop and use value strata, the oversight agency needs each individual assessment in the study universe. If detailed value information is not available, the oversight agency should work with local taxing jurisdictions to obtain sufficient information. At a minimum, a questionnaire can be used to request the total value and number of parcels in predetermined value categories or quantiles (each range contains the same amount of value).

In situations in which value stratification information is not available, or where property ratios are not significantly value-influenced, substrata can be created based on property subtype, geographic area, or other appropriate criteria. Stratification by these criteria corrects for differences in level of appraisal between substrata. In large jurisdictions, substratification by geographic areas generally is more appropriate for residential properties while sub-stratification by either geographic area or property subtypes (e.g., office, retail, and warehouse/industrial) can be appropriate for income-producing properties.

When relying on the median and when sample sizes permit, it is appropriate to stratify within property class by whichever property characteristic is most likely to capture differences in appraisal levels. This characteristic can be geographic area, property subtype, or value range. Substratification by value range helps capture value-related differences in assessment levels, which (unlike the weighted mean) are not reflected in the median.

3.6 Statistical Analysis

When ratio studies are conducted for equalization purposes, confidence intervals and statistical tests can be used to determine whether it should be concluded at a given confidence level that appraisal performance or level requirements in a stratum (or jurisdiction) being tested meets or falls outside of mandated standards. Statistical tests can be used for comparisons among strata, provided the sample sizes are large enough that meaningful differences are not missed (see section 6, “Ratio Study Statistics and Analyses”).

3.7 Evaluation and Use of Results

Lack of independence between locally determined values and sale prices (sales chasing) or independent appraisals can subvert attempts to improve equity (direct equalization) and result in incorrect distribution of funds between states or provinces and local jurisdictions (indirect equalization). To guard against these possibilities, oversight agencies should ensure that sold and unsold properties are appraised similarly. Also, appraisals used as substitutes for sales must reflect market value, and the oversight agency must take remedial measures in instances in which they do not (see section 9, “Estimating Performance of Unsold Properties”, and Appendix E, “Sales Chasing Detection Techniques”).

4. Timing and Sample Selection

Ratio studies made by oversight and equalization agencies should be conducted at least annually. Where possible, ratio studies conducted by equalization agencies should use final values established at the local level, inclusive of changes made by local appeal boards up to that time. However, if local appraisers or boards “chase sales” or set values in a manner that is dissimilar to the way other property values have been set, the sample may not be sufficiently representative and should not be used without careful investigation and necessary adjustment.

4.1 Date of Analysis

The date of analysis is a past year when appraisals from past years are being evaluated to avoid the effects of sales chasing. When prior-year assessments are used to gauge current performance (to avoid sales chasing), the results should be adjusted for any reappraisal activity or assessment changes that occurred in the population (net of new construction) between the prior and current years. Sale prices also should be adjusted to the assessment date to account for time trending.

If the purpose of the study is equalization, using sales after the appraisal date (adjusted for time as necessary) helps ensure the independence of appraisals and sales prices. A sales period spanning the appraisal date can be used if measures are taken to ensure the independence of appraisals made after the earlier sales. This approach has the advantage of reducing the importance of time adjustments.

4.2 Representativeness of Samples

The design and conduct of ratio studies requires decisions that maximize representativeness within the constraints of available resources.

In many kinds of statistical studies, samples are selected randomly from the population and from within each stratum to maximize representativeness. Ratio study samples based on independent appraisals can be randomly selected. Because sales are convenience samples and do not repre-

sent true random samples, care must be taken to maximize the representativeness of sales samples.

A ratio study sample is considered sufficiently representative for direct equalization and mass appraisal performance evaluation when the distribution of ratios of properties in the sample reflects the distribution of ratios of properties in the population. A ratio study is considered sufficiently representative for indirect equalization when the distribution of ratios of dollars of property value in the samples reflects the distribution of ratios of dollars of property value in the population.

Sales from areas or substrata in which the number of sales is disproportionately large can distort ratio study results by weighting level and uniformity indicators toward whatever conditions exist in the overrepresented area. To alleviate this problem and create better representativeness, large samples can be further stratified by

- randomly selecting sales to be removed
- isolating the overrepresented groups into substrata
- redefining the time period for the overrepresented groups
- weighting the data

4.2.1 Maximizing Representativeness with Independent Appraisals

For independent appraisal-based ratio studies, the application of random sampling techniques can help ensure that appraisal procedures used for the sampled properties are similar to the corresponding population. A well-designed random sampling plan also can help ensure that properties selected for independent appraisals are not concentrated in areas of high sales activity or associated with property types with higher turnover rates in the market.

The USPAP competency rule requires appraisers to have both knowledge and experience required to perform specific appraisals. Independent single-property appraisals must be developed in compliance with Standard 1, must be reported in compliance with Standard 2, and must be reviewed in compliance with Standard 3 of USPAP. Most importantly, care must be taken to ensure that independent appraisals reflect market value as of the appraisal date. Independent mass appraisals must be developed and reported in compliance with Standard 6 of *USPAP*.

4.2.2 Very High-Value Properties

Assessment jurisdictions often contain unique, very-high-value properties (for example, properties that constitute more than 10 percent of the value of a property class) that cannot reasonably be combined with other properties for purposes of the ratio study. For indirect equalization, high-value parcels are especially important to maximize representativeness. For instance, consider a population

consisting of 1,000 properties, 999 of which range in value from \$20,000 to \$750,000, and one that is valued at \$1 billion (e.g., a power plant). If the intended use of the ratio study is to estimate the general level and uniformity of appraisal in regard to the typical property, the stratified population of parcels need not include the \$1 billion property. If the intended use of the ratio study is to estimate the total market value in the jurisdiction, however, exclusion of the power plant can distort the study.

Very high-value properties should not be ignored or assumed to be appraised at the legal or general level for indirect equalization studies. An equalization agency should place very high-value property in a separate stratum to prevent distortion of the overall weighted mean or total estimated value. To value the property for ratio study purposes the equalization agency should use a recent properly adjusted sales price if available. If a recent sale is not available the agency should conduct an appraisal of such properties (this is the preferred option) or audit and adjust as necessary the values developed by the local jurisdiction.

5. Acquisition and Analysis of Sales Data

The highest level of independence and objectivity in an equalization or performance monitoring ratio study requires independent sales validation. If resources are not available to achieve this level of sophistication, then a comprehensive audit program should be developed to review the validation and screening work of the local jurisdiction (see Appendix A, "Sales validation Guidelines").

5.1 Sale Adjustments for Statutorily Imposed Value Constraints

Most states and provinces require appraisal of certain classes of property using statutorily prescribed methods of appraisal that are intended to produce a constrained value that is less than market value. The most common class of property to which such constraints apply is farmland and rangeland that qualifies for agricultural-use valuation. However, constraints may also apply to subsidized housing, mineral land, and other classes. When the purpose of the ratio study is direct or indirect equalization, sales prices must be adjusted as if the selling parcel were subject to the same constraints. If this cannot be done, independent appraisals, which employ the required constraints, should be used to determine the level of appraisal in a manner consistent with the statutory constraints. For example, assume that statutory restrictions require a fixed or artificially high capitalization rate to be used in determining farmland value. If unadjusted farmland sales were to be used, the resulting ratios would be low and could lead to improper equalization decisions. Instead, independent appraisals using the required capitalization rate should be done. These appraisals would lead to ratios that would correctly allow for the statutory constraint.

Use of constrained values produces ratio study results that do not provide information on the true level of appraisal in relation to market value. Use of constrained values is appropriate for equalization. However, when the purpose of the ratio study is to determine the overall quality of assessments or the amount of benefit being awarded by a given statutory constraint on appraised value, the unadjusted sale price or independent market value appraisal must be used. Often, procedural audits can be used as adjuncts to more traditional ratio studies. These audits can be particularly effective when the purpose is to judge overall appraisal quality and when precise, quantitative statistical measures are not obtainable.

5.2 Outlier Ratios

Oversight agencies should consider the extent of sales verification when developing guidelines for trimming limits. In practice, this means that if an oversight agency derives sales data from assessing jurisdictions that may have already removed outliers from the sample, additional trimming may not be necessary (see Appendix B, “Outlier Trimming Guidelines”).

5.2.1 Value Outliers

When the weighted mean is used for indirect equalization, a method that identifies high-value *influential* sales is recommended. Since an influential sale may not have an unusually low or high ratio relative to the rest of the sample, the definition of distortion is based on the principle that the point estimate calculated from the sample should not be statistically significantly different whether the suspect observation is in the sample or not.

To test for an influential sale, one approach is to remove it from the sample and compute the weighted mean and associated confidence interval. If the weighted mean of the sample lies outside the confidence interval calculated without the influential sale, then the sale is truly influential and is a candidate for further scrutiny, isolation in a separate stratum, or possible trimming.

This procedure is intended to test the presence of individual influential sales and is not intended to be used successively after deletion of a sale, but can be applied to more than one apparent outlier at a time by leaving all other sales in the comparison group. Note, however, that the presence of multiple influential sales can indicate the start of a trend. Presence of influential sales is often associated with high price-related differential (PRD) values, which could be the result of systematic regressivity or progressivity. In contrast, the coefficient of price-related bias (PRB) is much less influenced by value outliers and should not be relied on to help identify these outliers.

5.2.2 Outlier Trimming

Statistics calculated from trimmed distributions, obviously, cannot be compared to those from untrimmed distributions or interpreted in the same way. This is especially problematic when making interjurisdictional comparisons. For this reason, oversight agencies may wish to promulgate uniform trimming procedures, based on sound statistical principles. Regardless of the chosen procedure, trimming of outliers must not occur more than once for any sample.

6. Ratio Study Statistics and Analyses

Ratio study measures covered in Part 1 are equally applicable to equalization ratio studies based upon sales or independent appraisals. See section 5.3, “Measures of Appraisal Level,” and section 5.4, “Measures of Variability,” in Part 1.

6.1 Measures of Appraisal Level

The median is the generally preferred measure of central tendency for direct equalization, monitoring of appraisal performance, or evaluation of the need for a reappraisal. The mean should not be used for indirect equalization if there are measurable differences in appraisal level of high- and low-value properties (see table 2-2). In data commonly containing outliers, the trimmed mean can be substituted for the mean (Gloude-mans 1999, chapter 3). See Appendix B for outlier-trimming procedures. Because of its dollar-weighting feature, the weighted mean is most appropriately used in indirect equalization, when estimating the total dollar value of the jurisdiction. When relying on the measure, however, outliers should be carefully reviewed (and deleted if appropriate), since they can strongly affect the weighted mean, particularly when they occur for high-value properties and in small samples.

6.2 Overall Ratio for Combined Strata

For purposes of oversight monitoring of overall appraisal performance and direct equalization, the generally preferred approach is to weight the median ratio of each stratum on the basis of the relative number of properties in the stratum. For indirect equalization, the weight assigned to a measure of central tendency of a stratum should be proportional to the share of that stratum’s total estimated market value. Because the number of parcels bears only a loose relationship to dollar value, weighting by number of parcels is not appropriate for indirect equalization.

For indirect equalization, the preferred method of calculating the overall market value of a jurisdiction is as follows:

1. Divide the total appraised (or assessed) value of each stratum by the stratum sample’s measure of

Table 2-1. Illustration of Combining Measures of Central Tendency (Example shown is for indirect equalization)

Data for properties in the study					
Stratum (1)	Total sample assessed value (2)	Total sample sale price (3)	Weighted mean (2)/(3) (4)	Total assessed value of stratum (5)	Indicated market value of stratum (6)
Residential	\$3,000,000	\$4,000,000	0.750	\$600,000,000	\$800,000,000
All other	950,000	1,000,000	0.950	400,000,000	421,000,000
Total				\$1,000,000,000	\$1,221,000,000

Overall ratio = \$1,000,000,000/\$1,221,000,000 = 0.819

Table 2-2. Preferred Estimators

	Indirect Equalization	Direct Equalization	Monitoring Performance
Median	—	X	X
Mean	—	—	—
Weighted Mean	X*	—	—

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

central tendency (see section 6.3, “Contrasting Measures of Appraisal Level,” in this part) to obtain an estimate of the total market value of taxable property in the stratum.

2. Sum the estimates of total stratum market value to obtain an estimate of the total market value of taxable property in the jurisdiction or class of property.
3. To obtain an overall weighted level of assessment (or ratio), divide the total appraised (or assessed) value of the jurisdiction or class of property by the estimated total market value (table 2-1 contains a simplified example).

6.3 Contrasting Measures of Appraisal Level

Table 2-2 summarizes the preferred measures of central tendency for the three broad purposes of indirect equalization, direct equalization, and the general monitoring of appraisal performance.

For indirect equalization, the preferred measure is the weighted mean (the measure used in table 2-1), because it gives equal weight to each dollar. This helps achieve an accurate estimate of total dollar value, the goal of indirect equalization. However, there are implicit difficulties in obtaining sales samples that are representative of all significant groups of properties with different ratios. The weighted mean can be disproportionately influenced by high-value properties, particularly in a small sales sample. A disproportionate influence of high-value properties can be reduced through value stratification within the property class. Such value stratification helps capture value-related ratio differences, as well as improve representativeness, regardless of which measure of central tendency is used. If there are provable value-related ratio differences within strata, the weighted mean must be used since the median is incapable of capturing value-related differences. In cases

in which value stratification is not practicable, equalization agencies may stratify by some proxy for value, such as neighborhood or property sub-class. If results appear distorted by non-representative high-value sales, outlier identification methods described in Appendix B should be employed.

While not conceptually preferred, the median can be used to prevent the disproportionate influence of high-value properties with outlier ratios. To be clear, although the median is not the conceptually appropriate measure, it nonetheless has the desirable property of smaller sampling variance and, in cases in which assessment regressivity/progressivity has not been found to be a significant concern, can provide an acceptable substitute for the weighted mean.

If samples are known to be reasonably representative through outlier trimming, the use of stratification or selection of random appraisals, the weighted mean would be the (only) correct measure. In cases which sample representativeness is a concern due to small samples or outliers, the median can reasonably be used as long as the equalization agency has checked to ensure that there are no significant price-related biases within the strata used in the study.

6.4 Measures of Variability

Measures of dispersion or variability relate to the uniformity of the ratios and should be calculated for each stratum in the study. In general, the smaller the measure, the better the uniformity, but extremely low measures can signal one of the following:

acceptable causes

- extremely homogeneous properties
- very stable markets

unacceptable causes

- lack of quality control
- calculation errors
- poor sample representativeness
- sales chasing

Note that as market activity changes or as the complexity of properties increases, the measures of variability usually increase, even though appraisal procedures may be equally valid.

6.5 Measures of Reliability

It is good practice to calculate measures of reliability whenever the results of a ratio study are used for equalization. Measures of reliability will indicate whether there is a desired degree of confidence that a given level of appraisal has not been achieved. The most commonly used measure of ratio study sample reliability is the confidence interval. This interval brackets the unknown population parameter for any sample statistic with a specified (chosen) degree of confidence. When the interval includes a desired assessment level or a performance standard range around the desired level (see section 11 and Table 2-4), equalization adjustments are not warranted. Similarly, when the interval includes a maximum allowable COD (see Table 2-3), reappraisal or other action to correct poor uniformity is not warranted.

6.6 Vertical Inequities

The measures of variability discussed in section 6.4 relate to “horizontal,” or random, dispersion among the ratios in a stratum, regardless of the value of individual parcels. Another form of inequity can be systematic differences in the appraisal of low- and high-value properties, termed “vertical” inequities. When low-value properties are appraised at greater percentages of market value than high-value properties, assessment *regressivity* is indicated. When low-value properties are appraised at smaller percentages of market value than high-value properties, assessment *progressivity* is the result. Appraisals made for tax purposes should be neither regressive nor progressive.

An index statistic for measuring vertical equity is the PRD, which is calculated by dividing the mean ratio by the weighted mean ratio. This statistic should be close to 1.00. Measures considerably above 1.00 tend to indicate assessment regressivity; measures below 1.00 suggest assessment progressivity. When samples are small or the weighted mean is heavily influenced by several extreme sales prices, however, the PRD may not be a sufficiently reliable measure of vertical inequities. A scatter plot of ratios versus appraised values or sale prices is a useful diagnostic tool. A downward (or upward) trend to the data indicates systematic regressivity (or progressivity). If not sufficiently representative, extreme sales prices can be excluded in calculation of the PRD. Similarly, when samples are very large, the PRD may be too insensitive to show small pockets in which there is significant vertical inequity. Standards for evaluating the PRD are given in section 9.2.7 in this part. In addition, more powerful statistical tests for vertical inequities are available and should be employed to determine the significance of the indication provided by the PRD (see section 5.7 in this part and Twark, Everly and Downing [1989]).

The coefficient of price-related bias (PRB) provides a more meaningful measure of price-related bias. It is obtained by regressing percentage difference from the median ratio on percentage differences in value (see Appendix D). A PRB of $-.045$ indicates, for example, that assessment ratios fall by 4.5% when values double and increase by 4.5% when values are halved. Like all regression coefficients, the statistical reliability of the PRB can be gauged by noting its *t*-value and related significance level. Like all regression coefficients, the statistical reliability of the PRB can be gauged by noting its *t*-value and related significance level, and by computing confidence intervals. In table 1-4 the PRB is 0.035 and is not statistically significant.

Unacceptable vertical inequities should be addressed through reappraisal or other corrective actions. In some cases, additional stratification can help isolate the problem. Measures of level computed for value strata should not be compared as a way of determining vertical inequity because of a boundary effect that is most pronounced in the highest and lowest strata (Schultz 1996).

6.7 Tests of Hypotheses

An appropriate test should be used whenever the purpose of a ratio study is implicitly or explicitly to test a hypothesis. A hypothesis is essentially a tentative answer to a question, such as, Are residential and commercial properties appraised at equal percentages of market value? A test is a statistical means of deciding whether the answer “yes” to such a question can be rejected at a given level of confidence. In this case, if the test leads to the conclusion that residential and commercial properties are not appraised at equal percentages of market value, some sort of corrective action on the part of assessing officials is clearly indicated. Appropriate tests are listed in table 1-2 and discussed in Gloudemans (1999), *Property Appraisal and Assessment Administration* (IAAO 1990), and *Improving Real Property Assessment* (IAAO 1978, 137–54)

6.8 The Normal Distribution

Many conventional statistical methods assume the sample data conform to the shape of a bell curve, known as the normal (or Gaussian) distribution. Performance measures based on the mean or standard deviation can be misleading if the study sample does not meet the assumption of normality. As a first step in the analysis, the distribution of sample ratios should be examined to reveal the shape of the data and uncover any unusual features. Although ratio study samples typically do not conform to the normal distribution, graphical techniques and numerical tests can be used to explore the data thoroughly. Traditional choices are the binomial, chi-square, and Lilliefors tests. Newer and more powerful procedures are the Shapiro-Wilk *W*, the D’Agostino-Pearson K^2 , and the Anderson-Darling A^2 tests (D’Agostino and Stephens 1986).

7. Sample Size

7.1 Importance of Sample Size

If it is desirable to create narrow, uniform margins of error in jurisdictions without sufficient sales, independent appraisals may be added.

7.2 Adequacy of a Given Sample Size

The adequacy of a given sample size can be evaluated by computing measures of reliability. If the confidence interval is sufficiently narrow, the sample is large enough. If the confidence interval is too wide, the oversight authority must either accept less precision or enlarge the sample, if possible.

7.3 Required Sample Size

Because designing for sampling objectives and planning for resource allocation in ratio studies must occur well before final ratio data sets are available and ratio study statistics are calculated, decisions on critical input variables must be made well before their true values are known. For example, the sample size formulas (Cochran 1977; Sherrill and Whorton 1991; and Gloude-mans 1999) used to plan for specific margins of error and/or specific levels of confidence theoretically require, as input variables, the actual variation within the final ratio data sets (usually measured by the coefficient of variation). However, the actual variation in final ratio data sets is not known during the design and planning stage and, thus, the desired sample size must be projected based upon the best information available at the time of design and planning. This projection results in unavoidable forecast error and can result in the production of a higher or lower sample size than needed to reach sampling objectives. This issue is an accepted part of conducting ratio studies when it is necessary and important to attain a predetermined or uniform degree of precision. In other cases, it may be acceptable to use all available qualified sales. When predetermination of sample size is important, the variation in the ratio data set from the most recent time period available can provide a reasonable estimate for the time period under analysis.

7.4 Remedies for Inadequate Samples

In addition to recommendations discussed in section 6.4, “Remedies for Inadequate Samples,” in Part 1, supplemental independent appraisals can be combined with sales (also see section 8.7, “Combining of Sales and Appraisals,” in this part).

7.5 History of Sales Reporting

Oversight agencies that develop ratio studies from sales provided by local assessment jurisdictions should track the number of transfers obtained in different study periods. Quality control techniques can be used to measure market activity or to determine whether an assessor is fully reporting sales information.

8. Appraisal Ratio Studies

Appraisal ratio studies are conducted by using appraised values for a random sample of parcels. Such sampling plans can be designed to be more representative of the population in terms of property characteristics than a sales sample of the same size but require adequately trained appraisers and are comparatively expensive. Few ratio studies are based solely on independently conducted appraisals, which then are compared to values determined by assessing officials. Many equalization or oversight agencies, however, do ratio studies in which both sales and appraisals are combined. Furthermore, it may be possible to develop sales driven models for use in appraising a particular population of properties (excluding those not adequately represented in the underlying model) or randomly selected parcels for ratio study purposes (see *Standard on Automated Valuation Models*, [IAAO 2003]). Estimates of value developed for use in appraisal ratio studies are considered appraisal services and must comply with *USPAP* Standards 1 and 2 or Standard 6.

8.1 Rationale

Independent appraisals can be used as indicators of market value. Independent appraisals are appraisals performed by appraisers who are not employees of the appraisal agency that is the subject of the study. Such appraisal ratio studies are particularly useful for property classes with limited sale data, such as commercial and industrial real property and personal property (see *Property Appraisal and Assessment Administration* IAAO 1990, Appendix 1-1] and Gloude-mans [1999, chapter 6]). In addition, appraisal ratio studies can be used for agricultural or other properties not appraised on an ad valorem basis. In this case, the appraisals should reflect the use value or other statutory basis on which the properties are appraised.

8.2 Advantages and Disadvantages

Appraisal ratio studies have both advantages and disadvantages. The advantages of appraisal ratio studies are

- the ability to sample from areas or property types with insufficient sales information
- a high degree of control in sample size that enables the analyst to treat jurisdictions equally, regardless of the availability of market information
- the avoidance of nonrepresentativeness stemming from the use of sales samples that may not represent the property population.
- the size of the sample can be specified and
- the initial sample can be randomly drawn, thus helping to maximize representativeness.

If objectivity can be maintained, the appraisal ratio study avoids potential distortions due to systematic differences

between appraisals of sampled and unsampled properties. In addition, independent appraisals can be used to test for systematic differences between appraisals of sold and unsold properties.

A disadvantage of appraisal ratio studies is the extra time and cost involved with the independent appraisal process. The subject and any comparables should be physically inspected and the appraisals documented according to appropriate standards. Applicable USPAP guidelines should be followed. Independent single-property appraisals should be developed in compliance with *Standard 1*, should be reported in compliance with *Standard 2*, and should be reviewed in compliance with *Standard 3* of USPAP. Independent appraisals done with a mass appraisal model should be developed and reported in compliance with *Standard 6* of USPAP. Another disadvantage is that appraisals are an opinion of value. Accordingly, they should be documented and tested against the market. However, this becomes difficult when sales data are scarce. To reduce this disadvantage, appraisal ratio study analysts should ensure that appraisals are carefully reviewed and allow local appraisers to submit appraisal information that may affect the value conclusion (see *Standard on Oversight Agency Responsibilities* [IAAO 2010]). Where adequate sales are available, independent appraisals should be checked for consistency with sales.

8.3 Sample Selection and Resource Requirements

Sample selection and resource planning in appraisal ratio studies require knowledge of statistical sampling, estimation principles, and available resources. Judgment must be used, because the determination of an adequate sample can require more information than is available during the design and planning phase, such as the actual variation within the final ratio data sets (see section 6.2, “Adequacy of a Given Sample Size,” in Part 1). Moreover, the cost of the study increases with the size of the sample. Therefore, the value of more reliable information must be balanced against the costs of obtaining that information.

In determining the size of the sample for each stratum, the following should be taken into consideration:

1. the required precision (typically measured by the margin of error) of the estimate of the appraisal level, for example, ± 0.05
2. the required confidence level, for example, 95 percent
3. the amount of dispersion expected in the final ratio data set
4. the wastage associated with properties that cannot be efficiently appraised or appraisals that cannot be used for one reason or another (see Gloudemans [1999, chapter 6] for sample size

formulas and required input variables; also see Sherrill and Whorton [1991]).

Once the desired size of an appraisal sample has been determined, the individual properties that will constitute the sample should be selected using a statistically valid sampling plan. Stratified random sampling is preferred.

If value stratification is used, sample properties selected from value groups during resource planning can shift into other value groups before completion of the study, thus reducing the ultimate representativeness of the sample. Some appraisal parcels may need to be removed from the sample when anomalous conditions are discovered such as environmental contamination (sufficiently reliable valuations may be prohibitively difficult or resource intensive) or when the independent appraiser is not allowed access to the property. Any sample parcels that are voided or that shift from a stratum because of value changes should be replaced if possible.

Appraisal ratio studies, as with sales ratio studies, require informed, reasoned judgment to maximize sample representativeness and statistical reliability.

8.4 Data Requirements and Appraisal Techniques

The appraisal techniques selected for an appraisal ratio study should be consistent with accepted appraisal principles and practices. The appraisals should reflect the appraisal date in question and should be well documented. Statistical software should be used as much as possible to expand analytical capabilities and perform calculations.

The appraisals used in appraisal ratio studies can be based on CAMA and automated valuation model (AVM) techniques (see *Standard on Automated Valuation Models*, [IAAO 2003]). The models used must be developed independently from those used for assessment purposes. Adequate market data and property characteristic data are required to develop reliable and defensible model estimates. If available, sales from a later period can be used to expand sample size. However, as in sales-based ratio studies, sales derived from primary assessing jurisdictions should be reviewed to ensure accuracy and validity. CAMA and AVM models have the advantage of reducing costs, permitting the use of larger, more representative samples. CAMA and AVM models developed for equalization must focus on the adequacy of overall, not individual, value or level of assessment estimates.

Because the purpose of the appraisal is to make an *independent* value estimate, not audit the assessor’s work, the appraisals should be made without knowledge of the assessor’s value. Appraisers should *not* be supplied with copies of the assessor’s appraisal work sheets or model information. Supervisors should spot-check and review the work of staff appraisers to ensure that the required independence is maintained. When the purpose of the ratio study is equal-

ization or performance measurement, rather than internal quality assurance, the appraisals should not be revealed to the assessor until the assessor's values are final.

8.5 Appraisal Chasing

Appraisal chasing can take two forms, either of which reduces or destroys the validity of the ratio study. The first occurs when an independent appraiser knows the local appraised value and either consciously or unconsciously biases the independent appraised value towards the local appraised value. Independent appraisers should not have access to the local appraiser's values or appraisal work papers prior to completing their appraisals. Also, independent appraisals should be reviewed and tested against the market.

The second form of appraisal chasing occurs when the local appraisal jurisdiction knows which properties are in the ratio study appraisal sample and adjusts local appraised values on some or all of these properties to achieve better ratios without making similar adjustments to unsampled properties. This form of appraisal chasing is similar to sales chasing and has similar consequences (see Appendix E, "Sales Chasing Detection Techniques"). Ratio study analysts should guard against this form of appraisal chasing by withholding the release of sample information until the local appraisal office's values are final. If this form of appraisal chasing occurs, the oversight agency can use local values prior to adjustment to provide a more accurate representation of the population ratios.

8.6 Reviewing of Appraisals

Appraisal supervisors should review appraisal models or individual single-property appraisals to ensure that USPAP and the agency's standards are met. It also is good practice to include some recently sold properties in the sample being appraised as a check on the validity of the methods being applied. In addition, the assessor must be afforded an opportunity to review the appraisals along with supporting documentation and to submit information supporting different value conclusions. If different value conclusions or factual information would materially affect the outcome of the study, a procedure for resolving conflicts, for example, by an independent review body, should be established.

8.7 Combining of Sales and Appraisals

Appraisals can be combined with valid sales in a ratio study. Using available sales adds objectivity to the study and reduces the required number of appraisals. On the other hand, combining sales and appraisals mixes two market indicators. If sales and appraisals are combined, an analysis should be performed to test the consistency of measures of central tendency derived from the sales ratios compared to the same measures derived from the appraisal ratios. A Mann-Whitney test comparing values per unit or comparing ratios based on sales with those based on appraisals is

appropriate for this purpose. Significant differences can result from several of the following conditions:

1. Sales have been chased.
2. Sales and appraisals came from different geographic areas with different markets and different levels of appraisal (maximize representativeness by stratifying).
3. Sales and appraisals have different property characteristics that cause different levels of appraisal.
4. All or some of the sales are invalid.
5. Outlier ratios are causing sale/appraisal ratio differences.
6. All or some of the appraisals are inaccurate.

If none of the first five conditions listed above apply, the appraisals should be tested against the market and revised as necessary (see Wooten, 2003).

Variability measures computed on sales used in the sample should not be expected to be similar to variability measures computed on appraisals. Sales ratios reflect the vagaries of the marketplace. Appraisal ratios, on the other hand, come from comparing the results of one appraisal model (the oversight agency's) to the results of another (the assessing office's). If both parties use mass appraisal procedures, differences in appraisals between the two models should be less than when compared with sales; thus, variability measures based on appraisal ratios can be expected to be lower than those based on sales ratios as long as they represent properties with similar characteristics and similar degrees of appraisal difficulty.

8.8 Average Unit Value Comparisons

In addition to a traditional ratio study, "expert" appraisals can take the form of average unit values and be compared against the assessor's average unit value for the same parcels. In this technique, parcels are stratified into homogeneous groups, as they would be for appraisal purposes. Appropriate units of comparison are identified for each group, and average unit values are determined through an analysis of available sales, cost, and income data. The assessor's average unit values for the same strata are then calculated and the two averages are compared. Average unit value comparisons is well-rooted in mass appraisal theory and offers an alternative to the time and expense associated with the selection and appraisal of individual parcels.

9. Estimating Performance for Unsold Properties

The objective of a ratio study is to determine appraisal performance for the population of properties. As long as sold and unsold parcels are appraised in the same man-

ner and the data describing them are coded consistently, statistics calculated in a sales ratio study can be used to infer appraisal performance for unsold parcels. However, if parcels that sell are selectively reappraised or recoded, based on their sale prices or some other criterion (such as listing price) and if such parcels are in the ratio study, sales ratio study uniformity inferences will not be accurate (appraisals will appear more uniform than they are). In this situation, measures of appraisal level will also be unsupported unless similar unsold parcels were appraised by a model that produces the same overall percentage of market value (appraisal level) as the parcels that sold.

Oversight agencies must ensure that sold and unsold parcels are appraised at the same level. Several techniques are available for determining whether assessors are selectively appraising sold parcels (see Appendix E, “Sales Chasing Detection Techniques,” or *Property Appraisal and Assessment Administration* [IAAO 1990, Appendix 20-2] and Gloudemans [1999, chapter 6] for a more detailed discussion).

If unsold properties within a properly specified group are not appraised consistently with sold properties within the same group and according to applicable guidelines, unadjusted sales ratio results cannot be used. The oversight agency will have to adjust calculated results or conduct an alternative study.

Once it is determined that *sales chasing* probably has occurred and probably is reducing the validity of ratio study statistical measures of level or uniformity, it is necessary to redo the ratio study to establish valid measures before any other recommendations, such as reappraisal or equalization action, can be made. If feasible, probably the best approach is to select a sample period that effectively precludes sales chasing. For example, when the lien or appraisal date is January 1, many jurisdictions use sales occurring before that date to make valuation decisions. To test the resulting valuations, it would be appropriate to use sales occurring after January 1 (or after the last date for changing assessments for the year in question), provided such data are time-adjusted (when necessary) backward to match the appraisal date. As a slight variation on this principle, earlier sales could be used, except when sales chasing is detected, in which case it is appropriate to switch to a later, post-appraisal-date sales period.

Legal or practical constraints can prevent use of optimal sample periods in many cases. In these situations, it is important to determine the exact cause of the sales chasing. For example, if a large proportion of selling properties are appealed and if appeal boards typically adjust to sale price, the result is the same as sales chasing by the assessor. One solution is to use appraised values prior to the action of the appeal board, provided that the appeal adjustment is not merely the result of an atypical clerical or other error. Another approach is to use current sales prices and prior-year values, adjusted for reappraisal

activity or assessment value changes in the population. The percentage increase or decrease in the prior-year's appraised values for the population (net of new construction) should be used to adjust the prior-year's values for the sample (Gloudemans 1999).

10. Presentation of Findings, Documentation, and Training

Oversight agencies should produce ratio studies in a manner that is transparent in all stages to all stakeholders.

(See section 8, Part 1.)

11. Ratio Study Standards

Each state and province should have ratio study performance standards. These standards, summarized in table 2-3, are suggested for jurisdictions in which current market value is the legal basis for assessment. In general, when state and provincial standards are not met, reappraisal or other corrective measures should be taken or equalization procedures can be imposed. When an oversight agency orders such actions, the burden of proof should be on the agency to show that the standards have not been achieved.

All standards recommended in this section are predicated on the assumption that all practicable steps necessary to maximize representativeness and validity in the underlying ratio studies have been conducted.

11.1 Level of Appraisal

The calculated measures of central tendency are point estimates and provide only an indication, not proof, of whether the level meets the appropriate goal. Confidence intervals and statistical tests should be used to determine whether the appraisal level differs from the established goal in a particular instance.

A decision by an oversight agency to take some action (direct equalization, indirect equalization, reappraisal) can have profound consequences for taxpayers, taxing jurisdictions, and other affected parties. This decision should not be made without a high degree of certainty that the action is warranted. Conversely, a decision not to take action when action is needed can have equally profound consequences. Oversight agencies should weigh all the options and consider the issues discussed below when developing or revising a level-of-appraisal standard, and when developing equalization or other appraisal oversight procedures.

11.1.1 Purpose of Level-of-Appraisal Standard

Jurisdictions that follow the IAAO recommendation of annual reassessments and comply with USPAP standards should be able to develop mass appraisal models that maintain an overall ratio level of 100 percent (or very near thereto). The local assessor may be required to observe reap-

Table 2-3. Ratio study uniformity standards indicating acceptable general quality*

General Property Class	Jurisdiction Size/Profile/Market Activity	COD Range
Residential improved (single family dwellings, condominiums, manuf. housing, 2-4 family units)	Very large jurisdictions/densely populated/newer properties/active markets	5.0 to 10.0
	Large to mid-sized jurisdictions/older & newer properties/less active markets	5.0 to 15.0
	Rural or small jurisdictions/older properties/depressed market areas	5.0 to 20.0
Income-producing properties (commercial, industrial, apartments,)	Very large jurisdictions/densely populated/newer properties/active markets	5.0 to 15.0
	Large to mid-sized jurisdictions/older & newer properties/less active markets	5.0 to 20.0
	Rural or small jurisdictions/older properties/depressed market areas	5.0 to 25.0
Residential vacant land	Very large jurisdictions/rapid development/active markets	5.0 to 15.0
	Large to mid-sized jurisdictions/slower development/less active markets	5.0 to 20.0
	Rural or small jurisdictions/little development/depressed markets	5.0 to 25.0
Other (non-agricultural) vacant land	Very large jurisdictions/rapid development/active markets	5.0 to 20.0
	Large to mid-sized jurisdictions/slower development/less active markets	5.0 to 25.0
	Rural or small jurisdictions/little development/depressed markets	5.0 to 30.0

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

**The COD performance recommendations are based upon representative and adequate sample sizes, with outliers trimmed and a 95% level of confidence.*

**Appraisal level recommendation for each type of property shown should be between 0.90 and 1.10.*

**PRD's for each type of property should be between 0.98 and 1.03 to demonstrate vertical equity. However, PRD standards are not absolute and may be less meaningful when samples are small or when wide variation in prices exist. In such cases, statistical tests of vertical equity hypotheses should be substituted.*

**Alternatively, assessing officials can rely on the PRB, which is less sensitive to atypical prices and ratios. PRB coefficients should generally fall between $-.05$ and $.05$. PRBs that are statistically significant and less than $-.10$ or greater than 0.10 indicate unacceptable vertical inequities.*

**CODs lower than 5.0 may indicate sales chasing or non-representative samples.*

praisal cycles defined by a legal authority or public policy that can extend beyond one year. During extended cycles inflation or deflation can influence the overall ratio.

The purpose of a performance standard that allows reasonable variation from 100 percent of market value is to recognize uncontrollable sampling error and the limiting conditions that may constrain the degree of accuracy that is possible and cost-effective within an assessment jurisdiction. Further, the effect of performance standards on local assessors must be considered in light of expectations of public policy and resources available. For these reasons, states or oversight agencies may adopt performance standards for appraisal level that allow some variance from the 100 percent goal of market value.

11.1.2 Recommended Appraisal Level Standards for Direct and Indirect Equalization

The performance standard adopted by an oversight agency should be a range around the legally required level of appraisal in a property class or an overall jurisdiction. This range should be 90 to 110 percent of the legally required level of appraisal for direct equalization or reappraisal, or 95 to 105 percent for indirect equalization. A smaller maximum range for indirect equalization is justified because taxpayers are not as comprehensively affected. Oversight agencies should adopt performance standards that are as close to the legally required level as can be justified given the local situation and taking into account

the factors discussed herein.

In addition to the above appraisal level standards, each class of property for which appraisal level standards have been defined must be within 5 percent of the overall level of appraisal of the jurisdiction (see section 11.2.3, "Uniformity among Strata," in this part). Both criteria must be met.

11.1.3 Confidence Intervals in Conjunction with Performance Standards

By themselves, the calculated measures of central tendency provide only an indication, not proof, of whether the appraisal level meets the performance standard. So, the purpose of confidence intervals and similar statistical tests is to determine whether the appraisal level differs from the established performance standard in a particular instance. A conclusion of noncompliance requires a high degree of confidence, thus a 90 percent (two-tailed) or 95 percent (one-tailed) confidence interval should be used, except for small or highly variable samples as described in section 11.1.5, "Adjustment for High Variability and Small Samples," in this part.

11.1.4 Decision Model

The oversight agency should determine whether the estimate is outside the acceptable range around the legal level of appraisal with a specified degree of statistical significance. The chosen interval should overlap the performance standard range of 90 percent to 110 percent

in the case of direct equalization or measuring appraisal performance. For indirect equalization the chosen interval should overlap the performance standard range of 95 percent to 105 percent. If the confidence interval does not overlap any portion of the appropriate range, equalization is performed or reappraisal orders are issued. See table 2-4 for an example of the direct equalization or appraisal performance decision making process.

11.1.5 Adjustments for High Variability and Small Samples

High variability, small sample size, or a combination of these factors often causes confidence intervals to become quite wide. Wide confidence intervals reflect the imprecision of the underlying statistic and can decrease the usefulness of performance measures. Also, wide confidence intervals can cause an inequitable situation in which jurisdictions with small samples and large variability are never subject to equalization or reappraisal orders, while jurisdictions with larger samples and much less variability are more likely to be subject to such orders even though their appraisal performance may be arguably better.

For these reasons, oversight agencies should consider expanding sample sizes by taking steps to increase the number of sales or by making independent appraisals (see section 7.4 part 2). If the sample size cannot be increased, two options may be considered when the point estimate fails to achieve compliance but the confidence interval overlaps the range of compliance:

- If a particular point estimate does not meet the standard for the current study cycle the oversight agency may reduce the level of confidence by 5% the following year. This may be followed by an annual stepwise reduction of 5%. Such a reduction may continue to a 70 percent level of confidence if the point estimate fails to meet the compliance threshold over this period of time. Corrective action would be imposed when a given year's confidence interval fails to include the performance standard range.
- The oversight agency may examine statistical point estimates over several study cycles. A jurisdiction that fails to meet a particular point standard for 5 consecutive years has a probability of less than 5% that compliance has been achieved, even if

the confidence interval overlaps the compliance threshold every year. In such cases the oversight agency would impose corrective decisions based upon the point estimate.

11.1.6 Calculating Equalization Adjustments

If noncompliance with either direct or indirect equalization standards is indicated, the appropriate point estimate (statistic) measuring appraisal level should be used to calculate adjustment factors, by dividing it into 100 percent.

11.2 Appraisal Uniformity

Assuming the existence of an adequate and sufficiently representative sample, if the uniformity of appraisal is unacceptable, reappraisal should be undertaken regardless of the level of appraisal. The oversight agency should recognize that the COD is a point estimate and cannot be accepted as proof of assessment uniformity problems without an appropriate degree of statistical confidence. Such proof can be provided by recognized statistical tests, including bootstrap confidence intervals. If the data are normally distributed, the COV and confidence intervals around this measure also can be determined. Then the COV can be mathematically converted into an equivalent COD.

11.2.1 Oversight Uniformity Standards

Oversight agencies should establish uniformity standards for local assessment jurisdictions. Any COD performance standards applied to strata within a particular jurisdiction should be related to the overall size, profile of property characteristics (type, age, condition, and obsolescence) and market activity. In general, tighter uniformity standards can be applied to larger jurisdictions with newer construction and active markets. And generally, less stringent uniformity standards should be applied to older, economically depressed or less densely developed areas with less efficient markets. Standards should also be relaxed in jurisdictions that experience economic instability due to sudden changes in supply or demand factors. In developing uniformity standards, oversight agencies should consider reasonable tolerance ranges in making compliance decisions.

11.2.2 Multi-level Uniformity Standards

The uniformity standards presented in table 2-3 are defined in terms of the COD (point estimate) measure and are

Table 2-4. Ratio Study Standards and Decision Making—Direct Equalization or Appraisal Performance Using Median 90%–110% Standard

Example demonstrating application of standard at a 95% level of confidence

Case	Point Estimate	Confidence Interval (CI) Width (95%)	CI Overlaps Performance Standard Range	Point Estimate in Performance Standard Range	Equalization Action or Reappraisal Order
1	92%	86% to 101%	yes	yes	no
2	88%	81% to 95%	yes	no	no
3	84%	79% to 88%	no	no	yes

intended to apply to ratio studies based on sales, not those based on independent appraisals in which lower CODs often are typically observed. If reliability measures are not employed, sample size will play a critical role in setting the maximum acceptable COD. In addition, in unusually homogeneous or restrictive markets or for properties subject to use-value or similar constrained value assessment, low CODs also can be anticipated. In all other cases, CODs less than 5 percent should be considered unusual and possibly indicative of nonrepresentative samples or the selective reappraisal of sold parcels. The COD standards in table 2-3 may not be applicable to property strata in unique, depressed, or rapidly changing markets. In such cases, assessment administrators may be able to develop target standards based on an analysis of past performance or results in similar markets elsewhere. Such an analysis can be based on ratio study results for the past five years or more.

11.2.3 Uniformity among Strata

Although the goal is to achieve an overall level of appraisal equal to 100 percent of the legal requirement, ensuring uniformity in appraisal levels among strata is also important. The level of appraisal of each stratum (class, neighborhood, age group, market areas, and the like) should be within 5 percent of the overall level of appraisal of the jurisdiction. For example, if the overall level of appraisal of the jurisdiction is 1.00, but the appraisal level for residential property is 0.93 and the appraisal level for commercial property is 1.06 the jurisdiction is not in compliance with this requirement. This test should be applied only to strata subject to compliance testing. The oversight agency can conclude that this standard has been met if 95 percent (two-tailed) confidence intervals about the chosen measures of central tendency for each of the stratum fall within 5 percent of the overall level of appraisal calculated for the jurisdiction. Using the above example, if the upper confidence limit for the level of residential property is 0.97 and the lower confidence limit for commercial property is 1.01, the two strata are within the acceptable range.

11.2.4 Vertical Equity

PRDs should be between 0.98 and 1.03. The reason this range is not centered on 1.00 relates to an inherent upward bias in the arithmetic mean (numerator in the PRD) that does not equally affect the weighted mean (denominator in the PRD). When samples are small, have high dispersion, or include properties with extreme values, the PRD may not provide an accurate indication of assessment regressivity or progressivity. When relying on the PRD to measure vertical equity, it is good practice to perform an appropriate statistical test for price-related biases before concluding that they exist (see table 1-2 in Part 1).

The PRB provides a measure of price-related bias that is more meaningful and less sensitive to extreme prices or ratios. As a general matter, the PRB coefficient should fall between -0.05 and 0.05 . PRBs for which 95% confidence intervals fall outside of this range indicate that one can reasonably conclude that assessment levels change by more than 5% when values are halved or doubled. PRBs for which 95% confidence intervals fall outside the range of -0.10 to 0.10 indicate unacceptable vertical inequities.

As an illustration of the above, assume that the PRB is -0.115 with a standard error of 0.02 and corresponding 95% confidence interval of -0.075 to -0.155 (-0.115 ± 0.04 approximately). One can conclude with 95% confidence that assessment levels change by at least 7.5% when values double or are halved but not that assessment levels change by at least 10%. This result would not be out of compliance with the ± 0.10 standard.

11.3 Natural Disasters and Ratio Study Standards

Natural disasters such as earthquakes, floods, and hurricanes can have a substantial impact on the conduct of ratio studies and the interpretation and use of the results, and in general, they:

- increase the difficulty of accurately identifying the physical and economic characteristics of property on the dates of sale/lease and the date of appraisal
- increase the difficulty of producing sufficiently reliable appraised values (numerators)
- decrease the availability of usable sales and other market data
- increase the difficulty of identifying and obtaining such usable data
- increase the difficulty of producing sufficiently reliable independent appraisals
- increase the difficulty of accurately matching the characteristics of numerators with those of denominators

These potential problems can result from extraordinary changes in market conditions and in the physical and economic characteristics of property between the dates of sale/lease and the date of appraisal. As a result of these potential problems, a number of unreliable sample properties may need to be voided and usable sample sizes can be reduced significantly. All of these factors should be considered when ratio study standards are applied to ratio study results from areas substantially affected by natural disasters, but such consideration must not result in unwarranted relaxation of applicable standards. When faced with such situations, oversight agencies must use informed, reasoned judgment and common sense to pro-

duce a sufficiently reliable ratio study, based upon the best information available.

12. Personal Property Studies

Most personal property ratio studies performed by oversight agencies are performed for equalization purposes. Because indirect equalization in particular requires overall estimation of value, it is imperative for these ratio studies to focus on large accounts.

Horizontal equity requires similar levels of appraisal between real and personal property. Sales data for personal property are difficult to obtain and analyze because markets for personal property are generally less visible and more difficult to follow than real property markets. Therefore, performance reviews and appraisal ratio studies should be used in place of sales ratio studies to determine the quality of appraisal of personal property. The performance review does not quantify assessment conditions but can determine general assessment quality. The appraisal ratio study can be used to determine the level and uniformity of assessment for personal property.

12.1. The Performance Review

The performance review is an empirical study that evaluates the assessment method used and the ability of the jurisdiction to meet its legal requirement in the assessment of personal property. This type of study can be used to allocate tax dollars in multijurisdictional funding calculations or equalization by assuming that jurisdictions passing the performance review are assessing personal property at the general level of other classes of property analyzed with ratio studies.

12.1.1. Discovery

The jurisdiction must have the ability to discover the owners or users of taxable personal property within the jurisdiction. This is accomplished using phone books, business/occupational licenses, listings, sales tax rolls, and field reviews (see IAAO Course 500, “The Assessment of Personal Property,” and *Standard on Valuation of Personal Property* [IAAO 2005] for a complete list).

12.1.2. Valuation

Personal property is valued by using acceptable schedules and methods including depreciation schedules published by nationally recognized valuation firms, market data from published valuation guides, and other generally accepted valuation methods and acceptable adjustments (see *Standard on Valuation of Personal Property*).

12.1.3. Verification

Inclusiveness of personal property returns and reports should be verified by an audit program. The audit program should focus on larger and complex accounts; however, it also should include randomly selected accounts. The audit program should provide coverage of the entire tax base regardless of the jurisdiction’s reappraisal cycle.

12.1.4 Forms and Renditions

Comprehensive forms supplied by the assessment authority should allow the taxpayer to disclose fully all assessable personal property. The tax laws should require mandatory compliance, with meaningful penalties for noncompliance.

12.2. Appraisal Ratio Studies for Personal Property

The appraisal ratio study produces an estimate of the level of assessment of personal property by developing a ratio for property that is on the tax roll through the use of appraisals. The level of assessment determined in this way can be adjusted downward to account for property that has not been assessed.

12.2.1 Assessment Ratio for Personal Property

Personal property market values are usually derived from appraisals using a replacement cost new less depreciation (RCNLD) approach (see IAAO Course 500). A comparison of the depreciation schedules in use to nationally accepted schedules would enable the calculation of a ratio for property on the roll. A statistically sound process should be used to select a sample that is representative of personal property on the tax rolls. Such a sample can be parcel- or value-based depending on the intended use of the ratio study in indirect or direct equalization.

12.2.2 Stratification

Proper stratification of personal property accounts should be done for greater statistical accuracy. Strata should be based on the type and value of personal property accounts.

Stratification by type of account should occur first. Personal property accounts can be divided into residential (motor vehicles, boats, aircraft, and the like), agriculture, and business accounts. Further stratification can occur in residential and agricultural accounts but is necessary in business or commercial accounts. Business accounts are usually stratified by size into a minimum of four groups. Value ranges for these groups should be derived from the value ranges in the local market. One example would be small (less than \$250,000), medium (\$250,000 to \$1 million), moderate (\$1–\$5 million), and large (greater than

\$5 million). Individual size of account can be determined by value on the prior-year personal property roll.

12.2.3 Property Escaping Assessment

Personal property is particularly prone to escaping assessment. Some determination should be made about the portion of taxable personal property not on the assessment roll. However, estimates based on national averages are less meaningful at the local jurisdictional level.

12.2.3.1 Identifying Personal Property Owners and Users Not on the Roll

Discovery tools can be used to determine accounts not on the roll for a sample area or group. Once the extent of the problem is identified, a projection can be made of the percentage of personal property not identified on the assessment roll.

12.2.3.2 Identifying Personal Property Not Included in Taxpayer Returns/Reports

The accepted method of determining the property omitted in taxpayer returns/reports is to audit the account

(see IAAO workshops on auditing). The audit results are applied back to the account value. The resulting fraction is property that is escaping taxation within that particular personal property account. If appropriate sampling techniques are used in selecting the accounts for audit, the resulting ratio is applied to the total roll to help determine the percentage of personal property escaping assessment within the jurisdiction.

12.2.4 Computing the Level of Appraisal

The overall ratio is then determined by reducing the valuation ratio by the percent of property wholly or partially escaping taxation. For example, if the appraisal level is found to be 90 percent and it is determined that 5 percent of personal property is escaping assessment, then the corrected level of assessment is the appraisal level times the percentage of personal property assessed: $0.90 \times (1 - 0.05) = 0.855$. For indirect equalization, this calculation would result in a higher equalized value.

Standard on Ratio Studies

Definitions

Absolute value. The value of a number (or variable) regardless of its sign. For example, 3 and -3 (minus 3) both have an absolute value of 3. The mathematical symbol for absolute value is one vertical bar on each side of the number in question, for example, $|3|$.

Accuracy. The closeness of a measurement, computation, or estimate to the true, exact, or accepted value. Accuracy also can be expressed as a range about the true value. *See also precision and statistical accuracy.*

Adjusted sale price. The sale price that results from adjustments made to the stated sale price to account for the effects of time, personal property, financing, or the like.

Appraisal. “The act or process of developing an opinion of value; an opinion of value” (USPAP 1999). The act of estimating the money value of property. The money value of property as estimated by an appraiser.

Appraisal date. The date as of which a property’s value is estimated. *See also assessment date.*

Appraisal ratio. (1) The ratio of the appraised value to an indicator of market value. (2) By extension, an estimated fractional relationship between the appraisals and market values of a group of properties. *See also level of appraisal.*

Appraisal ratio study. A ratio study using independent expert appraisals as indicators of market value.

Appraisal-sale price ratio. The ratio of the appraised value to the sale price (or adjusted sale price) of a property; a simple indication of appraisal accuracy.

Appraised value. The estimate of the value of a property before application of any fractional assessment ratio, partial exemption, or other adjustments.

Arithmetic mean. A measure of central tendency. The result of adding all the values of a variable and dividing by the number of values. For example, the arithmetic mean of 3, 5, and 10 is 18 divided by 3 or 6.

Array. An ordered arrangement of data, such as a listing of sales ratios, in order of magnitude.

Assessed value. (1) A value set on real estate and personal property by a government as a basis for levying taxes. (2) The monetary amount at which a property is put on the assessment roll for purposes of computing the tax levy. Assessed values differ from the assessor’s estimate of actual (market) value for four major reasons: fractional assessment ratios, partial exemptions, preferential assessments, and decisions by assessing officials to override market value.

Assessment. (1) In general, the official acts of determining the amount of the tax base. (2) As applied to property taxes, the official act of discovering, listing, and appraising property, whether performed by an assessor, a board of review, or a court. (3) The value placed on property in the course of such act.

Assessment-appraisal ratio. The ratio of the assessed value of a property to an independent appraisal.

Assessment date. The status date for tax purposes. Appraised values reflect the status of the property and any partially completed construction as of this date.

Assessment progressivity (regressivity). An appraisal bias such that high-value properties are appraised higher (or lower) than low-value properties in relation to market values. *See also price-related differential (PRD) and coefficient of price-related bias (PRB).*

Assessment ratio. (1) The fractional relationship of an assessed value to the market value of the property in question. (2) By extension, the fractional relationship of the total of the assessment roll to the total market value of all taxable property in a jurisdiction. *See also level of assessment.*

Assessment-sale price ratio. The ratio of the assessed value to the sale price (or adjusted sale price) of a property.

Assessor. (1) The head of an assessment jurisdiction. Assessors can be either elected or appointed. In this standard the term is sometimes used collectively to refer to all assessment officials charged with administering the assessment function. (2) The public officer or member of a public body whose duty it is to make the original assessment.

Average deviation. The arithmetic mean of the absolute deviations of a set of numbers from a measure of central tendency such as the median. Taking absolute values is generally understood without being stated. The average deviation of the numbers 4, 6, and 10 about their median (6) is $(2 + 0 + 4) \div 3 = 2$. The average deviation is used in computing the coefficient of dispersion (COD).

Bias. A type of nonsampling error in which a calculated statistic differs systematically from the population parameter. A process is biased if it produces results that vary systematically with some factor that should be irrelevant. In assessment administration, assessment progressivity (regressivity) is one kind of possible bias.

Bootstrap. A computer-intensive method of statistical inference that is based on a repeated resampling of data to provide more information about the population charac-

teristics. The bootstrap is a data-driven procedure that is particularly useful for confidence interval approximation when no traditional formulas are available or the sample has been drawn from a population that does not conform to the normal distribution.

CAMA. *See computer-assisted mass appraisal*

Central tendency. (1) The tendency of most kinds of data to cluster around some typical or central value, such as the mean or median. (2) By extension, any or all such statistics. Some kinds of data, however, such as the weights of cars and trucks, may cluster about two or more values, and in such circumstances the meaning of central tendency becomes unclear. This may happen in ratio studies in which two or more classes of property are combined.

Class. A set of items defined by common characteristics. (1) In property taxation, property classes such as residential, agricultural, and industrial may be defined. (2) In assessment, building classification systems based on type of building design, quality of construction, or structural type are common. (3) In statistics, a predefined category into which data may be put for further analysis. For example, ratios may be grouped into the following classes: less than 0.500, 0.500 to 0.599, 0.600 to 0.699, and so forth.

COD. *See coefficient of dispersion.*

Coefficient of concentration. The percentage of observations falling within a specified percentage (say, 15 percent) of a measure of central tendency.

Coefficient of dispersion (COD). The average deviation of a group of numbers from the median expressed as a percentage of the median. In ratio studies, the average percentage deviation from the median ratio.

Coefficient of price-related bias (PRB). An index of price-related bias obtained by regressing percentage deviations from the median ratio on percentage changes in a value proxy, which is obtained by giving equal weight to assessments and sales prices so as to minimize measurement biases.

Coefficient of variation (COV). A standard statistical measure of the relative dispersion of the sample data about the mean of the data; the standard deviation expressed as a percentage of the mean.

Computer-assisted mass appraisal (CAMA). A process that uses a system of integrated components and software tools necessary to support the appraisal of a universe of properties through the use of mathematical models that represent the relationship between property values and supply/demand factors.

Confidence interval. A range of values, calculated from the sample observations, that are believed, with a particular probability, to contain the true population parameter (mean, median, COD). The confidence interval is not

a measure of precision for the sample statistic or point estimate, but a measure of the precision of the sampling process (*see reliability*).

Confidence level. The degree of probability associated with a statistical test or confidence interval, commonly 90, 95, or 99 percent. For example, a 95 percent confidence interval implies that were the estimation process repeated again and again, then 95 percent of the calculated intervals would be expected to contain the true population measure (such as the median, mean, or COD).

Contributory value. The amount a component of a property contributes to the total market value. For improvements, contributory value must be distinguished from costs.

COV. *See coefficient of variation.*

Date of sale (date of transfer). The date on which the sale was consummated. This is considered to be the date the deed, or other instrument of transfer, is signed. The date of recording can be used as a proxy if it is not unduly delayed as it would be in a land contract.

Direct equalization. The process of converting ratio study results into adjustment factors (trends) and changing locally determined appraised or assessed values to more nearly reflect market value or the legally required level of assessment. *See also equalization and indirect equalization.*

Dispersion. The degree to which data are distributed either tightly or loosely around a measure of central tendency. Measures of dispersion include the range, average deviation, standard deviation, coefficient of dispersion, and coefficient of variation.

Distribution-free statistics. A set of robust nonparametric methods whose interpretation or reliability does not depend on stringent assumptions about the distribution of the underlying population from which the sample has been drawn. *See also parametric statistics.*

Equalization. The process by which an appropriate governmental body attempts to ensure that property under its jurisdiction is assessed at the same assessment ratio or at the ratio or ratios required by law. Equalization can be undertaken at many different levels. Equalization among use classes (such as agricultural and industrial property) can be undertaken at the local level, among properties in a school district and a transportation district; equalization among counties is usually undertaken by the state to ensure that its aid payments are distributed fairly. *See also direct equalization and indirect equalization.*

Exploratory data analysis. That part of statistical practice concerned with reviewing the data set to isolate structures, uncover patterns, or reveal features that may improve the confirmatory analysis.

Fixture. An asset that has become part of real estate through attachment in such a manner that its removal

would result in a loss in value to either the asset or the real estate to which the asset is affixed.

Fractional assessments. Assessments that by law or by practice have assessment ratios different from 1. Usually the assessment ratio is less than 1, and if assessment biases are present, different classes of property may have different fractional ratios.

Frequency distribution. A table or chart showing the number or percentage of observations falling in the boundaries of a given set of classes. Used in ratio studies to summarize the distribution of the individual ratios. *See also class and histogram.*

Histogram. A bar chart or graph of a frequency distribution in which the frequencies of the various classes are indicated by horizontal or vertical bars whose lengths are proportional to the number or percentage of observations in each class.

Hypothesis. A statement in inferential statistics, the truth of which the analyst is interested in determining.

Independent appraisal. An estimate of value using a model different from that used for assessment purposes. Independent appraisals are used to supplement sales in sales ratio studies or in appraisal ratio studies.

Indirect equalization. The process of computing hypothetical values that represent the oversight agency's best estimate of taxable value, given the legally required level of assessment or market value. Indirect equalization allows proper distribution of intergovernmental transfer payments between state or provincial and local governments despite different levels of appraisal between jurisdictions or property classes. *See also equalization and direct equalization.*

Interquartile range (IQR). The result obtained by subtracting the first quartile from the third quartile. By definition 50 percent of the observations fall within the IQR.

Land contract. An executor's contract for the purchase of real property under the terms of which legal title to the property is retained by the vendor until such time as all conditions stated in the contract have been fulfilled; commonly used for installment purchase of real property.

Level of appraisal. The common, or overall, ratio of appraised values to market values. Three concepts are usually of interest: the level required by law, the true or actual level, and the computed level based on a ratio study.

Level of assessment. The common or overall ratio of assessed values to market values. *See also level of appraisal.* *Note:* The two terms are sometimes distinguished, but there is no convention determining their meanings when they are. Three concepts are commonly of interest: what the assessment ratio is legally required to be, what the assessment ratio for the population actually is, and what

the assessment ratio for the population seems to be, on the basis of a sample and application of inferential statistics. When level of assessment is distinguished from assessment ratio, *level of assessment* usually means either the legal requirement or the true ratio, and *assessment ratio* usually means the true ratio or the sample statistic.

Margin of error. A measure of the uncertainty associated with statistical estimates of a parameter. It is typically linked to consumer surveys or political poll questions. A margin of error is a key component of a confidence interval. It reports a "plus or minus" percentage or proportion quantity in a confidence interval at a specified level of probability (typically 95 percent). *See also confidence interval.*

Market value. The major focus of most real property appraisal assignments. Both economic and legal definitions of market value have been developed and refined. A current economic definition agreed upon by agencies that regulate federal financial institutions in the United States is: The most probable price (in terms of money) which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby: The buyer and seller are typically motivated; Both parties are well informed or well advised, and acting in what they consider their best interests; A reasonable time is allowed for exposure in the open market; Payment is made in terms of cash in United States dollars or in terms of financial arrangements comparable thereto; The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale. (See USPAP for additional comments.)

Mass appraisal. The process of valuing a universe of properties as of a given date using standard methodology, employing common data, and allowing for statistical testing (*see USPAP*)

Mean. *See arithmetic mean.*

Median. A measure of central tendency. The value of the middle item in an uneven number of items arranged or arrayed according to size; the arithmetic average of the two central items in an even number of items similarly arranged.

Median absolute deviation. The median of the absolute deviations from the median. In a symmetrical distribution, the measure approximates one-half the IQR.

Median percent deviation. The median of the absolute percent deviations from the median; calculated by dividing the median absolute deviation by one-hundredth of the median.

Nonparametric statistics. *See* **distribution-free statistics.**

Nonsampling error. The error reflected in ratio study statistics from all sources other than sampling error. While nonsampling error is unavoidable due to the inefficiencies inherent in real property markets, the imperfections of the appraisal process, and the imperfections of conducting ratio studies, all practicable steps must be taken to minimize nonsampling error in ratio studies.

Normal distribution. A theoretical distribution often approximated in real world situations. It is symmetrical and bell-shaped; 68 percent of the observations occur within one standard deviation of the mean and 95 percent within two standard deviations of the mean.

Observation. One recording or occurrence of the value of a variable, for example, one sale ratio among a sample of sales ratios.

Outliers. Observations that have unusual values, that is, differ markedly from a measure of central tendency. Some outliers occur naturally; others are due to data errors.

Parameter. Numerical descriptive measure of the population, for example, the arithmetic mean or standard deviation. Parameters are generally unknown and estimated from statistics calculated from a sample of the population.

Parametric statistics. Statistics whose interpretation or reliability depends on the distribution of the underlying data. *See also* **distribution-free statistics.**

Percentile. The values that divide a set of data into specified percentages when the data are arrayed in ascending order. The tenth percentile includes the lowest 10 percent of the values, the twentieth percentile includes the lowest 20 percent of the values, and so forth.

Personal property. *See* **property.**

Plottage value. The excess of the value of a large parcel of land formed by assemblage over the sum of the values of the unassembled parcels.

Point estimate. A single numerical value that can be used to estimate a population parameter. It is calculated on the basis of information collected from a sample. Point estimates are generally constructed to provide the best unbiased estimate of the population parameter consistent with the sample data. However, the point estimate is only an estimate, and is unlikely to have the same value as the population parameter. (See **Confidence interval** and **Reliability** for discussion of precision of the sampling process.)

Points. Prepaid interest on a loan; one point is equal to 1 percent of the amount of the loan. It is common to deduct points in advance of the loan, so that an individual pays interest on 100 percent of the loan but gets cash on, say, only 99 percent.

Population. All the items of interest, for example, all the properties in a jurisdiction or neighborhood; all the observations in a data set from which a sample may be drawn.

Precision. The level of detail in which a quantity or value is expressed or represented. It can be characterized as the number of digits used to record a measurement. A high level of represented precision may be used to imply a greater level of accuracy; however, this relationship may not be true. Precision also relates to the quality of an operation or degree of refinement by which results are obtained. A method of measurement is considered precise if repeated measurements yield the same or nearly the same numeric value. *See also* **accuracy and statistical precision.**

PRB. *See* **coefficient of price-related bias.**

PRD. *See* **price-related differential.**

Price. The amount asked, offered, or paid for a property. (See USPAP [2004] for additional comments.)

Price-related differential. The mean divided by the weighted mean. The statistic has a slight bias upward. Price-related differentials above 1.03 tend to indicate assessment regressivity; price-related differentials below 0.98 tend to indicate assessment progressivity.

Progressivity. *See* **assessment progressivity (regressivity).**

Property. An aggregate of things or rights to things. These rights are protected by law. There are two basic types of property: real and personal. Real property consists of the interests, benefits, and rights inherent in the ownership of land plus anything permanently attached to the land or legally defined as immovable; the bundle of rights with which ownership of real estate is endowed. To the extent that "real estate" commonly includes land and any permanent improvements, the two terms can be understood to have the same meaning. Also called *realty*. Personal property is defined as those items that generally are movable or all items not specifically defined as real property. Many states include as personal property the costs associated with placing personal property in service, such as sales tax, freight, and installation. Installation items include, but are not limited to, wiring, foundations, hookups, and attachments. Two commonly used tests for distinguishing real and personal property are (1) the intent of the parties and (2) whether the item may be removed from the real estate without damage to either.

Qualified sale. A property transfer that satisfies the conditions of a valid sale and meets all other technical criteria for inclusion in a ratio study sample. If a property has undergone significant changes in physical characteristics, use, or condition in the period between the assessment date and sale date, it would not technically qualify for use in ratio study.

Quartiles. The values that divide a set of data into four equal parts when the data are arrayed in ascending order. The first quartile includes the lowest quarter of the data, the second quartile, the second lowest quarter, and so forth.

Random sample. A sample of n items selected from a population in such a way that each sample of the same size is equally likely. This also includes the case in which each element in the sample has an equal chance of being selected.

Range. (1) The maximum value of a sample minus the minimum value. (2) The difference between the maximum and minimum values that a variable may assume.

Ratio study. A study of the relationship between appraised or assessed values and market values. Indicators of market values may be either sales (sales ratio study) or independent “expert” appraisals (appraisal ratio study). Of common interest in ratio studies are the level and uniformity of the appraisals or assessments. *See also level of appraisal and level of assessment.*

Real property. *See property.*

Regressivity. *See assessment progressivity (regressivity).*

Regressivity index. *See price-related differential.*

Reliability. In a sampling process, the extent to which the process yields consistent population estimates. Ratio studies typically are based on samples. Statistics derived from these samples may be more or less likely to reflect the true condition in the population depending on the reliability of the sample. Representativeness, sample size, and sample uniformity all contribute to reliability. Formally, reliability is measured by sampling error or the width of the confidence interval at a specific confidence level relative to the central tendency measure.

Representative sample. A sample of observations from a larger population of observations, such that statistics calculated from the sample can be expected to represent the characteristics of the population being studied.

Sale price. (1) The actual amount of money exchanged for a unit of goods or services, whether or not established in a free and open market. An indicator of market value. (2) Loosely used synonymously with “offering” or “asking price.”

Sale ratio. The ratio of an appraisal (or assessed) value to the sale price or adjusted sale price of a property.

Sales chasing. Sales chasing is the practice of using the sale of a property to trigger a reappraisal of that property at or near the selling price. If sales with such appraisal adjustments are used in a ratio study, the practice causes invalid uniformity results and causes invalid appraisal level results, unless similar unsold parcels are reappraised by a method that produces an appraisal level for unsold properties equal

to the appraisal level of sold properties. (2) By extension, any practice that causes the analyzed sample to misrepresent the assessment performance for the entire population as a result of acts by the assessor’s office. A subtle, possibly inadvertent, variety of sales chasing occurs when the recorded property characteristics of sold properties are differentially changed relative to unsold properties. Then the application of a uniform valuation model to all properties results in the recently sold properties being more accurately appraised than the unsold ones.

Sales ratio study. A ratio study that uses sales prices as proxies for market values.

Sample. A set of observations selected from a population. If the sample was randomly selected, basic concepts of probability may be applied.

Sampling error. The error reflected in ratio study statistics that results solely from the fact that a sample of the population is used rather than a census of the population.

Scatter diagram or scatter plot. A graphic means of depicting the relationship or correlation between two variables by plotting one variable on the horizontal axis and one variable on the vertical axis. Often in ratio studies it is informative to determine how ratios are related to other variables. A variable of interest is plotted on the horizontal axis and ratios are plotted on the vertical axis.

Significance. A measure of the probability that an event is attributable to a relationship rather than merely the result of chance.

Skewed. The quality of a frequency distribution that makes it asymmetrical. Distributions with longer tails on the right than on the left are said to be skewed to the right or to be positively skewed. Distributions with longer tails to the left are said to be skewed to the left or to be negatively skewed.

Standard deviation. The statistic calculated from a set of numbers by subtracting the mean from each value and squaring the remainders, adding together all the squares, dividing by the size of the sample less one, and taking the square root of the result. When the data are normally distributed, the percentage of observations can be calculated within any number of standard deviations of the mean from normal probability tables. When the data are not normally distributed, the standard deviation is less meaningful and the analyst should proceed cautiously.

Standard error. A measure of the precision of a measure of central tendency; the smaller the standard error, the more reliable the measure of central tendency. Standard errors are used in calculating a confidence interval about the arithmetic mean and the weighted mean. The standard error of the sample mean is the standard deviation divided by the square root of the sample size.

Statistical accuracy. The closeness between the statistical estimate and the true (but unknown) population parameter value it was designed to measure. It is usually characterized in terms of error or the potential significance of error and can be decomposed into sampling error and nonsampling error components. Accuracy can be specified by the level of confidence selected for a statistical test. *See also accuracy.*

Statistical precision. A reference to how closely the survey results from a sample can reproduce the results that would be obtained from the entire population (a complete census). The amount by which a sample statistic can vary from the true population parameter is due to error. Even if all the sample data are perfectly accurate, random (sampling) error affects statistical precision (measured by the standard error or standard deviation). The dispersion of ratios in the population and the sample size have a controlling influence over the precision of any statistical estimate. When the reliability of a statistical measure is being evaluated, narrower confidence intervals have greater precision. *See also precision.*

Statistics. Numerical descriptive data calculated from a sample, for example, the median, mean, or COD. Statistics are used to estimate corresponding measures, termed parameters, for the population.

Stratify. To divide, for purposes of analysis, a sample of observations into two or more subsets according to some criterion or set of criteria.

Stratum, strata (pl.). A class or subset that results from stratification.

Time-adjusted sale price. The price at which a property sold adjusted for the effects of price changes reflected in the market between the date of sale and the date of analysis.

Trimmed mean. The arithmetic mean of a data set identified by the proportion of the sample that is trimmed from each end of the ordered array. For example, a 10 percent trimmed mean of a sample of size ten is the average of the eight observations remaining after the largest and smallest observations have been removed.

Value. (1) The relationship between an object desired and a potential owner; the characteristics of scarcity, utility, desirability, and transferability must be present for value to exist. (2) Value may also be described as the present worth of future benefits arising from the ownership of real or personal property. (3) The estimate sought in a valuation. (4) Any number between positive infinity and negative infinity.

Variable. An item of observation that can assume various values, for example, square feet, sales prices, or sales ratios. Variables are commonly described by using measures of central tendency and dispersion.

Weighted mean; weighted average. An average in which each value is adjusted by a factor reflecting its relative importance in the whole before the values are summed and divided by their number.

Weighted mean ratio. Sum of the appraised values divided by the sum of the sales prices (or independent estimates of market value), which weights each ratio in proportion to the sale price (or independent estimate of market value).

References

- The Appraisal Foundation. 2012–2013 (updated every two years). *Uniform standards of professional appraisal practice* (USPAP). Washington, DC: The Appraisal Foundation.
- Barnett, Vic, and Toby Lewis. 1994. *Outliers in statistical data*. New York: John Wiley & Sons, Inc.
- Clapp, John M. 1989. Sample size in ratio studies: How can “small” be made “large enough.” *Property Tax Journal* 8(3):211–31.
- Cochran, William G. 1977. *Sampling techniques*, 3rd ed. New York: John Wiley & Sons, Inc.
- D’Agostino, Ralph B., and M. A. Stephens. 1986. *Goodness-of-fit techniques*. New York: Marcel Dekker.
- Dornfest, Alan S. 2004. State and provincial ratio study practices: 2003 survey results. *Journal of Property Tax Assessment & Administration* 1(1):31–70
- Efron, Bradley, and Robert J. Tibshirani. 1993. *An introduction to the bootstrap*. New York: Chapman & Hall.
- Gloude-mans, R.J. 1999. *Mass appraisal of real property*. Chicago: International Association of Assessing Officers.
- Gloude-mans, R. and R. Almy. 2011. *Fundamentals of mass appraisal*. Kansas City, MO: International Association of Assessing Officers.
- Hart, Anna. 2001. Mann-Whitney test is not just a test of medians: Differences in spread can be important. *British Medical Journal* 2001(323):391–393.
- Hoaglin, David C., Fredrick Mosteller, and John W. Tukey. 1983. *Understanding robust and exploratory data analysis*. New York: John Wiley & Sons.
- Iglewicz, Boris, and David C. Hoaglin. 1993. *How to detect and handle outliers*. Milwaukee: ASQC Quality Press.
- International Association of Assessing Officers (IAAO). 2005. *Standard on valuation of personal property*. Kansas City, MO: International Association of Assessing Officers.
- International Association of Assessing Officers (IAAO). 2010. *Standard on property tax policy*. Kansas City, MO: International Association of Assessing Officers.
- International Association of Assessing Officers (IAAO). 2010. *Standard on oversight agency responsibilities*. Chicago: International Association of Assessing Officers.
- International Association of Assessing Officers (IAAO). 2003. *Standard on automated valuation models*. Chicago: International Association of Assessing Officers.
- International Association of Assessing Officers (IAAO). 2013. *Standard on mass appraisal of real property*. Kansas City, MO: International Association of Assessing Officers.
- International Association of Assessing Officers (IAAO). 1997. *Glossary for property appraisal and assessment*. Chicago: International Association of Assessing Officers.
- International Association of Assessing Officers (IAAO). 1990. *Property appraisal and assessment administration*. Chicago: International Association of Assessing Officers.
- International Association of Assessing Officers (IAAO). 1978. *Improving real property assessment: A reference manual*. Chicago: International Association of Assessing Officers.
- Knight, John R., Thomas J. Miceli, and C.F. Sirmans. 2000. Repair allowances, selling contracts and house prices. *Journal of Real Estate Research* 20(3):
- Lessler, Judith T., and William D. Kalsbeek. 1992. *Non-sampling error in surveys*. New York: John Wiley & Sons, Inc.
- Schultz, Ronald J. 1996. The law of the tool: A question of fairness. *Assessment Journal* 3(6):62–70.
- Sherrill, Koren, and Elbert Whorton, Jr. 1991. Sample size estimation techniques of the state equalization study of school districts in Texas. *Property Tax Journal* 10(1):125–39.
- Tomberlin, Nancy. 2001. Trimming outlier ratios in small samples. *Assessment Journal* 8(4):29–35.
- Tomberlin, Nancy. 2001. Sales validation from an oversight agency’s perspective. *Assessment Journal* 8(6):29–35]
- Twark, Richard D., Raymond W. Everly, and Roger H. Downing. 1989. Some insights into understanding assessment uniformity measures: Regressivity and progressivity. *Property Tax Journal*. 8(3):183–91.
- Wooten, Tim. 2003. Asking the right questions is the key to a valid ratio study analysis. *Assessment Journal* 10(4):97–102.

Additional Resources

- Committee on Sales Ratio Data, National Association of Tax Administrators. 1954. Report of the Committee. *Guide for assessment-sales ratio studies*. Chicago: Federation of Tax Administrators.
- Birch, J.W. and M.A. Saunderman. 2000. Optimal Trimming of appraisal-sales ratio studies. *Assessment Journal* 6(4):25–31.

- Birch, J.W. and M.A. Saunderman. 1997. Testing for outliers in sales and appraisal data. *Assessment Journal* 4(4):31–42.
- Bonett, D.G. and E. Seier. 2006. Confidence intervals for a coefficient of dispersion in nonnormal distributions. *Biometrical Journal*. 48(1):144–148
- Conover, W. J. 1980. *Practical nonparametric statistics*. New York: John Wiley & Sons.
- D'Agostino, R.B., A. Belanger, and R.B. D'Agostino, Jr. 1990. A suggestion for using powerful and informative tests for normality. *The American Statistician* 44(4):316–21.
- Denne, R.C. 2011. The PRB and other potential successors to the flawed PRD as a measure of vertical assessment inequity. *Fair & Equitable* 9(11): 3–10.
- Dornfest, A.S., A. Chizewsky, and P. Davis. 2004. Alternate methods of addressing ratio study outliers. *Journal of Property Tax Assessment and Administration* 1(4):5–14.
- Dornfest, A.S. 1993. Mass appraisal performance evaluation: Strategies for painless implementation. *Assessment Digest* 15(1):2–11.
- Dornfest, A.S. 2000. State and provincial ratio study practices: 1997 Survey results. *Assessment Journal* 4(6):23–67.
- Dornfest, A.S. 1990. Perspectives on ratio studies: The rural state. *Assessment Digest* 12(3):17–21.
- Gloude-mans, R.J. 1999. *Mass appraisal of real property*. Chicago: International Association of Assessing Officers.
- Gloude-mans, R.J. 1990. Adjusting for time in computer-assisted mass appraisal. *Property Tax Journal* 9(1):83–99.
- Gloude-mans, R.J. 2000. An empirical evaluation of central tendency measures. *Assessment Journal* 7(1):21–27.
- Gloude-mans, R.J. 2001. Confidence intervals for the COD: Limitations and solutions. *Assessment Journal* 8(6):23–27.
- Gloude-mans, R.J. 2011. The coefficient of price-related bias: A measure of vertical equity. *Fair & Equitable* 9(8): 3–8.
- Groves, R.M. 2004. *Survey errors and survey costs*. New York: John Wiley & Sons.
- International Association of Assessing Officers (IAAO). 2003. *Standard on facilities, computers, equipment and supplies*. Chicago: International Association of Assessing Officers.
- International Association of Assessing Officers (IAAO). 1977. *Analyzing assessment equity*. Chicago: International Association of Assessing Officers.
- Jacobs, T. 1986. Assessment quality control. *Assessment Digest* 8(4):8–13.
- Benmamoun, M. 2006. Bootstrap confidence intervals and Gloude-mans' COD tolerance test using SPSS and Stata. *Journal of Property Tax Assessment and Administration* 3(4):56–61.
- Mendenhall, W., J.E. Reinmuth, and R.J. Beaver. 1993. *Statistics for management and economics*, 7th ed. Belmont, CA: Duxbury Press.
- Neave, H. R., and P. L. Worthington. 1988. *Distribution-free tests*. London, England, and Boston, MA: Unwin Hyman.
- Neter, J., W. Wasserman, and G.A. Whitmore. 1987. *Applied statistics*. 3rd ed. Boston, MA: Allyn and Bacon, Inc.
- Snedecor, G.W., and W.G. Cochran. 1967. *Statistical methods*, 6th ed. Ames Iowa: Iowa State University Press.
- Whorton, E.B. Jr. 2003. Should sales ratio studies be used for equalizing state funds for schools? *Assessment Journal*. 10(2):29–40.
- Wu, K. and R. Baker, Jr. 2000. Using Tukey line in support of PRD. *Assessment Journal* 7(5):41–50.
- Wu, K., and R. Baker, Jr. 2000. Evaluating assessment performance using a composite index: A tool for communication. *Assessment Journal* 7(1):29–33.
- Additional readings on ratio studies can be found at LibraryLink, IAAO's online catalog of resources, and <http://www.iaao.org>. Many Web sites offer good information on statistics. Because Web site addresses change frequently, they are not listed here.

Appendix A. Sales Validation Guidelines

A.1 Sources of Sales Data

The best sources of sales data are copies of deeds or real estate transfer affidavits containing the full consideration and other particulars of the sale. Assessing officers in jurisdictions without laws mandating full disclosure of sales data to assessing officials work under a severe handicap and should seek legislation that provides for such disclosure.

1. *Real estate transfer documents.* These documents are (1) copies of deeds and land contracts, (2) copies of real estate transfer affidavits, and (3) closing statements.
2. *Buyers and sellers.* Buyers and sellers of real property can be contacted directly to secure or confirm sales data. Means of contact include sales questionnaires, telephone interviews, and personal interviews.
3. *Third-party sources.* Third-party sources include multiple listing agencies, real estate brokers and agencies, government and private fee appraisers, attorneys, appraisal organizations, and others. Of particular value are those individuals or agencies that publish lists of sales or provide sales in an electronic format.

A.2 Information Required

The following data are needed to make any necessary adjustments to sales prices, compute sales ratios, and update ownership information.

1. *Full consideration involved.* This is the total amount paid for the property, including the cash down payment and amounts financed. The sale price is the most essential item of information concerning the sale, and its accuracy must be carefully scrutinized. In many jurisdictions it is common practice in deeds of conveyance to state considerations in such terms as “one dollar plus other due and just consideration.” These amounts are rarely the actual selling price and should be ignored in favor of information from the buyer and seller or other reliable source.
2. *Names of buyer and seller.* This information permits the assessor to maintain a current record of the owners of all property in the jurisdiction. Transfer documents often refer to the buyer as the grantee or transferee and to the seller as the grantor or transferor.
3. *Addresses, phone numbers, and other contact information of buyer and seller or their legal designee.* This information helps to identify more positively the parties to the sale. If the buyer will not reside at the property, the buyer’s address may be needed for future correspondence. If the seller has established a new address, this information will aid the assessor in contacting the seller regarding the sale.
4. *Relationship of buyer and seller.* It is important to know whether the buyer and seller are related individuals or corporate affiliates because such sales often do not reflect market value.
5. *Legal description, address, and parcel identifier.* If each parcel is assigned a unique parcel identifier and if this number is noted on the document at the time it is recorded, then the assessor can locate the parcel in the files directly. If not, the legal description or street address is essential to locate the parcel.
6. *Type of transfer.* It is crucial to identify whether or not a sale is an “arm’s-length” transfer. Therefore, if the sources of sales data do not include copies of deeds, the type of deed should be specifically required.
7. *Time on the market.* Sales that have been exposed to the open market too long, not long enough, or not at all may not represent market value.
8. *Interest transferred.* The appraiser must identify whether or not the entire bundle of rights (fee simple) to the property has transferred. For example, in some transactions, only a life tenancy (“life estate”) may be conveyed, or the seller may retain mineral or other rights to the property. Similarly, the sale price of a property encumbered by a long-term lease may not reflect the market value of the fee simple estate in the property.
9. *Type of financing.* In analyzing the sale, it is helpful to know the amount of down payment; the type, remaining amount, and interest rates of notes secured by mortgages or deeds of trust assumed by the buyer; and the value of any stocks, bonds, notes, or other property passed to the seller. It is also important to know whether the sale conveys title to the property or that it is a land contract, in which title is not conveyed until some time in the future, typically several years.
10. *Personal property.* A sales ratio study requires knowledge of the amount paid for the real

property. The sale document ideally would note the type and value of any significant personal property items included in the transaction.

11. *Date of transfer.* This is the date on which the sale was closed or completed. The date the deed or other transfer document was recorded can be used as a surrogate, provided there was no undue delay in the recording. If there has been a delay in recording, the date of the deed or transfer instrument should be used.
12. *Instrument number.* This number, as well as the record or deed book and page, indicates where the deed is located in the official records and thus can be important in researching sales or leases and identifying duplication.

The data noted above should be maintained in a separate data file or the sale history file component of a CAMA system. In addition, the file should include additional information useful for stratification and other analytical purposes. Sales data files should reflect the physical characteristics of the property when sold. If significant legal, physical, or economic changes have occurred between the sale date and the assessment date, the sale should not be used for ratio studies. (The sale may still be valid for mass appraisal modeling by matching the sale price against the characteristics that existed on the date of sale.)

A.3 Confirmation of Sales

A.3.1 Importance of Confirmation

The usefulness of sales data is directly related to the completeness and accuracy of the data. Sales data should be routinely confirmed or verified by contacting buyers, sellers, or other knowledgeable participants in the transaction. In general, the fewer the sales in a stratum, the less common or more complex the type of property, and the more atypical the sale price, the greater the effort should be to confirm the particulars of the sale. With larger sample sizes, it may be sufficient to confirm single-family residential sales by audit or exception.

A.3.2 Methods of Confirmation

In general, the completeness and accuracy of sales data are best confirmed by requesting the particulars of a sale from parties to the sale. If a transfer document is not required, questionnaires after the sale can be used. A sales questionnaire, which requests the type of information listed in Section A.2, is one practical means of confirming sales. Telephone or personal interviews can be more comprehensive than mailed questionnaires. Forms with space to record the same types of information should be used for such interviews. Appendix H contains a model sale confirmation questionnaire (additional sample sales questionnaires and interview forms can be found in *Improving Real Property Assessment* [IAAO 1978, 95–104]).

Mailed sales questionnaires should be as concise as possible and should include

- a postage-paid return envelope
- official stationery
- purpose of the questionnaire
- contact person
- authorized signature

Forms designed for telephone interviews should include the name and phone number of the contact person. Such forms also should include the date and name of the person conducting the interview along with the number of attempts made to contact a party to the sale.

A.4 Screening Sales

Sales used in a ratio study must be screened to determine whether they reflect the market value of the real property transferred. Specific objectives of sales screening are as follows:

- to ensure that sales prices reflect to the maximum extent possible only the market value of the real property transferred and not the value of personal property, financing, or leases
- to ensure that sales that occurred only during the period of analysis are used
- to ensure that sales are excluded from the ratio study only with good cause (e.g., when they compromise the validity of the study)

Every arm's-length, open-market sale that appears to meet the conditions of a market value transaction should be included in the ratio study unless one of the following occurs:

- Data for the sale are incomplete, unverifiable, or suspect.
- The sale fails to pass one or more specific tests of acceptability.
- A sufficiently representative sample of sales that occurred during the study period can be randomly selected to provide sufficiently reliable statistical measures.

The sales reviewer should take the position that all sales are candidates as valid sales for the ratio study unless sufficient and compelling information can be documented to show otherwise. If sales are excluded without substantiation, the study may appear to be subjective. Reason codes can be established for invalid sales.

No single set of sales screening rules or recommendations can be universally applicable for all uses of sales data or under all conditions. Sales screening guidelines and procedures should be consistent with the provisions of the

value definition applicable to the jurisdiction. Appraisers must use their judgment, but should not be arbitrary. To help analysts make wise and uniform judgments, screening procedures should be in writing. Each sales analyst should be thoroughly familiar with these procedures as well as with underlying real estate principles (Tomberlin 2001).

A.4.1 Sales Generally Invalid for Ratio Studies

The following types of sales are often found to be invalid for ratio studies and can be automatically excluded unless a larger sample size is needed and further research is conducted to determine that sales are open-market transactions.

1. *Sales involving government agencies and public utilities.* Such sales can involve an element of compulsion and often occur at prices higher than would otherwise be expected.
 2. *Sales involving charitable, religious, or educational institutions.* A sale to such an organization can involve an element of philanthropy, and a sale by such an organization can involve a nominal consideration or restrictive covenants.
 3. *Sales involving financial institutions.* A sale in which the lienholder is the buyer can be in lieu of a foreclosure or a judgment and the sale price can equal the loan balance only.
 4. *Sales between relatives or corporate affiliates.* Sales between relatives are usually non-open-market transactions and tend to occur at prices lower than would otherwise be expected.
 5. *Sales settling an estate.* A conveyance by an executor or trustee under powers granted in a will may not represent fair market value, particularly if the sale takes place soon after the will has been filed and admitted to probate in order to satisfy the decedent's debts or the wishes of an heir.
 6. *Forced sales.* Such sales include those resulting from a judicial order. The seller in such cases is usually a sheriff, receiver, or other court officer.
 7. *Sales of doubtful title.* Sales in which title is in doubt tend to be below market value. When a sale is made on other than a warranty deed, there is a question of whether the title is merchantable. Quit claim deeds and trustees' deeds are examples.
1. *Trades.* In a trade, the buyer gives the seller one or more items of real or personal property as all or part of the full consideration. If the sale is a pure trade with the seller receiving no money or securities, the sale should be excluded from analysis. If the sale involves both money and traded property, it may be possible to include the sale in the analysis if the value of the traded property is stipulated, can be estimated with accuracy, or is small in comparison to the total consideration. However, transactions involving trades should be excluded from the analysis whenever possible, particularly when the value of the traded property appears substantial.
 2. *Partial interests.* A sale involving the conveyance of less than the full interest in a property should be excluded from the analysis unless several sales of partial interests in a single property take place at the same time and the sum of the partial interests equals the fee-simple interest. Then the sum of the sales prices of the partial interests can sometimes be assumed to indicate the sale price of the total property. At other times, however, the purchase of such partial interests is analogous to plottage value in which a premium may have been paid.
 3. *Land contracts.* Land contracts and other installment purchase arrangements in which title is not transferred until the contract is fulfilled require careful analysis. Deeds in fulfillment of a land contract often reflect market conditions several years in the past, and such dated information should be excluded from analysis. Sales data from land contracts also can reflect the value of the financing arrangements. In such instances, if the transaction is recent, the sale price should be adjusted for financing (see section A.5.2).
 4. *Incomplete or unbuilt common property.* Sales of condominium units and of units in planned unit developments or vacation resorts often include an interest in common elements (for example, golf courses, clubhouses, or swimming pools) that may not exist or be usable on the date of sale or on the assessment date. Sales of such properties should be examined to determine whether prices might be influenced by promises to add or complete common elements at some later date. Sales whose prices are influenced by such promises should be excluded from the analysis, or the sales prices should be adjusted to reflect only the value of the improvements or amenities in existence on the assessment date.

A.4.2 Sales with Special Conditions

Sales with special conditions can be open-market sales but must be verified thoroughly and used with caution in ratio studies.

5. *Auctions*. In general, auction sales of real property tend to be at the lower end of the price spectrum. Auction sales that have been well-advertised and well-attended may be valid for consideration in ratio studies. The seller also must have the option to set a minimum bid on the property or the right of refusal on all bids (*with reserve*) in order for the sale to be considered valid.

A.4.3 Multiple-Parcel Sales

A multiple-parcel sale is a transaction involving more than one parcel of real property. These transactions present special considerations and should be researched and analyzed before being used in ratio studies.

If the appraiser needs to include multiple-parcel sales, he or she should first determine whether the parcels are contiguous and whether the sale comprises a single economic unit or multiple economic units. Regardless of whether the parcels are contiguous, any multiple-parcel sale that also involves multiple economic units generally should not be used in ratio studies because of the likelihood that these sales include some plottage value or some discount for economies of scale, unless adequate adjustments for these factors can be made to the sale price.

A.4.4 Acquisitions or Divestments by Large Property Owners

Acquisitions or divestments by large corporations, pension funds, or real estate investment trusts (REITs) that involve multiple parcels typically should be rejected for ratio study purposes.

A.4.5 IRS 1031 Exchanges

Internal Revenue Service (IRS) Regulation 1031 stipulates that investment properties can be sold on a tax-deferred basis if certain requirements are met. Sale transactions that represent Section 1031 exchanges should be analyzed like any other commercial transaction and, absent conditions that would make the sale price unrepresentative of market value, should be regarded as valid.

A.4.6 Internet Marketing

Property that sells on the Internet and meets the criteria of being an open-market, arm's-length transaction should be included as a valid transaction in a ratio study. Brokerage and realty firms are using the Internet as an additional method to advertise and market their inventory of property.

A.4.7 Inaccurate Sale Data

Sale information should never be considered absolutely trustworthy. Jurisdictions can reduce the problem by requiring a sale verification questionnaire (see Appendix

H). There should be statutory penalties for persons who falsify information.

A.5 Adjustments to Sale Prices

Sale prices used in ratio studies may need to be adjusted for financing, assumed long-term leases, personal property, gift programs, and date of sale. This is especially true for nonresidential properties. The real property tax is based on the market value of real property alone as of a specific date. This value may not be the same as investment value (that is, the monetary value of a property to a particular investor) and does not include the value of personal property or financing arrangements.

If adjustments for more than one purpose are to be made, they should be made in the following order:

1. adjustments that convert the price to a better representation of the market value as of the date of sale (These include adjustments for financing and assumed long-term leases.)
2. adjustments that develop or isolate the price paid for taxable real property (These include adjustments for personal property received by the buyer, property taken in trade by the seller, the combination of partial interest sales, and incomplete or unbuilt common property.)
3. adjustments for differences in market value levels between the date of sale and the date of analysis

Procedures for adjusting sales prices should be documented and the adjustment factors supported by market data. These requirements imply an ongoing study of local real estate prices, interest rates, and financing practices. Unsubstantiated or blanket adjustments can jeopardize the acceptance accorded a ratio study by making it appear subjective.

A.5.1 Adjustments for Financing

When financing reflects prevailing market practices and interest rates, sales prices require no adjustment for financing. Adjustments should be considered in the following instances:

1. The seller and lender are the same party and financing is not at prevailing market rates.
2. The buyer assumes an existing mortgage at a non-market interest rate. As with personal property, the preferred means of adjusting for financing is by individual parcel. In this instance and no. 1 above, downward adjustments are warranted when (1) the loan appears to be well secured and the contract interest rate is less than the market interest rate, or (2) the loan appears not to be well secured and the contract interest

rate is lower than that required by the market for a loan of equal risk. The amount of adjustment can be computed by capitalizing the difference between monthly payments based on the required market interest rate and those based on the actual interest rate. Market analysis using paired sales (sales of similar properties, some with and some without conventional financing) or statistical techniques can correct for such factors.

3. The seller pays “points” (a percentage of the loan amount). (*Points paid by the borrower are part of the down payment and do not require adjustment.*) When the seller pays points, the sale price should be adjusted downward by the value of the points.
4. The property is sold under a gift program. Gift programs are a type of creative financing for qualified buyers by certain lending institutions that provide the buyer with additional monies to use as part of a down payment or for property improvements. This program is typically associated with low-value properties and can be difficult to discover without a validation questionnaire and/or telephone interview. The gift amount is added to the actual sale price of the property; however, the seller is never in receipt of the gift amount. This gift amount must be deducted from the actual sale price of the real estate prior to statistical analysis.

Adjustments for financing require data on actual and market interest rates, the amount of the loan, and the term and amortization provisions of the loan. Obtaining and properly analyzing such data, as well as estimating the extent to which the market actually capitalizes non-market financing, are difficult and time-consuming and require specialized skills.

A.5.2 Adjustments for Assumed Leases

The sale price of a property encumbered by a long-term lease of at least three years should be adjusted as follows:

- If the contract rent differs significantly from market rent, then the sales price should be adjusted by the difference between the present worth of the two income streams.
- If the contract rent exceeds market rent, the present worth of the difference in the two income streams should be subtracted from the sale price.
- If the contract rent is less than current market rent, the present worth of the difference in the two income streams should be added to the sale price.

A.5.3 Adjustments for Personal Property

Sales screening includes determining the contributory value of any significant personal property included in the sale. Personal property includes such tangibles as machinery, furniture, and inventories and such intangibles as franchises, licenses, and non-compete agreements. Ordinarily, it is not necessary to consider goodwill, going-concern value, business enterprise value, or the like, unless the value of these intangible assets has been itemized in a sales contract or a formal appraisal has been prepared by either party.

It is necessary to decide whether each item included in the sale should be classified as real or personal property. (See *Standard on Valuation of Personal Property* [IAAO 2005], which provides guidance on classification of property as real or personal.)

Sale prices should be adjusted by subtracting the contributory value of personal property received by the buyer. Ordinary window treatments, outdated models of free-standing appliances, and common-grade used furniture included with residential property do not usually influence the sale price of real property and do not require an adjustment unless the items were specifically broken out in the contract as personal property included in the sale price.

If the value of personal property appears to be substantial (10 percent for residential, 25 percent for commercial), the sale should be excluded as a valid sale in statistical analysis unless the sample size is small.

A.5.4 Adjustments for Time

There should be a program to track changes in price levels over time and adjust sale prices for time as required. This step is an important component of a ratio study. Time adjustments must be based on market analysis and supported with appropriate documentation.

Valid time-adjustment techniques are as follows:

- tracking sales and appraisal ratios over time
- including date-of-sale as a variable in regression or feedback models
- analyzing re-sales
- comparing per-unit values over time in homogeneous strata, such as a subdivision or condominium complex
- isolating the effect of time through paired sales analysis
- statistically supported time trend analysis studies

These techniques are discussed in Gloudemans (1990; 1999), *Property Appraisal and Assessment Administration* (IAAO 1990, Appendix 5-3), and *Improving Real Property Assessment* (IAAO 1978, section 4.6). If sales

prices have generally been rising, ratios for sales that occurred after the assessment date tend to understate the overall level of appraisal. Similarly, sales ratios for sales that occurred before the assessment date tend to overstate the level of appraisal. If prices are generally declining, an opposite pattern results. When tracking ratios over time (using the inverse ratio technique) for determining time adjustments, it is important that ratios for chased sales be excluded, since there is no correlation of such sales ratios with the date of sale.

Changes in price levels should be monitored and time adjustments made by geographic area and type of property, because different segments of the market tend to change in value at different rates.

Oversight agencies can make any appropriate time adjustments after making all other adjustments.

A.5.5 Other Adjustments

Adjustments to sales prices should not be made for real estate sales and brokerage commissions; closing costs, such as attorney's fees, transfer taxes, and title insurance; and current or delinquent property taxes. Exceptions to this general rule occur when the buyer agrees to pay real estate commissions and delinquent property taxes, in which case the amounts of the payments should be added to the sale

price if not already included in the sale amount. Other exceptions occur when the seller agrees to pay expenses normally paid by the buyer. Such expenses include loan origination fees and repair allowances. Loan origination fees paid by the seller should be deducted from the sale price. Repair allowances should be deducted from the sales price only if the property was in an unrepaired state on the appraisal date, but sold at a higher price reflecting the value of the repairs. If the sale occurred before the appraisal date and the repairs were made prior to that date, no adjustment should be made (Knight, Miceli, and Sirmans 2000).

A.5.6 Special Assessments

Special assessments are used to finance capital improvements or provide services adjacent to the properties they directly benefit. Typically, the property owner is obligated to make annual payments of principal and interest to a local unit of government over a specified number of years. The sale price of a property encumbered by a special assessment can require adjustment if the current balance of the defrayed amount is significant. The sale price can be adjusted upward to account for this lien. If the effect on market value is significant and can be ascertained, an adjustment should be made.

Appendix B. Outlier Trimming Guidelines

B.1 Identification of Ratio Outliers

It is first necessary to determine a procedure to identify outliers. Outlier identification based on the interquartile range (IQR) uses order statistics (see table B-1) and has been shown to be robust for a wide variety of distributions (Iglewicz and Hoaglin 1993; Barnett and Lewis 1994). The term outlier is often associated with ratios that fall outside 1.5 multiplied by the IQR. A factor of 3.0 X IQR often is chosen to identify extreme outliers. Other outlier identification procedures are found in statistical literature and can be used. Outlier identification and trimming should follow the sales validation process and precede the calculation of ratio statistics and related tests or analyses.

The example in table B-1 demonstrates the use of the 1.5 X IQR procedure to identify outlier ratios. The distribution of ratios often is skewed to the right; therefore, it may be preferable to apply appropriate transformations to the ratios prior to applying the IQR method. For example, the use of logarithmic transformations tends to identify fewer high and more low ratios as outliers.

B.2 Scrutiny of Identified Outliers

The preferred method of handling an outlier ratio is to subject it to additional scrutiny to determine whether the sale is a non-market transaction or contains an error in fact. If an error can be corrected (for example, data entry), the property should be left in the sample. If the error cannot be corrected or inclusion of the identified outlier would reduce sample representativeness, the sale should be excluded.

B.3 Outlier Trimming

Once outliers have been identified and scrutinized and any errors resolved, the next step is to exclude those that may unduly influence calculated statistical measures. For this reason, it is acceptable to trim outliers identified by recognized procedures (for cautionary notes on trimming small samples, see Tomberlin [2001] and Hoaglin, Mosteller, and Tukey [1983]). An example of such trimming is found in Table B-2. However, trimming of outliers using arbitrary limits, for example, eliminating all ratios less than 50 percent or greater than 150 percent, tends to distort results and should not be employed.

Detected outliers should be reported and can be treated in a variety of ways, including trimming (D'Agostino and Stephens 1986). If outliers are to be considered for removal, the analyst can select a procedure to trim all or just the extreme or influential outliers (see table B-2). If a trimming method has been used to reject ratios from the sample, this fact must be stated in the resulting statistical

Table B-1. A Distribution-Free Method for Locating Outliers
(The following procedure identifies outlier ratios that fall more than 1.5 times beyond the range of the middle 50 percent of the arrayed sample.)

Locating trim boundaries

Data set before trimming

Rank	Ratio (A/S)
1	0.611
2	0.756
3	0.762
4	0.853
5	0.867
6	0.909
7	0.925
8	0.944
9	1.014
10	1.052
11	1.178
12	1.367
13	1.850
14	2.500
Median ratio	0.935
QOD	32.271

Steps to locate trim boundaries

1. Locate the first quartile point

Formula to locate the first quartile:

$$(0.25 \times \text{number of ratios}) + 0.25$$

$$(0.25 \times 14 \text{ ratios}) + 0.25 = 3.75$$

3.75 is three-quarters between the third and fourth ranked ratios.

$$\text{Ratio 3} = 0.762$$

$$\text{Ratio 4} = 0.853$$

$$\text{Three-quarters between} = (0.853 - 0.762) \times 0.75 = 0.068$$

$$\text{The first quartile point} = 0.762 + 0.068 = 0.830$$

2. Locate the third quartile point

Formula to locate the third quartile

$$(0.75 \times \text{number of ratios}) + 0.75$$

$$(0.75 \times 14 \text{ ratios}) + 0.75 = 11.25$$

11.25 is one-quarter between the eleventh and twelfth ranked ratios.

$$\text{Ratio 11} = 1.178$$

$$\text{Ratio 12} = 1.367$$

$$\text{One-quarter between} = (1.367 - 1.178) \times 0.25 = 0.047$$

$$\text{The third quartile point} = 1.178 + 0.047 = 1.225$$

3. Compute the interquartile range

The distance between the first and third quartile = interquartile range

$$1.225 - 0.830 = 0.395$$

4. Establish the lower boundary

Lower trim point = first quartile - (interquartile range x 1.5 or 3.0)

$$0.830 - (0.395 \times 1.5) = 0.238,$$

5. Establish the upper boundary

Upper trim point = (interquartile range x 1.5 or 3.0) + third quartile

$$(0.395 \times 1.5) + 1.225 = 1.818$$

Outliers identified:

1.850

2.500

Table B-2. Effects of Outlier Trimming
Outliers identified in Table B-1 trimmed

<i>After 1.5x trimming</i>	
Rank	Ratio (A/S)
1	0.611
2	0.756
3	0.762
4	0.853
5	0.867
6	0.909
7	0.925
8	0.944
9	1.014
10	1.052
11	1.178
12	1.367
Median ratio	0.917
COD	15.649

analysis. Outlier trimming is not mandatory; however, if outlier-trimming procedures are not used, sales with extreme or influential ratios must be thoroughly validated and determined to be highly trustworthy observations because they can play a pivotal role in the ratio study outcome.

B.4 Trimming Limitations

For some distributions, such as when the sample exhibits a high clustering around a specific ratio, the IQR outlier identification method is not appropriate. In such cases the IQR could be quite narrow, leading to the calculation of lower and upper boundaries for outliers and extremes that are quite close to the middle of the data. In such cases, ratios beyond those boundaries should not be automatically excluded, but instead reasonable judgment should be applied to exclude only true outliers or extremes. As one safeguard, analysts can refrain from automatically

deleting any “outliers” or “extremes” inside the boundaries where 95 percent (two standard deviations) of the observations would be expected to lie, assuming a normal distribution of data.

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

In general, IQR-based outlier identification should be undertaken in instances in which sample sizes are sufficient to preclude the aberrant results that can be expected when this procedure is applied to small, highly variable samples.

B.5 Analytical Use of Identified Outliers

After identification, scrutiny, and correction of errors associated with outliers, the procedure can be run again to identify any remaining apparent outliers. If outlier ratios tend to be concentrated in certain areas or other subsets of the sample, they can point directly to systematic errors in the appraisal process and should be stratified and reanalyzed if they are sufficiently representative.

B.6 Reporting Trimmed Outliers and Results

Ratio study reports or accompanying documentation should clearly state the basis for excluding outlier ratios. Statistics calculated from trimmed distributions, obviously, cannot be compared to those from untrimmed distributions or interpreted in the same way.

Appendix C.

Median Confidence Interval Tables for Small Samples

For small samples, tables C-1 and C-2 demonstrate use of a formula based upon the binomial distribution (Clapp 1989) to develop the lower and upper median confidence interval estimates. R_i is the ratio in an array ranked from the lowest ($i = 1$) to the highest (sorted in ascending order). Each confidence interval boundary typically falls between two ratios in the array. The interpolation factor is multiplied by the ratio value and the two are added together to obtain a weighted average. This method should be used for small samples with up to 30 observations (see tables C-1 and C-2). For larger samples the method found in *Property Appraisal and Assessment Administration* (IAAO 1990, p 609) may be used.

Example

Using data from table 1-4 ($n = 17$ ratios) and a 95 percent confidence interval in table C-2:

Lower bound:

$$[0.695 (\text{Ratio}_9) \times 0.9899] + [0.717 (\text{Ratio}_{10}) \times 0.0101] = 0.695$$

Upper bound:

$$[0.933 (\text{Ratio}_{23}) \times 0.9899] + [0.895 (\text{Ratio}_{22}) \times 0.0101] = 0.933$$

Therefore, the 95% median ratio confidence interval in table 1-4 is from .695 to .933.

Table C-1. 90% Confidence Interval Table

n	Lower Bound	Upper Bound
5	$.8800 \times R^1 + .1200 \times R^2$	$.8800 \times R^5 + .1200 \times R^6$
6	$.6333 \times R^1 + .3667 \times R^2$	$.6333 \times R^6 + .3667 \times R^7$
7	$.2286 \times R^1 + .7714 \times R^2$	$.2286 \times R^7 + .7714 \times R^8$
8	$.8643 \times R^2 + .1357 \times R^3$	$.8643 \times R^8 + .1357 \times R^9$
9	$.5667 \times R^2 + .4333 \times R^3$	$.5667 \times R^9 + .4333 \times R^{10}$
10	$.1067 \times R^2 + .8933 \times R^3$	$.1067 \times R^{10} + .8933 \times R^{11}$
11	$.7855 \times R^3 + .2145 \times R^4$	$.7855 \times R^{11} + .2145 \times R^{12}$
12	$.4282 \times R^3 + .5718 \times R^4$	$.4282 \times R^{12} + .5718 \times R^{13}$
13	$.9558 \times R^4 + .0442 \times R^5$	$.9558 \times R^{13} + .0442 \times R^{14}$
14	$.6511 \times R^4 + .3489 \times R^5$	$.6511 \times R^{14} + .3489 \times R^{15}$
15	$.2217 \times R^4 + .7783 \times R^5$	$.2217 \times R^{15} + .7783 \times R^{16}$
16	$.8261 \times R^5 + .1739 \times R^6$	$.8261 \times R^{16} + .1739 \times R^{17}$
17	$.4603 \times R^5 + .5397 \times R^6$	$.4603 \times R^{17} + .5397 \times R^{18}$
18	$.9735 \times R^6 + .0265 \times R^7$	$.9735 \times R^{18} + .0265 \times R^{19}$
19	$.6480 \times R^6 + .3520 \times R^7$	$.6480 \times R^{19} + .3520 \times R^{20}$
20	$.2072 \times R^6 + .7928 \times R^7$	$.2072 \times R^{20} + .7928 \times R^{21}$
21	$.8084 \times R^7 + .1952 \times R^8$	$.8084 \times R^{21} + .1952 \times R^{22}$
22	$.4156 \times R^7 + .5844 \times R^8$	$.4156 \times R^{22} + .5844 \times R^{23}$
23	$.9413 \times R^8 + .0587 \times R^9$	$.9413 \times R^{23} + .0587 \times R^{24}$
24	$.5884 \times R^8 + .4116 \times R^9$	$.5884 \times R^{24} + .4116 \times R^{25}$
25	$.1203 \times R^8 + .8797 \times R^9$	$.1203 \times R^{25} + .8797 \times R^{26}$
26	$.7371 \times R^9 + .2629 \times R^{10}$	$.7371 \times R^{26} + .2629 \times R^{27}$
27	$.3161 \times R^9 + .6839 \times R^{10}$	$.3161 \times R^{27} + .6839 \times R^{28}$
28	$.8687 \times R^{10} + .1313 \times R^{11}$	$.8687 \times R^{28} + .1313 \times R^{29}$
29	$.4831 \times R^{10} + .5169 \times R^{11}$	$.4831 \times R^{29} + .5169 \times R^{30}$
30	$.9876 \times R^{11} + .0124 \times R^{12}$	$.9876 \times R^{30} + .0124 \times R^{31}$

From Table 1-4. Demonstration Ratio Study Report

Rank	Parcel #	Appraised value	Sale price*	Ratio
1	9	\$87,200	138,720	0.629
2	10	38,240	59,700	0.641
3	11	96,320	146,400	0.658
4	12	68,610	99,000	0.693
5	13	32,960	47,400	0.695
6	14	50,560	70,500	0.717
7	15	61,360	78,000	0.787
8	16	47,360	60,000	0.789
9	17	56,580	69,000	0.820
10	18	47,040	55,500	0.848
11	19	136,000	154,500	0.880
12	20	98,000	109,500	0.895
13	21	56,000	60,000	0.933
14	22	159,100	168,000	0.947
15	23	128,000	124,500	1.028
16	24	132,000	127,500	1.035
17	25	160,000	150,000	1.067

Date: 0/0/00. No outlier trimming

* or adjusted sale price

Table C-2. 95% Confidence Interval Table

n	Lower Bound	Upper Bound
6	$.9000 \times R^1 + .1000 \times R^2$	$.9000 \times R^6 + .1000 \times R^7$
7	$.6857 \times R^1 + .3143 \times R^2$	$.6857 \times R^7 + .3143 \times R^8$
8	$.3250 \times R^1 + .6750 \times R^2$	$.3250 \times R^8 + .6750 \times R^9$
9	$.9222 \times R^2 + .0778 \times R^3$	$.9222 \times R^9 + .0778 \times R^{10}$
10	$.6756 \times R^2 + .3244 \times R^3$	$.6756 \times R^{10} + .3244 \times R^{11}$
11	$.2873 \times R^2 + .7127 \times R^3$	$.2873 \times R^{11} + .7127 \times R^{12}$
12	$.8936 \times R^3 + .1064 \times R^4$	$.8936 \times R^{12} + .1064 \times R^{13}$
13	$.6056 \times R^3 + .3944 \times R^4$	$.6056 \times R^{13} + .3944 \times R^{14}$
14	$.1659 \times R^3 + .8341 \times R^4$	$.1659 \times R^{14} + .8341 \times R^{15}$
15	$.8218 \times R^4 + .1782 \times R^5$	$.8218 \times R^{15} + .1782 \times R^{16}$
16	$.4827 \times R^4 + .5173 \times R^5$	$.4827 \times R^{16} + .5173 \times R^{17}$
17	$.9899 \times R^5 + .0101 \times R^6$	$.9899 \times R^{17} + .0101 \times R^{18}$
18	$.7076 \times R^5 + .2924 \times R^6$	$.7076 \times R^{18} + .2924 \times R^{19}$
19	$.3059 \times R^5 + .6941 \times R^6$	$.3059 \times R^{19} + .6941 \times R^{20}$
20	$.8835 \times R^6 + .1165 \times R^7$	$.8835 \times R^{20} + .1165 \times R^{21}$
21	$.5479 \times R^6 + .4521 \times R^7$	$.5479 \times R^{21} + .4521 \times R^{22}$
22	$.0697 \times R^6 + .9303 \times R^7$	$.0697 \times R^{22} + .9303 \times R^{23}$
23	$.7381 \times R^7 + .2619 \times R^8$	$.7381 \times R^{23} + .2619 \times R^{24}$
24	$.3373 \times R^7 + .6627 \times R^8$	$.3373 \times R^{24} + .6627 \times R^{25}$
25	$.8958 \times R^8 + .1042 \times R^9$	$.8958 \times R^{25} + .1042 \times R^{26}$
26	$.5481 \times R^8 + .4519 \times R^9$	$.5481 \times R^{26} + .4519 \times R^{27}$
27	$.0677 \times R^8 + .9323 \times R^9$	$.0677 \times R^{27} + .9323 \times R^{28}$
28	$.7221 \times R^9 + .2779 \times R^{10}$	$.7221 \times R^{28} + .2779 \times R^{29}$
29	$.3063 \times R^9 + .6937 \times R^{10}$	$.3063 \times R^{29} + .6937 \times R^{30}$
30	$.8709 \times R^{10} + .1291 \times R^{11}$	$.8709 \times R^{30} + .1291 \times R^{31}$

Appendix D. Coefficient of Price-Related Bias

The coefficient of price-related bias (PRB) is an index of vertical equity that quantifies the relationship between assessment-sales ratios (ASR) and value in percentage terms. A PRB of 0.043 indicates that, on average, assessment ratios increase by 4.3 percent whenever values increase by 100 percent (e.g., double or double again). The PRB has several technical advantages, including being less sensitive to outliers than the PRD, and also quantifies the statistical significance of observed relationships. Using table D-1 as an example, the measure is found as follows:

1. Compute a value proxy, "value," as 50 percent of sale price + 50 percent of assessed value. To ensure that assessed values and sales prices receive equal weight, assessed values can be divided by the median ratio before summing:

$$\text{Value} = 0.50 \times (\text{AV}/\text{Median}) + 0.50 \times \text{SP}$$

Where:

AV= Assessed Value

SP = Sale Price

Columns (5) and (6) illustrate the calculation. Computing a value proxy based on both assessed values and sales prices minimizes bias inherent in comparing ratios against either assessed values or sales prices alone (see, for example, Gloudemans and Almy 2010, pp 219, 229, 389–391).

2. Take the natural logarithm of the value proxy and divide by 0.693:

$$\text{Ln_Value} = \ln(\text{value})/0.693$$

This is shown in column (7) of table D-1.

Taking logarithms converts the value proxy to a percentage basis, which substantially minimizes the impact of atypically high values (outliers) in the analysis. Dividing by 0.693 allows each increment of 1 to be interpreted as a change of 100 percent. (For example, $\ln(100,000)/0.693 = 16.613$ and $\ln(200,000)/0.693 = 17.613$).

3. Compute percentage differences from the median assessment ratio (column 8 of table D-1):

Table D-1. Illustration of PRB

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sale	AV	SP	ASR	AV/Med	.5(3) + .5(5) "Value"	Indep Var Ln(Value)/.693	Dep Variable (ASR - Med)/Med
1	116,700	114,500	1.019	128,267	121,383	16.893	0.120
2	130,300	121,000	1.077	143,215	132,107	17.015	0.184
3	130,200	133,900	0.972	143,105	138,503	17.083	0.069
4	145,500	139,000	1.047	159,921	149,461	17.193	0.151
5	134,100	145,000	0.925	147,392	146,196	17.161	0.016
6	153,900	156,500	0.983	169,154	162,827	17.317	0.081
7	143,400	161,100	0.890	157,613	159,357	17.286	-0.022
8	156,900	169,500	0.926	172,451	170,976	17.387	0.017
9	169,000	175,000	0.966	185,751	180,375	17.464	0.061
10	149,200	181,000	0.824	163,988	172,494	17.400	-0.094
11	160,100	188,900	0.848	175,969	182,434	17.481	-0.068
12	191,400	205,000	0.934	210,371	207,685	17.668	0.026
13	177,200	216,150	0.820	194,763	205,457	17.652	-0.099
14	205,500	219,000	0.938	225,868	222,434	17.767	0.031
15	206,500	235,000	0.879	226,968	230,984	17.821	-0.034
16	243,800	249,000	0.979	267,965	258,482	17.984	0.076
17	211,600	258,900	0.817	232,573	245,737	17.911	-0.102
18	242,500	263,000	0.922	266,536	264,768	18.018	0.013
19	258,400	305,900	0.845	284,012	294,956	18.174	-0.072
20	265,900	312,500	0.851	292,255	302,378	18.210	-0.065
21	305,700	336,000	0.910	336,000	336,000	18.362	0.000
22	291,600	360,000	0.810	320,502	340,251	18.380	-0.110
23	312,800	399,900	0.782	343,804	371,852	18.508	-0.140
24	352,200	418,500	0.842	387,109	402,805	18.624	-0.075
25	354,900	459,000	0.773	390,077	424,538	18.700	-0.150
Sum	5,209,300	5,923,250	22.578			PRB	-0.120
						Std Error	0.025
	Median	0.910		COD	0.075	t-value	-4.721
	Mean	0.903		PRD	1.027	d.f.	23
	WtdMean	0.879		Sales	25	Sig	0.000

$$\text{Pct_Diff} = (\text{ASR} - \text{Median}) / \text{Median}$$

Where:

PCT_Diff = Percentage Difference

ASR = Assessment-Sales Ratio

4. Regress (3) on (2):

$$\text{Pct_Diff} = b_0 + b_1 \times \text{Ln_Value}$$

Because each increment of 1 in the independent variable represents a 100 percent change in value, the regression coefficient, b_1 , represents the corresponding percentage change in assessment ratios.

Figures D-1 and D-2 below contain plots of assessment ratios with assessed values and sales prices, respectively. Similarly, Figure D-3 is a plot of ratios against the value proxy and Figure D-4 plots percentage differences from the median ratio on logarithms of the value proxy divided by 0.693. In this case, all four plots show a regressive relationship. The PRB quantifies the relationship. As shown toward the bottom of table D-1, PRB = -0.120, meaning that ratios

decline by 12.0 percent when values double (and increase by 12.0 percent when values are halved). The relationship is significant at the 99.9 percent confidence level. The 95 percent confidence interval is -0.172 to -0.067.

To illustrate the relative insensitivity of the PRB to outliers, consider table D-2. Sales prices for the first 15 sales increase by increments of \$50,000: from \$50,000 for sale 1 to \$750,000 for sale 15. The ratios alternate from 0.90, to 1.00, to 1.10. Since the first (lowest sale) has a ratio of 0.90 and the highest sale has a ratio of 1.10, there is minor progressivity. As shown in the upper half of table D-3, the COD is 6.7, the PRD is 0.992, and the PRB is 0.02, all good performance measures.

Now consider sale 16 in table D-2, which is a relative outlier with a sale price of \$2,500,000 and ratio of 0.75. As shown in the lower half of table D-3, the PRD falls well outside of 0.98 to 1.03 and indicates regressivity. The PRB (as denoted in Table D-3 in the column entitled "Coefficients" and "B"), with a benign value of -0.011, is little affected by the outlier and is not statistically significant.

Figure D-1. Plot of Ratios with Assessed Value

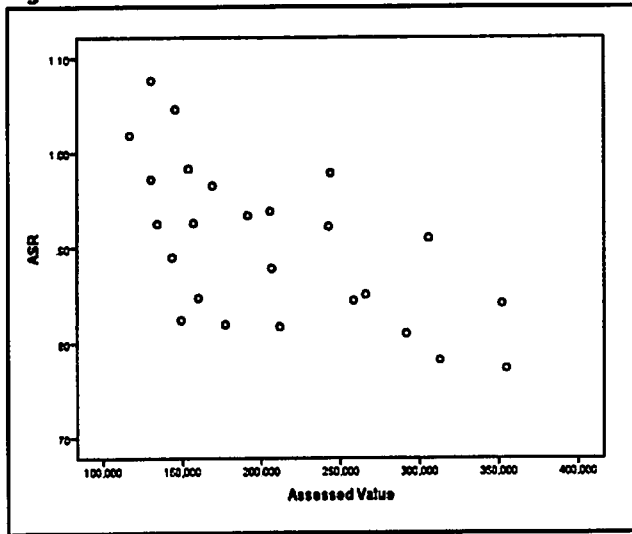


Figure D-3. Plot of Ratios with Value Proxy

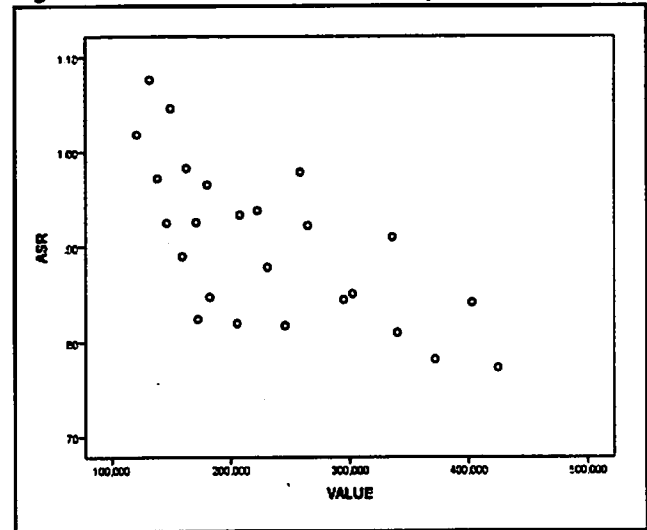


Figure D-2. Plot of Ratios with Sale Price

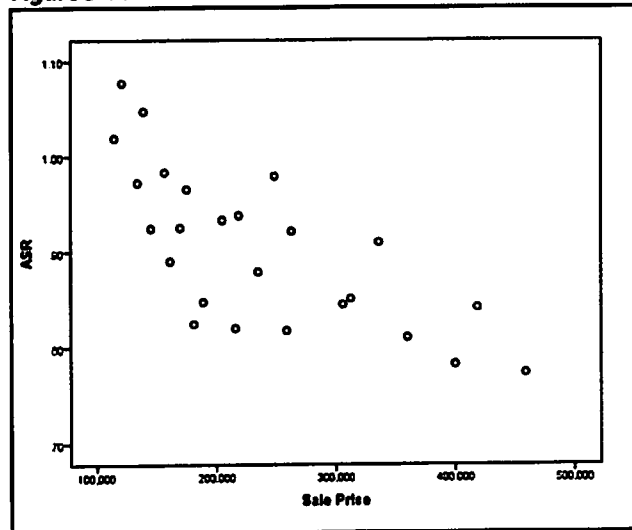


Figure D-4. PRB Plot

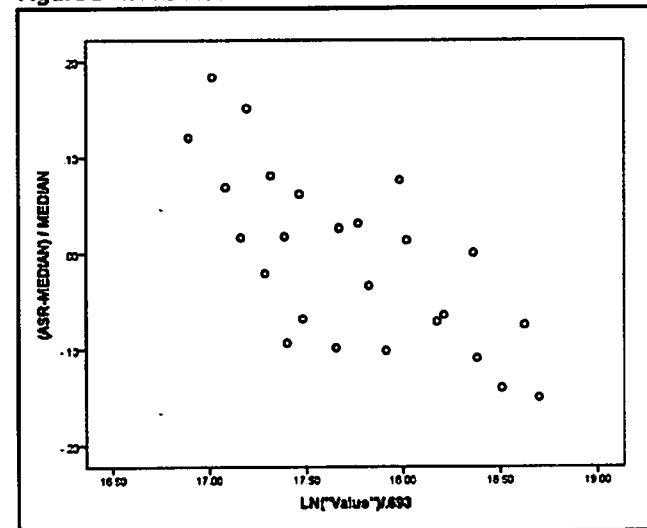


Table D-2. Ratio data with outlier

SALE	PRICE	ASMT	ASR
1	50,000	45,000	0.900
2	100,000	100,000	1.000
3	150,000	165,000	1.100
4	200,000	180,000	0.900
5	250,000	250,000	1.000
6	300,000	330,000	1.100
7	350,000	315,000	0.900
8	400,000	400,000	1.000
9	450,000	495,000	1.100
10	500,000	450,000	0.900
11	550,000	550,000	1.000
12	600,000	660,000	1.100
13	650,000	585,000	0.900
14	700,000	700,000	1.000
15	750,000	825,000	1.100
16	2,500,000	1,875,000	0.750

Table D-3. Ratio statistics with and without outlier

Ratio Statistics for 15 Sales (No Outliers)							
Ratio Statistics for ASMT / PRICE							
Sales	Mean	Median	Weighted Mean	Minimum	Maximum	PRD	COD
15	1.000	1.000	1.008	.900	1.100	.992	.067

Model	Coefficients		t	Sig.	95.0% Confidence Interval for B		
	B	Std. Error			Lower Bound	Upper Bound	
1	PRB	.020	.020	1.032	.321	-.022	.063

Ratio Statistics for 16 Sales (1 Outlier)							
Ratio Statistics for ASMT / PRICE							
Sales	Mean	Median	Weighted Mean	Minimum	Maximum	PRD	COD
16	.984	1.000	.932	.750	1.100	1.056	.078

Model	Coefficients		t	Sig.	95.0% Confidence Interval for B		
	B	Std. Error			Lower Bound	Upper Bound	
1	PRB	-.011	.021	-.520	.611	-.056	.034

Appendix E. Sales Chasing Detection Techniques

As long as sold and unsold parcels are appraised in the same manner and the data describing them are coded consistently, statistics calculated in a sales ratio study can be used to infer appraisal performance for unsold parcels. However, if parcels that sell are selectively reappraised or recoded based on their sale prices or some other criterion (such as listing price) and if such parcels are in the ratio study, sales ratio study uniformity inferences will not be accurate (appraisals will appear more uniform than they are). In this situation, measures of appraisal level also will be unsupportable unless similar unsold parcels were appraised by a model that produces the same overall percentage of market value (appraisal level) as on the parcels that sold based on consistently coded descriptive and locational data.

Assessors and oversight agencies do not need to employ all the detection techniques described in this appendix, but should consider implementing at least one procedure. In some cases, access to assessment information for all properties is necessary to perform the suggested techniques. Agencies that do not have access to these data are at a disadvantage, but should still implement detection techniques, such as those described in sections E.3 and E.4, which do not require such comprehensive assessment information.

E.1 Comparison of Average Value Changes

If sold and unsold properties within a specified group are appraised in the same way, their appraised values should reflect similar average percentage changes from year to year. Accordingly, changes in appraised values for sold and unsold parcels can be compared to determine whether sold parcels have been selectively appraised. Alternatively, the average percent change in value for sample parcels can be compared to that for the population of properties within a specified group or stratum for an indication of selective reappraisal.

For example, if sold parcels are considered representative of a stratum and appraised values increased an average of 10 percent while appraised values for unsold parcels in the same stratum increased an average of only 2 percent, “sales chasing” is a likely conclusion. At a more sophisticated level, the distribution of value changes for sold and unsold parcels can be compared, or statistical tests can be used to determine whether the distributions are different at a given level of confidence.

Statistical significance in the absence of practical significance may be moot. In large samples, small differences

in the magnitude of assessed value changes on sold and unsold parcels can be proven to be statistically significant, yet the actual differences may be slight. Therefore, it is prudent to establish some reasonable tolerance, such as 3 percentage points (e.g., a change of 6 percent for sold properties and 3 percent for unsold properties), before concluding that a meaningful problem exists. Such tolerance applies to other detection techniques discussed below.

E.2 Comparison of Average Unit Values

If sold and unsold parcels are appraised equally, average unit values (for example, value per square foot) should be similar. An appropriate test (Mann Whitney or *t*-test) can be conducted to determine whether differences are significant.

E.3 Split Sample Technique

In this technique, two ratio studies are performed, one using sales that occurred before the appraisal date and one using sales after the appraisal date, both adjusted for date of sale as appropriate. Except for random sampling error and any error in time adjustments, results of the two studies should be similar. Sales chasing is indicated if the results of the first study are consistently better than those from the second. In such a case, the second study is still valid; the first study should be rejected.

E.4 Comparison of Observed versus Expected Distribution of Ratios

Assuming the ratio studies are based on sales that have been properly adjusted for time and other factors, a strong indication of the likelihood of “sales chasing” can be obtained by computing the proportion of ratios that would be expected to fall within a particular narrow range of the mean given the lowest likely standard deviation (although this depends somewhat on the assumption of a normal distribution). For example, with a standard deviation of 5 percent given a normal distribution, about 32 percent of the ratios would be expected to fall within ± 2 percent of the mean (for example, between 98 and 102 percent, given a mean of 100 percent). Except in highly constrained or well-behaved real estate markets, many appraisers consider such a low standard deviation, corresponding approximately to a COD of 4 percent, to be unachievable. Regardless of the distribution of the ratios, the likelihood is extremely low that there would be a sufficiently representative sample with more than this proportion of ratios in such a narrow range. If such is the case, “sales chasing” is a likely conclusion. Sometimes other processes through

which adjustments to assessments on selling parcels are more pronounced than on the population as a whole mimic the effect of sales chasing, such as more intensive reviews of sales than non-sales. Regardless of the practice, the representativeness of the ratio study is called into question and additional tests should be instituted.

Although samples may not be normally distributed, in which case equivalently precise proportions of expected ratios around the median cannot be determined, the 32 percent concentration is very conservative. Finding such a high concentration of ratios around any measure of central tendency is a strong indicator of sales chasing or of a non-representative ratio study. In addition, when the distribution of ratios is bimodal or multimodal, similar significant concentrations of ratios around these modes can indicate selective reappraisal or sales chasing.

Table E-1 demonstrates the conservative nature of the 32 percent concentration. If the minimum achievable COD is, in fact, higher than 4 percent for the strata or property class being analyzed, then even lower concentrations could indicate sales chasing, and previously discussed investigative procedures should be instituted. One disadvantage to this procedure is that it can be misleading when applied to small samples. Therefore the method should not be employed for sample sizes less than 30.

Even when critical proportions of ratios shown in table E-1 are exceeded, further investigation should be conducted before concluding that sales chasing has occurred.

E.5 Mass Appraisal Techniques

Provided sales are sufficient in number, oversight agencies can develop mass appraisal models to apply to a random sample of unsold properties or to the population of properties that are represented by the sold properties. An independent multiple regression or other automated calibration techniques can be used to develop the models. An appraisal ratio study is then conducted for the unsold parcels by using values predicted by the independent models as indicators of market values. This approach has the following advantages:

- It is objective and rooted in the market.
- The models can be reviewed for sufficient reliability before being applied to the unsold parcels.
- The technique yields measures of central tendency, which can be compared against those produced by the sales ratio study and tested for compliance with standards for the level of appraisal.
- The technique takes the form of an appraisal ratio study but avoids the time and expense of single-property appraisals.

Reliability of this method depends on the accuracy and independence of the mass appraisal models used to generate the value estimates. The models must be consistent with appraisal theory and reviewed for sufficient reliability by examining goodness-of-fit statistics. The models should be independent of those used for assessment purposes.

Table E-1. Example of critical ratio concentrations indicative of sales chasing or similar practices

Minimum achievable COD	Standard deviation assuming normal distribution and mean ratio of 100%	Critical proportion of ratios*	z score based on \pm 2% range (Absolute value)	Expected proportion of ratios below 0.98	Expected proportion of ratios below 1.02	Expected proportion between 0.98 and 1.02 (within \pm 2% of central tendency)
1.6%	2.00%	69	1.0000	0.1587	0.8413	0.6826
4.0%	5.00%	32	0.4000	0.3446	0.6554	0.3108
5.0%	6.25%	26	0.3200	0.3745	0.6255	0.2510
6.0%	7.50%	22	0.2667	0.3949	0.6051	0.2102
7.0%	8.75%	19	0.2286	0.4110	0.5896	0.1801
8.0%	10.00%	16	0.2000	0.4207	0.5793	0.1586
10.0%	12.50%	13	0.1600	0.4364	0.5636	0.1272
12.0%	15.00%	11	0.1333	0.4467	0.5530	0.1063
14.0%	17.50%	10	0.1143	0.4545	0.5455	0.0910
16.0%	20.00%	8	0.1000	0.4602	0.5398	0.0796

* Given the assumption that the COD shown represents the minimum achievable COD for the property type, class, or strata being analyzed with the ratio study, sales chasing (or a similar distortive procedure) is very likely if the concentration of ratios with \pm 2% of a measure of central tendency, such as the median or a mode, or 100%, equals or exceeds this value. This proportion is based on values of the standard normal distribution function and assumption that sample size is greater than 30. The critical number equals the integer immediately exceeding the expected proportion.

Appendix F. Alternative Uses for Ratio Study Statistics

In addition to the use of statistical measures to determine underlying assessment level and uniformity, comparisons between measures can provide useful information about sample representativeness, the distribution of the ratios, and the influence of outliers. For example, by comparing the mean and weighted mean, even without determining the PRD, the analyst should be aware that a large difference between these two measures indicates probable influence of atypical ratios on high-priced properties. This in turn could mean that outliers are still present in the sample and that the sample is not representative. Alternatively, it could indicate systematic appraisal error in the appraisal of properties within a particular price range. The geometric mean-to-mean relationship can provide similar information, especially about the presence of very low ratios, which have a greater influence on the geometric

mean. The relationship between the COD and COV can provide similar additional guidance. This standard chooses the COD as the primary recommended measure of uniformity. This choice reflects the expectation of non-normal distributions of ratios. Despite this consideration, it is useful to recognize that, in a normal distribution, the COV is approximately 1.25 times the COD. When the COV/COD ratio exceeds 1.25, the likely cause is a small number of very high ratios, which may again be non-representative.

It is incumbent on the analyst to review the ratio study sample to attempt to provide a representative sample. Comparisons of statistics, such as those given in this appendix, provide an additional tool to help the analyst in this regard.

Appendix G. Legal Aspects of Ratio Studies

Property taxation is governed by federal, state, and provincial constitutions, statutes, and administrative rules or regulations, many of which require uniform treatment of property taxpayers. Ratio studies play an important role in judging whether uniformity requirements are met. Relevant Canadian Federal statutes based on the Constitution Acts of 1867–1975 provide that municipal councils cannot discriminate between taxpayers of the same class within municipalities.

Relevant United States federal provisions include the Bill of Rights, the commerce clause of the United States Constitution, the Fourteenth Amendment, and the Tax Injunction Act (28 U.S.C. § 1341). Together they guarantee basic protections and due process while still granting states the authority to classify property and grant reasonable exemptions. Many constitutions have clauses that require uniformity in the assessment and taxation of property, although some jurisdictions, either by constitution or statute, permit certain differences between classes. Ratio studies provide a gauge of whether uniformity requirements are being met.

A key U.S. federal statute relating to ratio studies is the U.S. Railroad Revitalization and Regulatory Reform Act (“4-R Act”) of 1976 (49 U.S.C. § 11501). The 4-R Act requires that rail transportation property be assessed for tax purposes at no more than 105 percent of the assessment level of other commercial and industrial property in the same taxing jurisdiction. Similar federal statutes relate to air transportation property, motor carriers, and bus lines (49 U.S.C. §§14502 and 40116).

The 4-R Act provides that ratio studies be used to measure alleged discrimination. In such cases, as in any ratio study, the purpose of the study must be clearly defined and the study must be conducted so that it accurately evaluates the issues at hand. Important issues in ratio studies conducted pursuant to the 4-R Act include the proper definition of “other” commercial and industrial property, screening and adjustments to sales data, proper measures of the level of appraisal, and the combining and weighting of centrally valued and locally assessed properties.

Appendix H. Sales Validation Questionnaire

Parcel Identification Number _____	Instrument Number _____
Instrument Type _____	<input type="checkbox"/> Multi Parcel Sale <input type="checkbox"/> Split Sale Recording Date _____

Seller (Grantor) Name _____ Mailing _____ City/ST/ZIP _____ Phone _____ E-mail address _____	Buyer (Grantee) Name _____ Mailing _____ City/ST/ZIP _____ Phone _____ E-mail address _____
Brief Legal Description _____ _____ _____	Property/Situs Address Name and Mailing Address for Tax Statements _____ _____ _____

PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. Special factors:
 - Sale between immediate family members:
SPECIFY THE RELATIONSHIP _____
 - Sale involved corporate affiliates belonging to the same parent company
 - Sale of convenience (correct defects in title; create a joint or common tenancy, etc.)
 - Auction Sale
 - Deed transfer in lieu of foreclosure or repossession
 - Forced sale or sheriff's sale
 - Sale by judicial order (guardian, executor, conservator)
 - Sale involved a government agency or public utility
 - Buyer (new owner) is a religious, charitable, or benevolent organization, school or educational association
 - Land contract or contract for deed
 - Sale of only a partial interest in the real estate
 - Sale involved a trade or exchange of properties
 - NONE OF THE ABOVE
2. Check use of property at the time of sale:

<input type="checkbox"/> Single Family Residence	<input type="checkbox"/> Agricultural Land
<input type="checkbox"/> Farm/Ranch with Residence	<input type="checkbox"/> Vacant Lot
<input type="checkbox"/> Condominium Unit	<input type="checkbox"/> Commercial/Industrial
<input type="checkbox"/> Other: (Specify) _____	
3. Was the property rented or leased at the time of sale? Yes No
4. Did the sale price include an existing business? Yes No
5. Was any personal property (such as furniture, equipment, machinery, livestock, crops, business franchise or inventory, etc.) included in the sale price? Yes No
If yes, please describe _____

- Estimated value of all personal property items included in the sale price \$ _____
6. Any recent changes to the property? Yes No
 - New Construction Demolition
 - Remodeling Additions
 Was the work performed by a professional? Yes No
 Date Completed _____/_____/_____
 Estimated cost of labor and materials? \$ _____
7. Was there a change in use? Yes No
If yes, please explain: _____
8. Does the buyer hold title to any adjoining property? Yes No
9. Was there an appraisal made on the property? Yes No
10. Were any delinquent taxes assumed by the purchaser?
 Yes—Amount \$ _____ No
11. Were the delinquent taxes included in the sale price?
 Yes No NA
12. How property was marketed (check all that apply):
 - Listed with real estate agent Displayed a "For Sale" sign
 - Advertised in the newspaper Offered by word of mouth
13. Was the property made available to other potential purchasers?
 Yes No
If not, explain _____
14. How long was the property on the market? _____
15. What was the asking price? _____
16. Date sales price was agreed upon _____/_____/_____
17. Method of financing (check all that apply):
 - New loan(s) from a Financial Institution
 - Name of lending institution: _____
 - Cash down payment \$ _____
 - Amount \$ _____ Interest rate _____ % Term _____
 - Assumption of Existing Loan(s)
 - Amount \$ _____ Interest rate _____ % Term _____
 - Seller Financing
 - Amount \$ _____ Interest rate _____ % Term _____
 - Trade of Property; Estimated Value \$ _____
 Describe Traded Property _____
 All Cash Not Applicable
18. Total Sale Price \$ _____
19. Was the sale influenced by any unusual circumstances?
 Yes No
If yes, please explain _____
20. Is the total sale price a fair reflection of the market value for the real estate on the sale date? Yes No If no, please explain _____

PRINT NAME - _____

SIGNATURE _____
 GRANTOR (SELLER) Daytime Phone No. (____) _____
 GRANTEE (BUYER) Daytime Phone No. (____) _____
 AGENT Daytime Phone No. (____) _____

Assessment Standards of the International Association of Assessing Officers

Guide to Assessment Standards

Standard on Assessment Appeal

Standard on Automated Valuation Models

Standard on Contracting for Assessment Services

Standard on Digital Cadastral Maps and Parcel Identifiers

Standard on Manual Cadastral Maps and Parcel Identifiers

Standard on Mass Appraisal of Real Property

Standard on Oversight Agency Responsibilities

Standard on Professional Development

Standard on Property Tax Policy

Standard on Public Relations

Standard on Ratio Studies

Standard on Valuation of Personal Property

Standard on Valuation of Property Affected by Environmental Contamination

Standard on Verification and Adjustment of Sales

To download the current approved version of any of the standards listed above, go to:

[IAAO Technical Standards](#)