
# School and Appraisal Districts' Property Value Study

## 2000
## How to Protest and Methods Used

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# How to Protest the Preliminary Findings of the 2000 Property Value Study

## January 2001

This booklet offers suggestions on how to build an effective protest of the Property Value Study's preliminary findings. In this booklet, "district" used alone refers to both an independent school district (ISD) and a county appraisal district (CAD).

### *Who may protest preliminary study findings?*

The law gives school districts and some property owners a right to protest the Comptroller's preliminary findings of taxable property value certified to the commissioner of education. Property owners may protest if their property is used in a school district study and the total tax liability on all of the owner's property in the school district's category sample is $100,000 or more. The Comptroller cannot as a practical matter mail preliminary findings to property owners who may qualify to appeal their study value. Individual owners, however, may request information about values placed on their properties to determine if they wish to protest. To obtain this information, contact staff in the Technical Properties or Field Studies Sections, at 1-800-252-9121.

Comptroller rule allows appraisal districts to protest appraisal performance measures in the same way that school districts protest preliminary value findings.

Petitioners have 40 days after preliminary findings are certified to protest. The Comptroller must hear school district protests and make final value decisions in time for the Texas Education Agency (TEA) to use the findings to distribute state education funds. Comptroller rules combine school district, taxpayer, and appraisal district protests into a single hearing. For example, an appraisal district will give evidence to the hearing examiner at the same time a school district within that appraisal district gives its evidence to the hearing examiner.

The law allows only school districts to appeal the result of their protest to district court. If the school district has filed a timely protest petition signed by the superintendent, the district may appeal to district court. This is true if the school district filed a joint protest with the appraisal district or if the school appoints the appraisal district as its agent.

**Another party's protest may change a school district's values, even if a school district did not file a protest.** For example, an appraisal district may protest to reduce its coefficient of dispersion. The result of its protest could affect one of its component school districts.

### *A Summary of the 2000 Study Protest Schedule*

**If a protest is necessary, school districts, appraisal districts, and property owners must file a protest petition by March 12, 2001.** Hearing examiners will hear protests in May

and will issue written proposed decisions. After proposed decisions are issued, the parties may file exceptions to the proposed decisions. If an exception is not filed within 10 days after the date the proposed decision is sent by facsimile machine or delivered to an overnight delivery service, the proposed decision becomes final. If exceptions are filed, final decisions will be issued in June. The Comptroller will certify final results to the commissioner on or before July 1, 2001.

### Protest Questions

Call Comptroller staff if you have any questions about your preliminary findings or your protest.

# Step 1. Review Preliminary Findings

Chief appraisers, school superintendents, and property owners should carefully review their preliminary findings. **Cooperation between school districts and appraisal districts is essential throughout the process.**

At a minimum, pay close attention to the following when you receive your findings and supporting data:

#### *Are the local values the same as on the Self Report?*

- Are the category values on the summary worksheet the same as those reported on the Self Report?
- Are the homestead exemptions correct?
- Are the tax abatement, pollution control, freeport, and other exemptions reported correctly? Is the tax paid to a tax increment financing reported correctly?
- Is the levy lost to the over-65 tax freeze correct?

#### *Are there clerical errors in the sample properties?*

- Are the correct appraisal roll values listed?
- Is each sample property located in the right school district?
- Are the selling prices and sale dates correct?
- Are the ages and square footages of the improvements correct? (Age by itself should not be protested. Age is relevant only if it significantly affects the improvement's depreciation.)

#### *Does the property sample accurately represent the category?*

- Are the sales included in the sample market transactions?
- Does the sample fairly represent all areas of the school district?
- Does the sample include a representative and reasonable range of building types and ages?
- Does the sample include a reasonable and representative range of property values within the category?
- Does the sample reasonably represent market conditions that existed on January 1 of the study year?
- Generally, look for gaps in the sample's coverage of your district. As long as your level of appraisal (ratio) in unsampled areas is similar to the ratio in sampled areas, the findings will not be significantly affected. However, if your level of appraisal is different in unsampled areas, the findings may be affected.

#### *Do the sample averages seem appropriate for your district?*

- Is the average value per square foot or per acre used in appraisals about right?
- Is the average value per parcel or per structure correct? (Divide the total category or stratum value by the number of parcels or accounts in the category or stratum.)

#### *Do the appraisal performance measures seem reasonable?*

- Given the last time the appraisal district reappraised the category, do the ratios appear reasonable?
- If the school or appraisal district has a ratio study of its own, are the ratios and coefficients of dispersion comparable?

List all corrections you want on the *Sale/Appraisal Ratio Study* form for the category the property is in (or an equivalent form). You must deliver your protest and all supporting evidence to the Property Tax Division (PTD) Manager by March 12, 2001.

# Step 2. Prepare Protest Evidence

You may present any relevant evidence for the hearing examiner's consideration. This section outlines the kinds of evidence staff considers when reviewing the evidence to make recommendations to resolve the protest.

Your preliminary findings may be changed only if you file a written protest petition with the Property Tax Division Manager.

Remember that you **must** deliver your protest petition, including **all** of your supporting evidence, by March 12, 2001. Petitions filed, faxed or postmarked after March 12 cannot be accepted.

This booklet refers to forms the agency provides for protests. Completing the forms as suggested in this booklet assures that you have met Government Code requirements for protesting.

Division staff will review all submitted evidence and make recommendations for resolving the protest. You should review the recommendations and tell PTD whether you agree or disagree. If you agree, your protest will be resolved and a hearing will not be required. If you disagree, PTD will schedule a hearing, unless you wish to have your protest hearing conducted in writing. If you want a hearing by written submission, call the Reporting Section at 1-800-252-9121.

**A Comptroller rule requires you to organize your evidence by category. The rule also requires you to list each specific change and state the**

**reason why the change will make the study more accurate. The Comptroller will reject any petition in which changes requested are not identified and adequately explained.** ***To avoid confusion, you should identify each appealed property by its PTD-assigned account number.***

Until March 12, you may amend your petition or deliver additional evidence. Evidence may not be filed after March 12, 2001.

### Correcting a Report of Property Value

Districts must appeal to correct errors in their *Report of Property Value (self report)*. When used in this booklet, the term self report means the information required on the *School District Report of Property Value*, whether the district submitted the information in electronic or paper form.

Late changes to the appraisal roll also may require self-report changes. To correct a self report after the study's preliminary release, you must file a protest by March 12. In the self report protest you should:

- summarize the changes you request;
- include corrected pages of the self report;
- include a corrected copy of the appraisal roll's real or personal property tax roll summary, including appraisal roll supplements;
- include a copy of the exemption summary to correct the self report's exemptions;
- include a copy of the special appraisal (timber or other special agricultural use) tax roll summary to correct your self report's productivity appraisal data; and
- write *SR* in the category blank on your *Statement of Evidence* form.

If you find an error in the self report's property category breakdown, you should file a revised report, explaining the requested changes and including documentation verifying the changes you request. Documentation may include a tax roll recap, appraisal review board orders, court orders requiring value changes, and other evidence of the value change.

Refer to the Comptroller's *Property Classification Guide* for information on how to classify property correctly.

### Correcting a Clerical Error

A clerical error is a transcription error, such as an error in listing the appraisal district value, a date, a sales price, an account number, the location of the property in a particular district or other error that does not reflect the data PTD intended to record. To correct a clerical error in the preliminary findings, you must:

- file a petition before the deadline;
- use the *Sale/Appraisal Ratio Study* form for the property category in which you found the clerical error; and
- list the data you want to correct.

You also must file copies of documents that verify the correction, such as the correct appraisal card, deed or other supporting evidence. Usually, the staff resolves clerical-error and self-report protests before hearings are held.

### Correcting Sample Representativeness

A value-stratified weighted mean appraisal ratio is a mechanism used to adjust the sample to represent the population from which it is drawn. Staff uses value-stratified ratios, whenever feasible, to estimate market values for residential property (Categories A and B), vacant lots (Category C), commercial property (Categories F1 and L1), and minerals (Category G). These ratios are stratified by value class within each category if reasonably accurate stratification data are available from one of two sources: stratification surveys or electronic appraisal rolls. If stratification data are not available from one of these sources, staff uses non-stratified weighted mean appraisal ratios to estimate market value. (For a detailed discussion of computation of a *value-stratified weighted mean appraisal ratio*, see page 16.)

If the makeup of the sample is significantly different from the makeup of all properties in the category, you may want to challenge representativeness. For example, if the sample does not include sales of a particular subcategory (such as brick veneer houses), from a particular area (such as lake front lots or a new subdivision) or from a particular value range (such as lots selling at $5,000 to $10,000) that constitutes a significant portion of category value, the representativeness of the sample may be questionable.

To assess whether or not the sample is representative, you will need data on the characteristics of properties in the category and information showing how the particular characteristic is distributed over the population. If your sample is stratified, you should show that the issue of sample representativeness is not resolved with value stratification.

**The fact that the sample excludes some value strata or types of property does not, however, necessarily mean that the category value is inaccurate. Only if the omitted property type is a significant portion of the category value and appraised at a level different from the properties in the sample is the category value likely to be inaccurate.** If you believe this is the case, your protest should include supporting evidence.

Your protest should include a statement detailing your reasons for challenging the representativeness of the sample and propose a different stratification. Include in your evidence your proposed stratification and the basis for your proposed stratification. Consider including a comparative analysis for the sample and the category. Value stratification is an efficient method of increasing sample representativeness when properties of different values are on the roll at different appraisal levels.

If you have conducted an independent ratio study in the district (other than gathering additional sales), you may submit the entire ratio study. You should provide a statement showing how you conducted your study and explaining why your ratio study is more accurate than the Comptroller's study. Include the data you used to stratify your ratio study samples.

### *Challenging Individual Sales in a Sample*

You may want to challenge specific sales. If so, Comptroller rules require you to:

- List the challenged sales on the *Sale/Appraisal Ratio Study* form for the property's category and include all the information requested on the form. Give the property's appraisal roll account number, legal description or address, sale date, selling price, and 2000 appraisal roll value. Appraisal roll values you list should reflect the property's value before exemptions are subtracted.
- Attach a statement for each sale stating why you are challenging it. This statement is required by Comptroller rules. You must avoid conclusive statements, such as "the sale is not a market transaction." Instead, state **why** the sale is not a market transaction and **include evidence that shows why**. You may want to attach a photograph of the property and a copy of the appraisal card. If the sale is not a market transaction or involves unusual terms, documentation—such as a sales contract or written statement from the buyer—is helpful.
- State if you want the sale adjusted (changed in some way) or deleted (removed from the sample).
- Provide supporting documentation for any requested adjustments, such as an analysis of the market in which the property is located.

### *Challenging Individual Appraisals in a Sample*

Samples often will include appraisals, particularly when sales are scarce, property types are under represented or when the appraisal district reappraises (or the appraisal review board adjusts) sold properties without reappraising comparable unsold properties. In most cases, an appraisal by an appraiser independent of the appraisal district carries more weight than one by an appraisal district. Comptroller rules require you to:

- List the challenged appraisals on the appropriate *Sale/Appraisal Ratio Study* form, including all information requested on the form. If you think the appraisal is basically correct, but that one or more variables such as construction class or percent good are incorrect, include corrected variables with a detailed explanation and documentation of why it is correct and recalculate the values and ratios. Show your changes. Appraisal roll values should reflect the property's value before subtracting exemptions.
- Attach a statement for each appraisal indicating why you are challenging it. You must avoid conclusive statements such as "this appraisal is not representative" or "the percent good is wrong." Instead, state why the appraisal is not representative. Also consider the following:
- If you think some aspect of the appraisal method should be changed, state all assumptions and sources of the data you used.
- Use a generally accepted manual for cost data and identify the manual you used. Submit all documentation for the schedules you use.
- Justify your depreciation estimates.
- Document your comparable sales and provide a sales adjustment grid.
- If you use the income approach, your statement should document the market data you used, as well as your calculation of market rents, vacancies, and expenses. Attach the income and expense analysis you used. Document capitalization rates with a sales analysis, a band-of-investment analysis, or another generally accepted method. You should adequately explain and document income and expense projections.
- Remember that generally accepted techniques for the conduct of a ratio study do not require you to use all three approaches to value.
- If you think a sample is not representative, explain why and submit documentation.
- Submit a clear photograph of the property and a copy of the appraisal card for each challenged appraisal. You may need more than one photograph to document the property's characteristics. Keep copies of the photographs you send.

### *Challenging Time Adjustment Factor*

If you think the staff's time adjustment factor is wrong, you should submit the following:

- A list of the staff's sample on the appropriate *Sale/Appraisal Ratio Study* form. Provide all data requested by the form, but substitute your time adjustment factor and recalculate the values and ratios. Highlight the time adjustment factor.
- A resale, matched pair or other analysis supporting your time adjustment factor.

If you are submitting new sales solely to challenge the time adjustment factor, check the "other" space at the top of the *Sale/Appraisal Ratio Study* form and write "time adjustment" in the space provided.

### *Deleting Sales from a Sample*

If you find non-market transactions in the sample, you should request their deletion or adjustment. Staff will review the request. Staff's review and recommendations are intended to ensure correct overall study results. If non-market transactions other than those listed by the protesting district are found, it is staff's obligation to recommend deleting those sales. If adjusting a sale results in a more correct sample than deleting the sales, staff may recommend adjusting the sale instead of deleting it. So, staff's recommendation may include deleting all non-market transactions from the sample or may include sale adjustments rather than deletions.

If the sample was randomly selected, staff may replace any sales deleted during the appeals process with alternative randomly selected sales. If a shortage of alternative sales prevents PTD from reaching its target margin of error, PTD may recommend randomly selecting properties to appraise for inclusion in the sample. **In any event, the new ratio may be higher or lower than the ratio originally appealed.**

### *Adding Sales to a Sample*

PTD staff selected the sales in each sample by one of these methods:

- Census. Staff selects all the market sales that occurred in a given time period.
- Random selection. Staff selects the sample randomly so that all the market sales in a given time period have an equal chance of selection.

You will usually have the most effective argument for adding sales if your evidence shows your sales improve the sample's representativeness; that your sales are accurate, arm's-length indicators of market value; and that you selected your sales without bias.

Make sure these sales do not duplicate the staff's sample properties and each has a date within the existing study time frame. If the sales you want to add were selected from a population of sales, you must include the entire population from which they were drawn. If you think some of the sales from the population should not be included because they are not market transactions, or for some other reason, you must provide supporting evidence.

Staff may recommend including the additional sales to the sales population and randomly selecting a new, more representative sample from this array, rather than including the requested sales in the sample. Alternatively, staff may recommend adding all available sales to the sample or adding all or randomly selected sales to certain value strata.

To request adding sales to the sample, you should:

- List all sales on the appropriate *Sale/Appraisal Ratio Study* form,* and include all information requested on the form. Show appraisal roll account number, legal description or address, sale date, selling price, and 2000 appraisal roll value. Appraisal roll values should reflect the property's value before subtracting exemptions. Please attach any relevant information about the terms and conditions of the sale.
- Include only market transactions. According to the International Association of Assessing Officers (IAAO), non-market sales should not be used in a ratio study. See the IAAO's *1999 Standard on Ratio Studies* for more details about non-market sales and for a discussion of sales with special conditions and sales by large business entities. Some typical examples of non-market sales, according to the IAAO, are:
  - Sales involving governmental entities or public utilities. These are generally forced sales, such as condemnation sales.
  - Sales involving charitable, religious or educational institutions. These are often full or partial gifts and thus not representative of market value.
  - Sales in which a financial institution is the buyer. These sales are often made in lieu of a foreclosure and are not exposed to the open market. However, open-market sales in which a financial institution is a willing buyer, such as the purchase of vacant land for a branch bank, are likely to be valid. Sales in which a financial institution is the seller should be viewed cautiously but may be valid if made on the open market.
  - Sales between relatives or corporate affiliates. These are not usually open-market sales and are usually made at prices favorable to the buyer. Corporate sales often require considerable research to determine legal relationships.
  - Sales of convenience. Sales of this kind are made to change or correct the title or deed. The grantee and grantor may be the same, and the sale price is usually nominal. A review of the deed is usually the best way to identify whether the transaction is a sale of convenience.
  - Estate sales. Sales in which the buyer is an executor or trustee are usually non-market sales at a nominal sales price. Sales from an estate may be used to satisfy the debts of the deceased or the wishes of an heir; otherwise, sales in which an estate is the seller may well be valid market sales.
  - Forced sales. Forced sales sometimes result from a judicial order. The seller is normally a sheriff, receiver, or other court officer. If the auction is well advertised and well-attended, the sale price may be at market value. On the other hand, an auction in which the receiver is required to accept whatever bid is offered is known as an *absolute auction* and produces sales that are always invalid for ratio studies.
  - Sales of doubtful title. Sales in which the title is in doubt tend to be below market value. Properties than sell with a quitclaim deeds or trustee's deeds may not have a merchantable title.
- Make sure you submit the correct sale price and supporting evidence to validate the sale price. Warranty deeds are not good evidence unless the full consideration is stated. Closing statements, sales agreements, written confirmations, and sales reporting service documents are good documentation.
- Use the staff's time adjustment (if any), unless you are protesting the time adjustment factor.
- Calculate the individual appraisal ratio for each sale.

### *Adding Appraisals to a Sample*

Though sales are usually the best evidence of market value, they are sometimes scarce. Therefore, you may choose to submit appraisals to enhance sample representativeness. However, appraisals are sometimes difficult to support as evidence because of the assumptions required in the process. Addressing errors or non-representativeness in the sample is usually more efficient than submitting alternate appraisals.

Appraisals have more weight if performed by an independent expert representing the district, someone who follows recognized professional appraisal standards and whose personal interests are not tied to the outcome of

*Sales may be submitted in electronic format, if all the information requested on the form is included.

the hearing. Remember, generally accepted techniques for conducting a ratio study do not require three approaches to value.

Information for appraisals should be submitted with the items listed below in mind.

- Remember that the study's appraisal date is January 1 of the study year. You should justify using appraisals for other dates and document all time adjustments.
- List all appraisals on the appropriate *Sale/Appraisal Ratio Study* form and include all information requested on the form. Appraisal roll values should reflect value before subtracting exemptions.
- Appraisals are made for various purposes with various value criteria, i.e., loan value, insurance value, and investment value. Appraisals used in the study must be at **market** value. Market value is defined in Section 1.04(7), Property Tax Code.
- Appraisals are most appropriate as evidence when there are no sales for a category or the sales available do not properly represent the category. If you want to add appraisals to improve representativeness, include data indicating why the staff's sample is not representative (See the discussion of *Correcting Sample Representativeness* on page 3.)
- If you plan to submit a number of appraisals, either select the properties to be appraised randomly or justify your alternate selection process. The final sample should represent an appropriate range of values and property types within the category. No matter how accurate the appraisals, a sample has little or no weight if it appears the properties were selected to achieve a particular ratio or value.
- Submit a clear photograph of the property and a copy of the appraisal card for each property you appraised. You may need more than one photograph to document the property's characteristics.
- Submit a supporting statement for each appraisal that identifies the appraiser and describes the appraiser's qualifications. This statement also should show the appraiser's assumptions and identify all data sources, particularly for cost, income and expense data. The statement should state and support depreciation estimates. It should list comparable sales and include an adjustment grid. If the appraiser used an income approach, the statement should document rent calculation, capitalization rate selection, income projection methods, and sources of the data. Finally, the statement should give the date for which the appraiser estimated market value.

***Market value*** means the price at which a property would transfer for cash or its equivalent under prevailing market conditions if:

(A) exposed for sale in the open market with a reasonable time for the seller to find a purchaser;

(B) 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

(C) 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.

### *Protesting the Productivity Value in Category D: Rural Real Property*

Category D includes rural real property that qualifies for productivity valuation (Category D1) and rural real property that does not qualify (Category D/E). The property that does not qualify is appraised at market value and is protested similarly to Categories A, B, and C.

The Property Tax Code requires appraisal districts to appraise qualified property at both market value and productivity value. Productivity value is based on an agricultural property's ability to produce agricultural or timber products.

The Comptroller's 2000 productivity value estimates are based upon the capitalized value of the average net agricultural or timber income generated by the land (net to land). For agricultural properties, staff estimates net to land for the various land classes for 1994 through 1998. The net to land is calculated using the income that would be due to the landowner under the lease arrangement (share or cash) typical of the area for the land class. All typical expenses directly attributable to the agricultural use of the land paid by the owner are subtracted from the owner's income to arrive at the net to land for that land class. The five years of net to land estimates are averaged and then divided by the mandated capitalization rate to determine the qualified land's appraised value. For more detailed information, see the *Manual for the Appraisal of Agricultural Land.*

The Comptroller's 2000 timberland value estimates are based upon the capitalized value of the average net to lands for 1995 through 1999. The net to land means the average net income that would have been earned by a person using ordinary prudence in the management of the land and the timber produced on the land. More detailed information is available in the *Manual for the Appraisal of Timberland.*

Protests of agricultural land's productivity value estimates frequently challenge the landowner's shared income or expenses for the land. The most effective evidence for these protests should include actual lease agreements specifying the shared crop proceeds and expenses. Summaries of cash or share lease information are also acceptable if the summary includes the names of the leasing parties, the acreage involved, and the terms of the lease. Evidence supporting the amount of landowner expenses could include actual receipts or information from local companies submitted on their company letterhead. Protests should identify the specific income and/or expense items being protested. Since

agricultural land's productivity values are based on five years of information, any evidence submitted should reasonably identify the year the information covers.

Information supporting protests of timberland value estimates will be more effective if supported by any of the five recognized sources of information specified in Section 23.71 of the Property Tax Code. Those sources are: U.S. Forest Service, U.S. Geological Survey, the Soil Conservation Service (now the Natural Resources Conservation Service), the Texas Forest Service, and colleges and universities within this state.

If your protest deals with appraisal issues such as income, it is a D1 appeal. If it deals with changes from land class to land class, it is a self-report appeal. A protest to correct *self-reported* acreage breakdowns or appraisal district values is a *self-report* protest. The district should write SR in the category blank on the protest. A protest of PTD's per acre values should be labeled as a Category D1 protest.

### *Protesting Categories F1 and L1*

The study's appraisal ratios and district value estimates for commercial property are divided into two categories. Category F1 is commercial real property and L1 is commercial personal property.

Correcting sample representativeness and other issues discussed on page 3 for other categories also apply to F1 and L1.

### *Challenging Individual Sales in an F1 Sample*

You should review all sales to ensure the appraisal district values are accurate. If any sales in the Category F1 study include the value of property listed in other categories (such as business personal property), the category ratio may change. Staff may be comparing a total sales price to a partial appraisal district value. This error typically occurs when an ongoing business is transferred to another party that continues to operate the business. You also should examine all sales for unusual terms or conditions. If these are present, you should supply evidence supporting your position.

### *Challenging Individual Appraisals in an F1 or L1 Sample*

Challenging appraisals included in a Category F1 or L1 sample may require the staff and district to make conclusions without sales as evidence of value. In these cases, the most efficient way to structure a protest is to perform and submit a detailed examination of the property. The examination should identify any erroneous information and appraisal assumptions. Evidence that supports errors identified in appraisals may include photographs of the real estate or personal property, construction costs, comparative sales analysis, or other supportable appraisal techniques.

If you are protesting particular personal property (Category L1) values, the best evidence is copies of company accounting records, income tax returns, asset listings showing original costs and dates of acquisition, supportable evidence of year-end inventories, or photographs showing inventory levels and equipment conditions.

### *Adding Sales or Appraisals of Commercial Properties*

To add sales or appraisals of commercial properties you should:

- Follow the same general guidelines for sales information listed in the section of this booklet describing how to protest Categories A, B, C, D, etc.
- Include a copy of the appraisal card showing the property's 2000 appraisal roll value.
- Record sales on the Category F1 Sale/Appraisal Ratio Study form.
- Include all properties that were part of the sale.
- If you submit independent appraisals, follow the guidelines for submitting appraisals listed on page 6.

### *Protesting Category G: Oil, Gas and Other Minerals*

Mineral properties in Texas are usually appraised using the income approach. The appraiser estimates the value by computing the present worth of a property's expected income using discounted cash flow analysis. Assumptions about the size, distribution, and duration of expected income flows generally define these estimates.

Production decline curves such as rate vs. time, rate vs. cumulative production, surface pressure vs. cumulative production, bottom hole pressure/Z factor vs. cumulative production, and type curves are used to appraise oil and gas properties. The production forecast and economic evaluation methods are based on the principle that a mineral lease's future production can be predicted and its economic value can be estimated based on past performance and related reservoir characteristics.

### *Challenging Individual Appraisals in a Category G Sample*

Projections of future lease production, product prices, lease operating costs, and the rate at which future income is discounted to the present (the discount rate) are important variables in appraising mineral properties. Your protest should center on why you think one or more of the variables used by the staff were not correct. Whether local mineral properties are appraised through contract with a professional valuation firm or in-house by appraisal district staff, please supply the following data:

- Comptroller lease number,
- Railroad Commission (RRC) district numbers,
- RRC identification numbers,
- Oil or gas identifier,
- January 1 start rate of principle product and forecast scenario,
- Product prices (oil price, gas price) and a description of your assumptions about future prices,
- Lease operating costs and escalation scenario (dollars/year),
- Discount rate, and
- Remaining economically recoverable reserves.

In addition, the following data is helpful:

- production-history curve (barrels of oil per month or million cubic feet of gas per month),

- pressure-production decline curve (pressure vs. cumulative gas production or bottom hole pressure/Z factor vs. cumulative gas production) for gas leases,
- water cut vs. cumulative production, and
- work-over, well treatment data.

Please check the appraisal roll values for the properties. If you or your appraisal firm disagree with any of the variables used in the staff's appraisals, you should document the differences or areas of disagreement and file a protest.

### Correcting Category G Sample Representativeness

Category G consists primarily of oil and natural gas producing properties, lignite and sulfur mines, and non-producing minerals. These mineral properties are divided into three subcategories. Subcategory G1 consists of oil and natural gas producing properties. Subcategory G2 consists of mines and quarries including lignite, sulfur, and other mineral reserves. Only exception properties are selected for category G2. Subcategory G3 consists of non-producing mineral properties defined as real property. Subcategory G3 typically consists of little value and is assigned the local tax roll value.

The division samples mineral properties in school districts if the mineral category represents 5 percent or more of the total school district value. Subcategory G1 sample is selected from the current year data provided by the appraisal firms and county appraisal districts. The low-value stratum is assigned the local tax roll value and contains property that make up the lowest 5 percent of the property subcategory's value in the school district. The high-value stratum or "Exception" properties are leases with a value of 20 percent or more of the total subcategory value in that school district. All Exception properties are selected for the sample.

After removing the high-value and low-value properties, staff stratifies the properties into four strata. Then staff randomly selects the leases to be appraised for the property value study.

The resulting ratio is based upon application of the ratios found to their respective populations reported. You may challenge the representativeness of the sample by the same methods discussed earlier under *Correcting Sample Representativeness* on page 3.

When submitting additional appraisals, you should provide all necessary variables for each property for staff review (see list of variables under "Challenging individual appraisals in a Category G sample" above). When requesting removal of an individual property in the sample, you should document why the particular property should not be included. In either case, you should provide information about the amount of value and number of leases for each kind of lease in the district.

### Protesting Category J: Utilities

The utility sample in each school district is based entirely on appraisals. Comptroller staff appraises each utility company as a unit, then allocates this unit value to school districts that have the utility company's property. Next, the staff compares the allocated values to the appraisal district's tax roll values to develop ratios and estimate taxable values.

The Comptroller will release copies of utility company appraisals on request. The unit appraisal may give you enough information to identify problems. If you find problems, you should document them with sufficient evidence to support the change you want.

The investment information that staff uses to allocate value is confidential. If requested, staff can supply non-confidential information to help you in your review. Included in the school and appraisal districts' preliminary mailout is a list of the companies that are in the utility sample. The school district weighted mean appraisal ratio appears at the bottom of the listing. In addition, the list shows the company number, appraised value, staff market value estimate, and an appraisal ratio for the company tested. A review of this printout will help you determine which company's appraisal may be in error. In addition to the information shown on the printout, you may request:

- a table showing company names and numbers,
- a listing of railroad trackage, type of track, and assessed values for railroad companies included in your district's utility sample,
- a list of pipeline company segments included in your district's utility sample, including the age, diameter, and mileage of each segment sampled, and
- the unit appraisals of utility companies included in the 2000 Property Value Study.

If you think the properties included in the Category J sample are not representative, you should submit evidence that supports the exclusion of property or the inclusion of additional properties.

When protesting Category J values, you should take the following steps.

- Review the appraisal roll values used to determine if they are correct. If you find an error, you should provide a copy of the appraisal card or appropriate portion of the tax roll.
- Review all mileage and other physical characteristics listed on the printout to find any errors. Again, if you find errors, you should provide documentation of the correct information.

If you think that the staff's value or allocation of value is incorrect, your protest should include all evidence necessary to support your position. This evidence may include:

- your unit value appraisal;
- valuation schedules;
- detailed listings of the physical property;
- investment information; and
- other valuation data.

### Individual Property Owner Protests

A property owner may protest the study's preliminary findings if the property tax liability for all of the

owner's properties in a school district category sample is $100,000 or more for the year of the study.

School districts, appraisal districts, and the property owner are subject to the same general protest petition filing requirements, deadlines, and other protest procedures. There are, however, some differences.

- The property owner or property owner's agent must sign the protest petition.
- The owner must be prepared to show the hearing examiner that the total tax liability on the property or properties included in a school district's category sample is $100,000 or more. The Comptroller's rule gives the hearing examiner responsibility for determining whether the hearing examiner has jurisdiction over the protest. If the owner cannot show the total tax liability is $100,000 or more for the year of the study, the examiner does not have authority to hear the protest.
- The property owner is not required to notify districts that may experience changes as a result of the protest. Districts may call the PTD's Reporting Section after the filing deadline to find out if a property owner in the district has appealed. Likewise, although the Comptroller sends each district a new summary of final values, a district may call the PTD's Reporting Section to find out if the result of an owner's appeal has changed its value or measures.
- The filing instructions in Step 3 apply in general to property owner protests.

If you are a property owner and want more information on submitting a protest, call the Reporting Section at 1-800-252-9121.

# Step 3. Prepare and File Protest Petition

A school district, appraisal district, or property owner must file a petition by March 12 to protest the Comptroller's preliminary findings.

This section gives instructions on using the agency's sample protest forms. These forms are not required by rule but using them will help ensure you comply with the Government Code and the Comptroller's rule concerning the contents of a protest. The forms will help you organize your evidence and present it in a standard format to help staff more quickly review the protest.

There are four types of protests: a school district protest; an appraisal district protest; a joint school and appraisal district protest; and a property owner protest.

An appraisal district doesn't have to protest—jointly or otherwise—just because one of its component school districts is protesting. Likewise, an ISD doesn't have to protest when its appraisal district protests. However, the Comptroller's rule requires a school district to notify each appraisal district that appraises property for the district about its protest. In addition, a protesting appraisal district must send its notice of protest to each school district that participates in the appraisal district.

### *File only one petition.*

A petitioner may file one, and only one, protest petition. This requirement is true whether you are protesting one or all categories of property. Although you may submit only one petition, you may have more than one person gather and present evidence. Assume that you want Appraiser B to gather and present Category J evidence and your agent to handle the evidence on all other categories. The correct approach is to file one petition, name the agent, and give written authorization for Appraiser B to present Category J evidence.

An authorization statement appears at the bottom of each category evidence form. **The division will review evidence filed by a person other than the agent only if the person has written authorization from the agent or district to submit the evidence.**

### *Name the school or appraisal district and the type of protest.*

Provide the name of the school or appraisal district. Specify if you are protesting the Comptroller's findings on behalf of the school or appraisal district, property owner or a combination.

### *Identify your agent.*

Provide the name, address, telephone number, and fax number of one person who is knowledgeable about the petition and will be available to discuss the protest and make decisions about it. **This individual is the district's agent.** A school district and appraisal district that are appealing jointly must agree on one agent to represent both parties.

Throughout the review process, staff may need to contact the agent with questions about evidence and to send correspondence. All correspondence about the protest, including the decision, will be delivered to the agent.

PTD must have written authorization from the district to replace the first-named agent with a new agent. After a new agent is named, PTD can accept decisions only from the newly authorized agent. PTD also must send all decisions and other correspondence to the newly named agent.

The person listed in the petition as the district's agent does not have to be the person who appears at a hearing on behalf of the protesting party. But, the person who appears must be authorized in writing by the agent to argue and present timely submitted evidence.

The Comptroller will consider only that evidence submitted by the agent or a person authorized by the agent in writing to present evidence. If the district intends for a lawyer to represent it in an informal conference or

hearing, the agent also must designate the attorney in writing.

***Have the petition authorized by the proper officials.***

The superintendent must sign a school district protest. The chief appraiser must sign an appraisal district protest. A property owner or property owner's agent must sign a property owner's protest. Both the chief appraiser and superintendent must sign a joint protest. The authorization statement does several things:

- it authorizes the protest,
- it appoints an authorized agent (the person to whom PTD will direct all official contacts),
- it states that the information submitted in the protest is true and correct to the best of the signer's knowledge,
- it states that a value claimed to be correct has been stated, and
- it states that notice has been given to the proper entities.

***Complete a statement of value claimed to be correct.***

The Government Code requires a district to state the total value it claims to be correct.

This claim may be made on the Comptroller form entitled *Statement of Value Claimed to be Correct*, which is a part of the petition.

***Include separate, completed statements of evidence for each challenged category.***

The petition form is a "cover sheet" for the entire protest. Comptroller rules require you to organize your evidence by property category. An appraisal district that challenges the Comptroller's finding of median level of appraisal should organize its evidence by category and school district. That way, the staff and the hearing examiner can focus more efficiently on the individual property category samples challenged in each school district.

For each category you protest, you also must include the following:

- *Statement of evidence* forms. These forms identify the category challenged, describe the types of evidence you have submitted, and set out the statement of your grounds for the protest.
  In specifying why you think the Comptroller's preliminary findings are wrong, you must specifically state why they are wrong. State the action you want the Comptroller to take and state how the action will improve the study's accuracy.
  The law requires your statement of evidence to be complete enough to confer jurisdiction on the hearing examiner and a district court. So, be clear, detailed and specific.
- All evidence and documents you want staff to review and the hearing examiner to consider. List sales and appraisals on the appropriate *Sale/Appraisal Ratio Study* forms enclosed with your packet. Attach these and any other supporting data to the statement of evidence forms.
- Written authorization if someone other than the agent will submit evidence. The Comptroller will not consider evidence submitted by a person other than the agent unless the person has written authorization. Each statement of evidence has a space for this authorization at the bottom of the form.

***Submit the original and two copies of every document and item of evidence with your petition.***

***File the petition on time.***

The petition and evidence, plus two copies of these documents, **must** be filed by March 12. A petition is timely if it is addressed to the Property Tax Division Manager, sent by first class mail or express mail and shows a postmark date no later than March 12. A petition of fewer than 10 pages may be filed as described above or will be considered timely if received by fax on or before March 12. However, the original must be mailed to the division within three days of the fax.

**A school district, appraisal district, or property owner may not file any evidence after March 12. The protesting party may not raise issues or present evidence not contained in the petition either to the hearing examiner or in the exceptions to the proposed decisions. Any petition may be supplemented or changed before March 12.**

A protesting party may receive one extension of up to ten days if requested in writing five days in advance of the original deadline. The examiner may grant an extension only for good cause. Good cause is something out of the district's control.

Occasionally, staff discovers an error in its study before the deadline to file protests. Staff may make changes, certify new preliminary findings, and notify the district of the change. Each district adversely affected by a change has 40 days to appeal the results of that change. A change is adverse if the school district value rises as the direct result of the change.

***Submit all of your evidence with the petition.***

The petition is an *evidentiary petition*, which means that it must include all evidence that the school district and appraisal district will rely on to challenge the Comptroller's preliminary findings. This requirement's purpose is to give the agency's staff enough time to look at all available evidence, try to resolve a protest without a hearing, and hold a hearing if necessary. Staff cannot review late-filed evidence and may make a motion to the hearing examiner that late evidence be excluded. The hearing examiner's decision is independent of the staff's recommendation.

**Staff Review and Response**

Staff reviews all evidence as it receives petitions. More often than not protests are settled informally after the staff recommends adjustments to appraisal performance measures or market value estimates. Staff may request additional evidence that could help resolve the protest. Districts have 10 days from the date of the request to submit this evidence. Evidence requested in this manner but not provided to staff may not be used in a protest hearing.

The 10-day rule is not intended to complete a protest filed without

sufficient evidence. The PTD staff will request additional evidence under the "10-day rule" only when the issue could be resolved by production of "self-proving" documents (such as a warranty deed or closing statement to prove the market nature of a sale).

The Comptroller's duty is to ensure the study's accuracy, therefore, staff's review of an appeal is not limited to merely those specific items raised by an appeal. A full review of protested categories and a recommendation devised to ensure accuracy are necessary for staff to meet its obligation.

**Because an appeal in a category opens up the entire category to staff review, staff's recommendations may include changes not requested by the protest.** For example, a protest requesting that some non-market transactions be deleted from the sample may result in a recommendation that all non-market transactions be deleted from the sample. Likewise, a protest suggesting that some sales be added to the sample could result in a recommendation that all known sales be added to the sales population and a new sample randomly selected from that population.

Protests that are not resolved through staff review and recommendation or a resolution conference will be presented in a formal hearing before a hearing examiner. **At the hearing, staff's recommendations have no more force or authority than the protesting party's.**

# Step 4. Schedule Hearing.

The agency will notify each protesting party's agent of the date and time of the hearing after it receives the protest. While the division's goal is to be as accommodating as possible, hearing dates cannot be rescheduled without creating serious difficulty in controlling the flow of protests. Therefore, staff will not reschedule a hearing without a showing of good cause. Consolidation of hearing dates for the convenience of an agent or attorney is *not* good cause for rescheduling.

After reviewing your protest, staff mails a *Conference and Hearing Form* along with the written recommendation on your protest. You may request that the hearing be conducted by written submission by selecting that option on the form. The hearing examiner will give your written submission the same weight given to evidence presented in person.

Before the hearing on an unresolved protest, the division schedules an informal resolution conference to explore the possibility of resolving the protest without the necessity of a formal hearing. Staff will notify you of the date set for this informal conference.

These informal resolution conferences may be conducted entirely in writing or, for those who prefer not to travel to Austin, via telephone conference call. Please contact PTD's Reporting Section to discuss the conference call option.

Hearings are conducted by hearing examiners who have been specifically chosen to hear all protests. During a hearing, the protesting party may present oral argument to support its challenge. **However, the protesting party may not raise an issue or request a remedy that was not specified in the petition and may not present oral or written evidence that**

## Checklist for Submitting Protests

**(All questions should be answered "yes.")**

- ❑ 1. For school district appeals, has only one protest petition been completed (per ISD), regardless of the number of categories protested? For other appeals, only one protest petition needs to be completed, regardless of the number of districts and/or categories involved. However, evidence must be arranged by school district, and by category.
- ❑ 2. Is the protest petition signed by the superintendent if it is a school district protest; by the chief appraiser if it is an appraisal district protest; by all protesting parties if it is a joint school district/appraisal district protest; or by the property owner or property owner's agent if it is a property owner protest?
- ❑ 3. Is one and only one agent authorized for your entire protest? (This single authorization is necessary so that the staff will know which one person to communicate with about your protest. Your agent may submit written authorization for others to present evidence by completing the authorization form at the bottom of each Category Statement of Protest and Evidence.)
- ❑ 4. Is there a Statement of Value Claimed to be Correct for each school district included in the appeal?
- ❑ 5. Is there a Statement of Protest and Evidence for each category you are protesting?
- ❑ 6. Does the Statement of Protest and Evidence describe the grounds of protest sufficiently to confer jurisdiction on the hearing examiner?
- ❑ 7. Is the evidence arranged by district in category order?
- ❑ 8. Did you submit an original and two copies of all protest materials?
- ❑ 9. Did you notify the proper districts of your protest?

**was not submitted with the petition.** Admissions, proposals, or offers made in the compromise of disputed issues in a preliminary conference may not be admitted in a hearing.

The hearing examiner's decision is based on the evidence and arguments of the protesting party and the Comptroller's staff. The examiner must issue a written decision. This decision is mailed to each protesting party by certified mail.

### Guidelines for Presenting a Protest

If you appear at a protest hearing, you should present your protest by following these guidelines:

***Restrict your comments.***

You may not introduce evidence you did not already submit by March 12, and you may not protest new categories, issues, or remedies at the hearing. Oral evidence, presented by an agent or attorney, must reflect evidence timely filed with the petition.

***Be organized.***

Unless directed otherwise by the hearing examiner, support your request by:

- stating the name of the school district;
- presenting your protest in category order:
- summarizing the evidence you have provided on that property or issue: and
- continuing with the next issue, category or school district.

***Be brief.***

The hearing examiner may set a time limit for the hearing. Brevity will allow time for the hearing examiner to ask questions. You must observe the time limit established for the hearing, regardless of the number of categories you are protesting.

***Stick to the point.***

Bringing up issues that the hearing examiner cannot resolve, such as state education aid allocations, will reduce the amount of time you have to discuss your evidence. While the hearing examiner may be sympathetic, he or she will only consider adjusting preliminary ratios and values based on *relevant* evidence—that is, evidence related to the correct total taxable value for your school district.

## Step 5. File Exceptions to the Hearing Examiner's Proposed Decision

The hearing examiner will prepare and mail your agent the proposed decision on your protest. After you receive the proposed decision, you may file written exceptions to it, but you may not submit any more evidence. Exceptions must be postmarked no later than **ten days** after the date the recommendation was **mailed** to the agent. Other parties will have an opportunity to reply to your exceptions.

Staff may choose to file exceptions to a proposed decision. Staff exceptions will be mailed to your agent. You will have **20 days** from the date the **proposed decision** was **mailed** to reply to staff's or any other party's exceptions.

The examiner will consider all written exceptions and replies. Based on these documents, the examiner may decide to change the proposed decision. However, he or she also may decide to let the proposed decision become final without changes.

If exceptions are not filed within ten days, the proposed decision becomes final. *A school district must file exceptions to preserve its right to appeal the hearing results to district court.*

## Step 6. Appeal a Final Decision

The hearing examiner notifies each protesting party's agent of the final decision if exceptions are filed. The statute permits school districts to appeal the examiner's final decision to the Travis County District Court by filing a petition within 30 days of the date it receives notice of the Comptroller's final decision. The law does not give taxpayers or appraisal districts the right to appeal to district court.

A school district may appeal to district court only those items and issues raised in its petition and exceptions.

Some school districts have asked the division if they are barred from filing a district court appeal when they work through their appraisal districts to file their protest. *School districts are not barred from appealing to district courts simply because they work with their appraisal district to file their protest or protest jointly with the appraisal district.* A school district may appeal to district court if it filed a timely protest petition signed by the superintendent. That protest petition may be either a joint school/appraisal district protest or it may be a separate school-district-only petition.

**The Property Tax Division will accept a protest package by FAX if it is less than ten pages, arrives on or before March 12, and if the originals are mailed within 3 days of the FAX.**

**The FAX numbers are: (512) 305-9801 or (512) 463-2427.**

# Purpose of and Methods Used in the Property Value Study

# Purpose of the Property Value Study

## Legislative Background

The Texas Government Code in Section 403.302 requires the State Comptroller to conduct an annual study to estimate the total taxable value of all property within each school district. This requirement is of primary importance because the state's distribution of several billion dollars in school aid depends in part on the Comptroller's findings.

As a part of this annual study, the code also requires the Comptroller to:

- use generally accepted sampling, valuation, and statistical techniques, ensure that different levels of appraisal on sold and unsold property do not adversely affect the accuracy of the study, and
- test the validity of taxable values and presume that appraisal roll values are correct when values are valid.

The Comptroller's test of "the validity of the taxable values assigned to each category of property by the appraisal district," as required by the Government Code, is accomplished by constructing a statistical margin of error about the Comptroller's estimate of value in each component school district. Values are presumed "valid" when they are within the error margin or when they are within an assigned tolerance range.

Section 5.10 of the Property Tax Code requires the Comptroller to determine annually the level and uniformity of property tax appraisals in each appraisal district by using data collected in the annual school district study discussed above. The school district study required by the Government Code and the appraisal district study required by Section 5.10 of the Property Tax Code are jointly referred to as the Comptroller's Property Value Study.

In Texas, state education aid is based in part on the per pupil wealth of a school district. The commissioner of education uses the Comptroller's estimates of taxable value to calculate the state funds each district receives.

*Taxable value* is the estimated property wealth of each school district for state funding purposes. It equals the market value of all property in a district, minus certain exemptions and deductions. The Comptroller's estimated taxable value reflects deductions for state-mandated homestead and disabled veterans' exemptions. Deductions also arise from reinvestment zones, freeport exemptions, productivity appraisal of qualified agricultural lands, the school tax ceiling for over-65 homeowners, and other state mandated exemptions.

In addition to estimating the wealth of each district, the Comptroller annually estimates the level and uniformity of property tax appraisals in each appraisal district. The *level of appraisal* shows whether the district has appraised typical properties at 100 percent of the legally required level (normally the market value). *The uniformity* measures indicate whether the appraisal district is appraising property uniformly within a category or from one category to another.

Under the Government Code, the agency must certify the preliminary findings of taxable value for each district before February 1 of the year following the year under study. The agency delivers the findings to districts and also certifies them to the commissioner of education. Districts that wish to protest their preliminary value findings must do so, within 40 days after the date of preliminary certification.

The Comptroller must publish the findings of the appraisal district study and distribute copies to all appraisal districts and members of the Legislature. Although the Property Tax Code does not give appraisal districts the right to appeal study findings, the Comptroller allows appeals of level and uniformity measures in an effort to enhance fairness and accuracy.

School districts and appraisal districts submit protests in March. Staff reviews the data from each protesting district to correct clerical errors and other problems. Most protests are resolved during this informal process and do not require a formal hearing before a hearing examiner.

In May, Comptroller hearing examiners hear the remaining unresolved protests. After this process, districts may file exceptions to the hearing examiners' proposed decisions. Final reviews of the proposed decisions, based on the written exceptions, occur in June.

How the findings of the Property Value Study are used in the school funding formula to determine state aid is described in Chapter 42 of the Education Code. If you have questions about state aid or the funding formula, contact the Texas Education Agency at 512/463-9238.

## Property Classifications

The Government Code and the Property Tax Code require the Comptroller to develop ratios and value estimates for property categories and to combine information on the various property categories into overall estimates.

The property categories generally studied are listed below.

- **A. Real Property: Single-family, Residential**
- **B. Real Property: Multifamily, Residential**
- **C. Real Property: Vacant Lots and Tracts**
- **D/E. Real Property: Acreage, Market Value and Farm and Ranch Improvements**
- **D1. Real Property: Acreage, Productivity Value**
- **F1. Real Property: Commercial**
- **G. Real Property: Oil, Gas and Other Minerals**
- **J. Real and Tangible Personal Property: Utilities**
- **L1. Personal Property: Commercial**

The Comptroller has the discretion to group properties into any other category or subcategory necessary for

the efficient and accurate completion of the Property Value Study.

There are several property categories for which the Comptroller does not develop ratios or value estimates. These categories are included in the study at the taxable value reported by the district. Districts may appeal these categories' reported values if they are inaccurate.

An explanation of the methods used in the school and appraisal district studies appears in the next sections.

# Methods Used in the School District Study

The Property Tax Division (PTD) determines total taxable value in a school district by estimating market value or by accepting the local appraised value in each property category in the district and then adding these category values for an overall school district value. To estimate category values, division staff obtains a representative sample of properties in each category, computes a weighted mean ratio from this sample and divides this ratio into the school district's self-reported appraisal roll value for the category.

Comptroller staff selects property samples randomly whenever possible to ensure that the samples reasonably represent the larger universe of properties in each category. A census of all sales is used when the number of sales is smaller than (or does not greatly exceed) the target sample size. Comptroller staff also stratifies samples to improve sample representativeness if stratification data are available and if stratification is feasible. (Stratification is discussed in detail in the next section.)

An appraisal ratio for an individual property is the ratio of the property's appraised value as shown on the appraisal roll to its market value. The market value is indicated by the sales price of the property or staff-appraised value. Table One shows appraisal ratios for a sample consisting of both sales and appraisals as indicators of market value. For example, Sale Number 1 in this table has an appraisal roll value of $65,834 and an adjusted sale price of $83,113. Dividing $65,834 by $83,113 yields an appraisal ratio of 0.79 for this parcel.

Table One also shows the computation of a non-stratified weighted mean appraisal ratio. A weighted mean appraisal ratio, as opposed to an unweighted mean appraisal ratio, takes into account the different values of the individual properties making up the sample. It is calculated by summing the appraisal roll values, summing the sales prices and staff appraisals, and dividing the first sum by the second. As shown in the table, the total appraisal roll value for this sample is $2,007,285, and the total value of sales and appraisals is $2,443,170. Dividing the former by the latter produces the weighted mean appraisal ratio of 0.8216. Finally, dividing the district's total self-reported appraisal roll category value of $27,621,400 by the weighted mean appraisal ratio of 0.8216 produces an estimated category market value of $33,619,036.

### Stratified Weighted Mean Appraisal Ratios

As mentioned earlier, PTD uses value-stratified weighted mean appraisal ratios whenever feasible to estimate market values for residential properties (Categories A and B), vacant lots (Category C), commercial properties (Categories F1 and L1), and minerals (Category G). These ratios are stratified by value class within each category if reasonably accurate stratification data are available.

The distribution of appraisal roll values by value class is obtained from stratification surveys, the appraisal rolls, or the prior year stratification surveys, depending upon availability. If stratification data are not available for a school district, stratified weighted mean appraisal ratios cannot be calculated. If the data to calculate a value-stratified ratio becomes available at any time during the process, including the protest process, a value-stratified ratio may be calculated.

A value-stratified weighted mean appraisal ratio is a mechanism to automatically adjust the sample to be representative of the population from which it is taken. For example, low-valued properties tend to be clustered in certain geographic areas, while mid-range and high-valued properties tend to be clustered in others. Similarly, construction types tend to vary with value class. A value-stratified weighted mean appraisal ratio adjusts for location effect and for the effects of varying construction types. In addition, it is a particularly useful tool for enhancing sample representativeness when appraisal levels in a category vary significantly between lower-valued and higher-valued properties.

PTD has established a value-stratification procedure, which results in six strata. For the most part, the value ranges within the strata vary from school district to school district, and from year to year depending entirely on the distribution of property value within each school district.

The six strata are:

**Stratum #1** - The low value stratum. After sorting all the properties in the category from lowest value to highest value, and beginning with the lowest valued property, this stratum contains the low-valued properties that collectively equal 5 percent of the category's total appraised value. PTD does not study this stratum. Instead, PTD accepts the locally determined value by defaulting to a ratio of 1.00.

**Stratum #2** - This stratum contains all properties that individually exceed 20 percent of the value in the property category. PTD may or may not study these high-valued properties.

**Stratum #3** - After the remaining properties (properties not included in stratum one or stratum two) are sorted from lowest value to highest value, properties representing about the first 25 percent of the remaining appraisal roll value in the category comprise stratum 3.

**Stratum #4** - Properties representing about the second 25 percent of the remaining appraisal roll value in the category comprise stratum 4.

**Stratum #5** - Properties representing about the third 25 percent of the remaining appraisal roll value in the category comprise stratum 5.

**Stratum #6** - Properties representing about the fourth 25 percent of the remaining appraisal roll value in the category comprise stratum 6.

PTD generally studies strata 3-6 by random sampling procedures discussed elsewhere in this publication.

Refer to PTD's Stratification Survey for detailed instructions on stratifying property.

Table Two, Three, and Four show how a stratified weighted mean appraisal ratio is calculated and how it differs from a weighted mean and a simple mean appraisal ratio. The stratified weighted mean appraisal ratio for a category is calculated by:

1. grouping sample properties by appraisal roll value stratum,
2. calculating a weighted mean appraisal ratio for each value stratum,
3. dividing the weighted mean appraisal ratio into the CAD total appraisal roll value for each value stratum to estimate a market value,
4. summing these individual market value stratum estimates, and
5. dividing the sum of the CAD values in each stratum by the sum of PTD's individual market value stratum estimates.

Table Two lists the properties in a hypothetical random sample. The sample properties are grouped in six strata (see preceding text for definitions of the various strata). A ratio is calculated for each property, by dividing the CAD value by the PTD appraisal value or sale price. A weighted mean ratio is

**Table One:**
**Sample Calculation of**
**Weighted Mean Appraisal Ratio**
**School District ABC**
**Category A: Single-family Residential**

**Sales**

| Sale Number | Appraisal Roll Value | Adjusted Sale Price | Individual Appraisal Ratio |
|---|---|---|---|
| 1 | $ 65,834 | $ 83,113 | 0.79 |
| 2 | 75,254 | 90,720 | 0.83 |
| 3 | 94,420 | 135,610 | 0.70 |
| 4 | 99,880 | 113,310 | 0.88 |
| 5 | 82,253 | 109,250 | 0.75 |
| 6 | 89,654 | 94,715 | 0.95 |
| 7 | 76,502 | 91,680 | 0.83 |
| 8 | 111,020 | 128,048 | 0.87 |
| 9 | 44,441 | 62,370 | 0.71 |
| 10 | 64,519 | 75,905 | 0.85 |
| 11 | 64,842 | 81,127 | 0.80 |
| 12 | 39,479 | 41,925 | 0.94 |
| 13 | 193,344 | 245,700 | 0.79 |
| 14 | 98,885 | 127,493 | 0.78 |
| 15 | 114,788 | 118,898 | 0.97 |
| 16 | 92,088 | 113,645 | 0.81 |
| 17 | 84,449 | 84,995 | 0.99 |
| 18 | 21,090 | 25,988 | 0.81 |
| 19 | 22,080 | 27,398 | 0.81 |

**Appraisals**

| Appraisal Number | Appraisal Roll Value | Appraisal Value for Study | Individual Appraisal Ratio |
|---|---|---|---|
| 1 | $ 97,576 | $ 110,741 | 0.88 |
| 2 | 60,437 | 70,964 | 0.85 |
| 3 | 107,543 | 148,828 | 0.72 |
| 4 | 60,264 | 86,303 | 0.70 |
| 5 | 69,708 | 76,117 | 0.92 |
| 6 | 76,935 | 98,327 | 0.78 |

**Total Sales and Appraisals**

| Total Appraisal Roll Value for Test | | Total Value of Sales and Appraisals | | Weighted Mean Appraisal Ratio |
|---|---|---|---|---|
| $2,007,285 | ÷ | $ 2,443,170 | = | .8216 |

| Total Appraisal Roll Category Value | | Weighted Mean Appraisal Ratio | | Estimated Category Market Value |
|---|---|---|---|---|
| $27,621,400 | ÷ | .8216 | = | $33,619,036 |

**Table Two:**
**Sample Calculation of a Value-Stratified Weighted Mean Appraisal Ratio (Step 1)**

| | Appraisal Roll Value *in the sample* | | Appraisal/ Sale Price *in the sample* | | Ratio* CAD / PTD *in the sample* |
|---|---|---|---|---|---|
| **STRATUM 1: $-0- to $2,500** | | | | | |
| Stratum 1 Total: | not sampled | | not sampled | | |
| **STRATUM 2: $1,205,000 and up** | | | | | |
| | 1,205,000 | | 1,209,961 | | 0.9959 |
| Stratum 2 Total: | 1,205,000 | ÷ | 1,209,961 | = | 0.9959 |
| **STRATUM 3: $2,501 to $15,300** | | | | | |
| | 11,243 | | 8,000 | | 1.4054 |
| | 13,510 | | 10,000 | | 1.3510 |
| | 14,194 | | 11,500 | | 1.2343 |
| | 14,800 | | 12,000 | | 1.2333 |
| | 15,001 | | 13,000 | | 1.1539 |
| Stratum 3 Total: | 68,748 | ÷ | 54,500 | = | 1.2614 |
| **STRATUM 4: $15,301 to $47,573** | | | | | |
| | 20,374 | | 20,000 | | 1.0187 |
| | 20,477 | | 20,000 | | 1.0238 |
| | 20,994 | | 20,000 | | 1.0497 |
| | 25,806 | | 24,800 | | 1.0405 |
| | 28,166 | | 27,000 | | 1.0432 |
| Stratum 4 Total: | 115,816 | ÷ | 111,800 | = | 1.0359 |
| **STRATUM 5: $47,574 to $110,625** | | | | | |
| | 51,007 | | 52,000 | | 0.9809 |
| | 52,191 | | 52,000 | | 1.0037 |
| | 53,217 | | 54,000 | | 0.9855 |
| | 54,141 | | 54,000 | | 1.0026 |
| | 57,396 | | 57,000 | | 1.0070 |
| Stratum 5 Total: | 267,952 | ÷ | 269,000 | = | 0.9961 |
| **STRATUM 6: $110,626 to $465,581** | | | | | |
| | 111,648 | | 125,000 | | 0.8932 |
| | 114,140 | | 135,000 | | 0.8455 |
| | 139,498 | | 150,000 | | 0.9300 |
| Stratum 6 Total: | 365,286 | ÷ | 410,000 | = | 0.8909 |
| **Grand Totals:** | $2,022,802 | | $2,055,261 | | |
| *totals based on 19 parcels* | | | | | |
| **Mean Ratio** *(unweighted average)* *average based on 19 parcels* | | | | | **1.0631** |
| **Weighted Mean Ratio** *$2,022,802/$2,055,261* | | | | | **0.9842** |
| **Price-Related Differential** *mean ratio 1.0631 / weighted mean ratio 0.9842* | | | | | **1.0802** |

*Rounded 4 places

calculated for each stratum by dividing the sum of the CAD values by the sum of the PTD appraisal or sale amounts. A weighted mean ratio is calculated for the entire property category by dividing the sum of the CAD values in every strata by the sum of the PTD values in every strata. A simple mean ratio is calculated by summing all the individual property ratios in the entire category and dividing by the number of ratios. The weighted mean and simple mean are calculated for comparison to the stratified weighted mean to be calculated in Table Four and for use in calculating the price-related differential (PRD). The PRD is calculated by dividing the simple mean by the weighted mean.

Table Three lists the strata shown in Table Two and shows for each stratum: the number of sample parcels, the CAD value of the sample properties, the PTD value of the sample properties, and the weighted mean ratio. Table Three also shows how the weighted mean stratum ratios are calculated by dividing the CAD value in each stratum by the PTD value in each stratum.

Table Four lists the strata shown in Table Two and Table Three and shows for each stratum: the number of parcels in the stratum, the CAD value in the stratum, the stratum ratio (from Table Two or Table Three), and the PTD market value estimate. Table Four also shows the calculation of the stratified weighted mean ratio by dividing the sum of the CAD values for each stratum by the sum of the PTD market value estimated for each stratum. This stratified weighted mean ratio is divided into the appropriate self-reported category total to develop the PTD's market value estimate for the category (refer to your *ISD Summary Worksheet* to see this final calculation).

As shown in the hypothetical example in Table Two, there are substantial differences in the level of appraisal among value strata. Lower-valued properties are appraised at higher levels than higher-valued properties, as indicated by a price-related differential well above 1.03. Using a stratified weighted mean

appraisal ratio will adjust for these differences so that they will not bias the sample ratio and the resulting market value estimate for the category.

The six value ranges used to compute stratified weighted mean appraisal ratios in each of Categories A, B, C, F1, and L1 are the same as those computed in the previous year's stratification survey or from the previous year's electronic appraisal roll submission.

Because the current study year's value ranges are unknown when staff selects sample properties, staff selects the sample based on value ranges from the previous study year. In calculating the stratified weighted mean, staff uses the current year's appraised values in the previous year's value ranges. To obtain the value ranges and amounts, staff uses either the stratification survey data or stratification from the electronic appraisal roll unless notable differences exist between the category totals shown on the reports of property value and the category totals from another source.

In some school districts, staff finds certain properties in a category sample sufficiently different from the remaining sample properties to warrant treatment as "exception" properties. Properties in samples smaller than the minimum sample size are also treated as exceptions. An exception property is a property placed in its own separate value class. The staff's rationale is to offset the potential bias that an exception property might have on the estimated ratio.

Staff set the minimum sample size in each stratum at the lower of five, or 25 percent of the number of properties in the stratum population. The 25 percent rule has the effect of lowering the minimum sample size when the number of properties in the stratum population is very small (fewer than 18).

PTD's samples of properties may sometimes include *outliers*. The IAAO's *Property Appraisal and Assessment Administration* states "Outliers are properties with very high or low sales ratios. ...Particularly when the sample is small, outliers can distort ratio studies and should be reviewed carefully."

If PTD staff determines the outlier is the result of an appraisal district error or unusual market variability, the outlier remains in the study. If the outlier was caused by a clerical error, a property mismatch, or an error in appraisal judgment, PTD staff attempts to correct the error so that the property can remain in the study. If staff finds, however, that the outlier is a non-market transaction, staff excludes the outlier from the sample. PTD may exclude extreme outliers that remain after the process described above is concluded.

### Using Confidence Intervals in School District Value Estimates

Comptroller staff uses confidence intervals to determine whether local value is assigned to a school district. To compute a confidence interval, staff adds the PTD value estimates for tested categories. Tested categories include randomly sampled categories and the value of censused properties from Categories D2 (productivity value of acreage), J (Utilities), and the value of exception properties. This sum is PTD's value estimate for tested categories. Staff then computes a confidence interval around this estimate of value. (One-half of the confidence interval, expressed in percentage terms, is the *margin of error*.)

If the district's summed values for the tested categories fall within this confidence interval, then staff assigns *local value* to the district. Conversely, if the district's summed values for these tested categories fall outside this confidence interval, then staff assigns *state value* to the property categories it studied in the district.

The division uses a uniform margin of error as a planning tool to allocate its resources. The *margin of error* as used in the study is an acceptable range of values within a school district. This range is expressed as a percentage of PTD's estimate of school district taxable value. The margin or error discussion in this section assumes a planned margin of error of 5 percent. The planned margin of error is set by management and may vary from year to year. A 5-percent planned margin of error can be illustrated by the following example.

If PTD attains a margin of error of 5 percent in a school district and estimates a value of $100 million for that district, the margin of error is $95 million to $105 million. If the local value falls anywhere within this range, PTD certifies the district's local value to the Texas Education Agency for school funding purposes.

The size of the actual margin of error is determined by the sample that is used in the study. PTD estimates how many sample parcels will be required to achieve the planned margin of error. Sometimes the estimated number of parcels is too high or too low to reach the planned margin of error and produces an actual margin of error lower or higher than planned.

In past studies, PTD has collected enough samples to reach a lower margin of error than planned in some school districts. In other districts, PTD was not able to collect enough samples to meet the planned margin of error so that PTD's actual margins of error were larger than planned.

In response to appraisal district and school district requests, the division will hold districts harmless when actual margins of error are less than planned. At a 5-percent, planned margin of error, this policy means that even if PTD's actual margin of error in a district is 4 percent, 3 percent or less, the district will be treated as if the margin of error is 5 percent for the purpose of determining value. For example, if PTD collects enough samples to reach a highly accurate actual 2-percent margin of error and the district's local value falls between 2 and 5 percent of PTD's value, the district's local value will be certified.

On the other hand, if PTD's actual margin of error is more than 5 percent, PTD will use the actual margin of error to decide whether to assign local value. For example, if a district's local value is 5.5 percent from PTD's value and the actual margin of error is 6 percent, the district's local value will be certified.

PTD attempts to obtain the proper number of samples in each school district property category to attain the planned margin of error in each school district. The two variables that affect staff's ability to attain the planned margin of error in each school district are appraisal *variability* and *sample size*. *Variability* is a measure of the district's appraisal uniformity or ability to appraise properties at the same percentage of market value. The coefficient of dispersion (COD) is one measure of variability. Sample size refers to the number of sales and appraisals included in a school district's property value study.

School districts with high variability require large sample sizes to attain the planned margin of error. The greater the variability, the larger the required sample size. PTD adjusts its sample sizes upward in an attempt to compensate for high variability and attain the planned margin of error. In some school districts, however, the variability is so large that hundreds or even thousands of appraisals are necessary to reach the planned margin of error. So, in some school districts, PTD may not allocate the prohibitive level of resources necessary to obtain the planned margin of error.

In most school districts, variability in the sample turns out to be slightly higher or lower than the variability used to calculate the sample sizes assigned to field staff. In these districts, even though PTD staff obtained the planned number of parcels, the margin of error will be higher or lower than planned but will be close, as compared to districts that have very high variability and prohibitive sample sizes.

More detailed explanations of the confidence interval and margin of error computations can be found in the *Questions and Answers* portion of this booklet on page 31.

### Aggregating School District Study Data for the Appraisal District Study

Samples collected for the school district study and aggregated to the appraisal district level provide the basis for computing appraisal district performance measures, by category. The methods used to compute these performance measures are discussed in the next section.

Samples from each category are aggregated to the appraisal district level, with one exception. The ratio derived for agricultural acreage receiving productivity appraisal is not a median derived from a property sample. Consequently, staff does not calculate measures of appraisal uniformity for acreage receiving productivity appraisal. The appraisal district performance measures listed under "D. Rural Real-Market Value" are derived from the property samples used to compute the weighted mean appraisal ratios for estimating the market values of non-qualified acreage and farm and ranch improvements.

## Table Three
## Sample Calculation of a Value-Stratified Weighted Mean Appraisal Ratio
## Step 2

| Stratum Number | *Number of Parcels in the sample* | CAD Value *in the sample* | ÷ | PTD Estimate *in the sample* | = | Stratum Ratio *weighted mean ratio in the sample** |
|---|---|---|---|---|---|---|
| (#) | ($n_{sample}$) | ($TX_{sample}$) | | ($TY_{sample}$) | | ($r1_{sample}$) |
| 1 | n/a | n/a | | n/a | | 1.0000 |
| 2 | 1 | 1,205,000 | ÷ | 1,209,961 | = | census |
| 3 | 5 | 68,748 | ÷ | 54,500 | = | 1.2614 |
| 4 | 5 | 115,816 | ÷ | 111,800 | = | 1.0359 |
| 5 | 5 | 267,952 | ÷ | 269,000 | = | 0.9961 |
| 6 | 3 | 365,286 | ÷ | 410,000 | = | 0.8909 |

*Rounded 4 places

## Table Four
## Sample Calculation of a Value-Stratified Weighted Mean Appraisal Ratio
## Steps 3-5

| Stratum Number | *Number of Parcels in the Stratum* | CAD Value *in the Stratum* | ÷ | Stratum Ratio *weighted mean ratio in the sample* | = | PTD Estimate *in the Stratum*** |
|---|---|---|---|---|---|---|
| (#) | ($N_{Stratum}$) | ($TX_{Stratum}$) | | ($r1_{sample}$) | | ($TY_{Stratum}$) |
| 1 | 711 | 300,224 | ÷ | 1.0000 | = | 300,224 |
| 2 | 1 | 1,205,000 | ÷ | census | = | 1,209,961 |
| 3 | 259 | 1,495,515 | ÷ | 1.2614 | = | 1,185,570 |
| 4 | 56 | 1,463,787 | ÷ | 1.0359 | = | 1,413,029 |
| 5 | 22 | 1,500,526 | ÷ | 0.9961 | = | 1,506,395 |
| 6 | 7 | 1,544,658 | ÷ | 0.8909 | = | 1,733,737 |
| | + | + | | | | + |
| | = | = | | | | = |
| | 1,056 | 7,509,710 | | 1.0219 | | 7,348,916 |
| | Total Stratum Parcels | Total CAD Value | | (7,509,710 ÷ 7,348,916) Stratified Ratio | | Total PTD Estimate |

**Rounded to the nearest dollar

# Methods Used in the Appraisal District Study

Section 5.10 of the Property Tax Code requires the Comptroller to conduct and publish an annual study of appraisal districts to determine the median level of appraisal and the uniformity of appraisal in each major property category in each appraisal district in the state. In addition, the Tax Code requires the agency to publish other standard statistical measures it considers appropriate. These measures are described later in this section. This section also requires the Comptroller to use the data collected from the annual school district study for the annual appraisal district study.

### Calculating the Median Appraisal Ratio

Section 1.12(c) of the Property Tax Code defines the median appraisal ratio as follows:

"The median appraisal ratio for a sample of properties is, in a numerically ordered list of the appraisal ratios for the properties: (1) if the sample contains an odd number of properties, the appraisal ratio above and below which there is an equal number of appraisal ratios in the list; or (2) if the sample contains an even number of properties, the average of the two consecutive appraisal ratios above and below which there is an equal number of appraisal ratios in the list."

The value of individual properties does not influence the median ratio; only the ranking of individual ratios within the sample matters. The median ratio falls at the middle of a group of ratios ranked from highest to lowest or lowest to highest.

Table Five uses 19 sales (marked "S1" to "S19") and six appraisals (marked "A1" to "A6") to show how to identify the median ratio. In this table, the appraisal ratios are ranked from the highest ratio to the lowest. Twenty-five properties make up the sample. The median ratio, 0.81, is thirteenth on the list. Twelve properties are ranked above it, and 12 are ranked below it.

An easy way to find the median for a sample containing an odd number of properties is to divide the total count by two, then round the result upward to the nearest whole number. The sample shown in Table Five contains 25 parcels. Dividing 25 by 2 yields 12.5. Rounding upward to the nearest whole number produces 13. The thirteenth ratio is the median.

For an even-numbered sample, the median is the average of the two middle ratios. If there were 24 properties in the sample, the median would be the average of ratios 12 and 13. Eleven ratios would be above 12 and below 13. Regardless of the number of parcels in a sample, the median will be the same whether the ratios are ranked from highest to lowest or lowest to highest.

Staff follows these steps to calculate a median level for each major category of property in each appraisal district, provided there were at least five

**Table Five**
**Sample Calculation of Median Appraisal Ratio**
**XYZ County Appraisal District**
**Category A: Single-family Residential**

**Sales and Appraisals**

| Number Sale or Appraisal | Appraisal Roll Value | Adjusted Sale Price or Appraised Value | Individual Appraisal Ratio |
|---|---|---|---|
| S 17 | $ 84,449 | $ 84,995 | 0.99 |
| S 15 | 114,788 | 118,898 | 0.97 |
| S 6 | 89,654 | 94,715 | 0.95 |
| S 12 | 39,479 | 41,925 | 0.94 |
| A 5 | 69,708 | 76,117 | 0.92 |
| S 4 | 99,880 | 113,310 | 0.88 |
| A 1 | 97,576 | 110,741 | 0.88 |
| S 8 | 111,020 | 128,048 | 0.87 |
| S 10 | 64,519 | 75,905 | 0.85 |
| A 2 | 60,437 | 70,964 | 0.85 |
| S 2 | 75,254 | 90,720 | 0.83 |
| S 7 | 76,502 | 91,680 | 0.83 |
| S 16 | 92,088 | 113,645 | **0.81** |
| S 18 | 21,090 | 25,988 | 0.81 |
| S 19 | 22,080 | 27,398 | 0.81 |
| S 11 | 64,842 | 81,127 | 0.80 |
| S 1 | 65,834 | 83,113 | 0.79 |
| S 13 | 193,344 | 245,700 | 0.79 |
| S 14 | 98,885 | 127,493 | 0.78 |
| A 6 | 76,935 | 98,327 | 0.78 |
| S 5 | 82,253 | 109,250 | 0.75 |
| A 3 | 107,543 | 148,828 | 0.72 |
| S 9 | 44,441 | 62,370 | 0.71 |
| S 3 | 94,420 | 135,610 | 0.70 |
| A 4 | 60,264 | 86,303 | 0.70 |

Total Tests = 25

**.81** - Median Appraisal Ratio for Category A, XYZ Appraisal District

properties in the sample. Staff then combines the properties making up the sample for each category into a larger sample of all properties in the appraisal district. The median ratio from the larger sample is listed as the "overall" ratio for the appraisal district.

### Measuring Appraisal Uniformity

The median level of appraisal measures the accuracy of an appraisal district's appraisals in relation to the standard of 100 percent of market value. The Property Tax Code also requires the agency to calculate a "coefficient of dispersion" around the median for each major property category. The coefficient of dispersion (COD) measures appraisal uniformity.

Technically, the COD expresses as a percentage of the median the average absolute deviation of the appraisal ratios in a sample from the sample's median. The COD indicates how tightly the individual ratios are clustered around the median ratio for the sample. A high COD indicates high variation—few ratios close to the median and low appraisal uniformity. A low COD indicates low variation—ratios clustered tightly around the median and high appraisal uniformity.

The International Association of Assessing Officers (IAAO) 1999 *Standard on Ratio Studies* contains standards for CODs. These are as follows:

1. single-family residential and condominiums – 15 or less; in areas of newer or fairly similar residences – 10 or less; heterogeneous rural residences and seasonal homes – 20 or less;
2. vacant land: 20 or less;
3. income properties in large, urban jurisdictions: 15 or less;
4. income properties in other jurisdictions: 20 or less.

The IAAO does not publish standards for other real and personal property, but notes that they vary with local conditions.

The COD measures appraisal uniformity independently of the median level of appraisal. As a result, CODs allow comparison of appraisal uniformity among districts or property categories where median levels of appraisal differ significantly.

Calculating a COD requires six steps:

1. Subtract the median ratio for the sample from each individual ratio making up the sample. The result is the deviation for each ratio.
2. Convert each deviation to its absolute value.
3. Total the absolute values of each deviation.
4. Divide the total deviation by the number of properties in the sample to get the average absolute deviation.
5. Divide the average absolute deviation by the median ratio.
6. Multiply the result by 100.

Table Six shows a sample calculation for a COD.

Comptroller staff calculates a COD for each major category of property in an appraisal district if the sample has

**Table Six**
**Sample Calculation for Coefficient of Dispersion**
**XYZ County Appraisal District**
**Category A: Single-family Residential**

| Sale or Appraisal Number | Individual Property Ratio % | | | Difference from Median (81%) | Absolute Value of Difference |
|---|---|---|---|---|---|
| S 17 | 99 | | | + 18 | 18 |
| S 15 | 97 | | | + 16 | 16 |
| S 6 | 95 | | | + 14 | 14 |
| S 12 | 94 | | | + 13 | 13 |
| A 5 | 92 | | | + 11 | 11 |
| S 4 | 88 | | | + 7 | 7 |
| A 1 | 88 | | | + 7 | 7 |
| S 8 | 87 | | | + 6 | 6 |
| S 10 | 85 | | | + 4 | 4 |
| A 2 | 85 | | | + 4 | 4 |
| S 2 | 83 | | | + 2 | 2 |
| S 7 | 83 | | | + 2 | 2 |
| S 16 | 81 | 10% | 25% | 0 | 0 |
| S 18 | 81 | | | 0 | 0 |
| S 19 | 81 | | | 0 | 0 |
| S 11 | 80 | | | - 1 | 1 |
| S 1 | 79 | | | - 2 | 2 |
| S 13 | 79 | | | - 2 | 2 |
| S 14 | 78 | | | - 3 | 3 |
| A 6 | 78 | | | - 3 | 3 |
| S 5 | 75 | | | - 6 | 6 |
| A 3 | 72 | | | - 9 | 9 |
| S 9 | 71 | | | - 10 | 10 |
| S 3 | 70 | | | - 11 | 11 |
| A 4 | 70 | | | - 11 | 11 |
| | | | | Total of Absolute Values = | 162 |

| | |
|---|---|
| 162 | – Total of Absolute Values |
| ÷ 25 | – Number of Sample Properties |
| = 6.48 | – Average Absolute Deviation |
| ÷ 81 | – Median Appraisal Ratio |
| = .08 | |
| x 100 | |
| = 8.0 | – Coefficient of Dispersion |

at least five properties. The staff combines the samples for each category into a larger sample to calculate the overall COD.

In addition to the COD, the staff calculates three other measures of appraisal uniformity—the percentage of properties within 10 percent of the median, the percentage of properties within 25 percent of the median, and the "Price-Related Differential" (PRD) (discussed below). The percentages are computed if the sample contains at least six properties. The PRD requires at least five properties.

To calculate the first of these, the staff multiplies the median appraisal ratio times 10 percent. Adding this result to the median yields the ratio that exceeds the median by 10 percent. Subtracting the result from the median yields the ratio 10 percent below the median. The staff counts the number of properties in the sample that have ratios equal to or between these two numbers. Dividing that count by the total number of properties shows the percentage within 10 percent of the median.

**Table Seven**
**Sample Calculation of**
**Price-Related Differential (PRD)**
**XYZ County Appraisal District**
**Category A. Single-family Residential**

**Sales and Appraisals**

| Number Sale or Appraisal | | Appraisal Roll Value | Adjusted Sale Price or Appraised Value | Individual Appraisal Ratio |
|---|---|---|---|---|
| S | 17 | $ 84,449 | $ 84,995 | 0.99 |
| S | 15 | 114,788 | 118,898 | 0.97 |
| S | 6 | 89,654 | 94,715 | 0.95 |
| S | 12 | 39,479 | 41,925 | 0.94 |
| A | 5 | 69,708 | 76,117 | 0.92 |
| S | 4 | 99,880 | 113,310 | 0.88 |
| A | 1 | 97,576 | 110,741 | 0.88 |
| S | 8 | 111,020 | 128,048 | 0.87 |
| S | 10 | 64,519 | 75,905 | 0.85 |
| A | 2 | 60,437 | 70,964 | 0.85 |
| S | 2 | 75,254 | 90,720 | 0.83 |
| S | 7 | 76,502 | 91,680 | 0.83 |
| S | 16 | 92,088 | 113,645 | 0.81 |
| S | 18 | 21,090 | 25,988 | 0.81 |
| S | 19 | 22,080 | 27,398 | 0.81 |
| S | 11 | 64,842 | 81,127 | 0.80 |
| S | 1 | 65,834 | 83,113 | 0.79 |
| S | 13 | 193,344 | 245,700 | 0.79 |
| S | 14 | 98,885 | 127,493 | 0.78 |
| A | 6 | 76,935 | 98,327 | 0.78 |
| S | 5 | 82,253 | 109,250 | 0.75 |
| A | 3 | 107,543 | 148,828 | 0.72 |
| S | 9 | 44,441 | 62,370 | 0.71 |
| S | 3 | 94,420 | 135,610 | 0.70 |
| A | 4 | 60,264 | 86,303 | 0.70 |
| Totals | 25 | $2,007,285 | $2,443,170 | 20.71 |

Mean = 20.71 ÷ 25 = .8284
Weighted Mean = $2,007,285 ÷ $2,443,170 = .8216
Price Related Differential = Mean ÷ Weighted Mean
= .8284 ÷ .8216 = 1.01 (rounded)

To calculate the percentage within 25 percent of the median, the staff multiplies the median times 25 percent and then adds and subtracts the results to find the upper and lower end of the range.

In Table Six, the properties in the sample that have ratios between 89.1 percent and 72.9 percent are within 10 percent of the median, and properties that have ratios between 101.2 percent and 60.7 percent are within 25 percent of the median. In Table Six, all properties fall within 25 percent of the median.

The COD and the percentage of properties within 10 and 25 percent of the median are measures of "horizontal" ratio dispersion. They measure how consistently appraisal districts are appraising properties at the same level (percentage of market value) without regard to the value of the properties. A low COD and high percentages indicate equitable appraisals, while a high COD and low percentages indicate inequitable appraisal.

Another form of inequity may arise from systematic differences in the appraisal of low-value and high-value properties. According to the IAAO *1999 Standard on Ratio Studies*, "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 results. Appraisals made for tax purposes, of course, should be neither progressive nor regressive." Progressive and regressive appraisal are forms of inequity called "vertical" inequity.

Staff reports a measure of vertical dispersion called the "Price-Related Differential" (PRD) for each property category on the CAD Summary Worksheet. The PRD is calculated by dividing a sample's mean ratio by its weighted mean ratio. The IAAO standard for this measure is .98 to 1.03, with PRDs below this range indicating progressivity, and measures above this range indicating regressivity. A PRD inside this range

indicates that low-value and high-value properties are being treated uniformly in regard to level of appraisal. Table Seven shows a sample PRD calculation. In this example the PRD is 1.01, which indicates uniformity.

The IAAO warns that the PRD is not a reliable statistic when the sample is small or when the sample is heavily influenced by extreme sales prices. For this reason, staff publishes the sample size on the CAD Summary Worksheet. Irrespective of sample size, however, the PRD is only an indicator; it alone cannot prove vertical equity or inequity. Additional tests are required to prove vertical inequity.

Together, the median level of appraisal, the COD, the percentage of properties within 10 or 25 percent of the median and the PRD enable the Property Value Study to address the legal requirements that appraisals be equal, uniform, and at 100 percent of market value.

# Developing Value Estimates and Appraisal Ratios: Category by Category

Property categories are informally called "local properties" and "technical properties." Local properties consist of residential properties and vacant lots; rural real property not qualified for productivity appraisal; commercial real and personal property; and other taxable property.

Property Tax Division (PTD) field appraisers gather almost all of the data used in the local properties portion of the Property Value Study. These employees, assigned to different regions throughout the state, appraise individual properties and collect sales data and other market information.

As a general rule, PTD staff will sample properties in a local property category in a school district if the category has at least 5 percent of total school district value or $250 million in value based on the preceding year's study. However, a category may be sampled at any time, regardless of whether its value falls within the general rule. Categories not sampled are assigned reported appraisal roll value (local value).

Technical properties consist of oil, gas and other mineral properties; utility properties; and, qualified agricultural properties. With the exception of agricultural properties, these properties often do not sell, and if they do, the sales data are rarely available. As a result of the lack of sales data, staff must obtain and analyze volumes of data and develop computer models to value these properties.

The Comptroller's Austin-based appraisers perform all of the necessary work to review and appraise these properties.

As a general rule, staff will sample properties in each technical property category in each school district if the category has a minimum percentage of district value and a minimum dollar amount. Categories not sampled are assigned reported appraisal roll value. The specific criteria for sampling categories and for assigning values to non-sampled categories are discussed in the individual category descriptions.

### Residential Properties and Vacant Lots (Categories A, B and C)

These properties consist of Categories A (single-family residential real property), B (multifamily residential real property), and C (vacant lots and tracts). Mobile homes on non-farm/ranch land owned by the occupants fall into Category A.

For each of these property categories sampled, field appraisers collect sales information and perform appraisals to develop a sample of tested parcels. Using this sample information, Austin-based staff then develops either a stratified or non-stratified weighted mean appraisal ratio for each category. (A stratified ratio was developed whenever possible. See the previous discussion of stratification.) This estimated ratio divided into the school district's total self-reported value for the category produces the staff's estimated value for the category.

### Rural Real Property: Acreage and Farm and Ranch Improvements (Category D)

These properties consist of Category D (rural acreage) and Category E (farm and ranch improvements, including mobile homes located on land owned by the occupants). Although Categories D and E remain as separate categories on the reports of property value, these categories were merged in 1989 for the purpose of calculating and reporting taxable value findings. This merger was necessary since rural improvements and land often sell together as one package. Consequently, this merger facilitates the comparison of total sales prices for land and buildings with the total appraised values on the appraisal roll without making artificial allocations between land and buildings.

Texas law requires appraisal districts to appraise property at 100 percent of its market value. Constitutional amendments, however, allow taxation of much of the state's agricultural land based on its productive capacity rather than its market value. These provisions require appraisal districts to classify qualified land according to its agricultural productivity, determine the net income to land for each land class over a five-year period, and capitalize the average to estimate productivity value. The Property Tax Code sets the capitaliza-

tion rate at the greater of 10 percent or $2^1/_2$ points above the Farm Credit Bank of Texas' lending rate for December 31 of the prior year. Property taxes are based on the productivity appraisal, but appraisal districts also must estimate the market value of any land receiving productivity appraisal.

Section 23.71 of the Property Tax Code establishes the procedures for productivity appraisal of timberland. This process differs only slightly from the procedure for agricultural land. Timberland is classified according to soil type and the type of timber grown. For each class, the estimated net income to land is capitalized into a value per acre.

PTD conducts two studies of property in the rural real property category: a market value study and a productivity study. The market value study covers all acreage taxed at its market value (acreage that did not receive productivity appraisal), as well as farm and ranch improvements. The staff collects sales and performs appraisals to develop a property sample based on market values. This sample may include some property receiving productivity appraisal, but the ratios for those individual parcels are calculated on the basis of the appraisal district's reported market values, not their productivity values.

From this market value sample, staff develops a non-stratified weighted mean appraisal ratio and divides this ratio into the school district's reported value of rural real property that did not qualify for productivity appraisal. The result is PTD's estimated market value for acreage not receiving productivity appraisal and the value of farm and ranch improvements.

To develop the productivity ratio, the division staff uses the appraisal district's report of total acreage in each of the agricultural land classes for each school district. Staff uses information provided by published sources and persons in each county who are familiar with local agricultural conditions. The Austin-based staff develops an estimate of net return to land over a five-year period and capitalizes the average using the legally mandated rate to reach an estimated value per acre for each land class. Multiplying the value for each class times the reported acreage in the class yields the total taxable value per land class. The total of the values for each land class is the total taxable value for all acreage receiving productivity appraisal in a school district.

On the report of property value, school districts report the total appraised value of all land receiving productivity appraisal. The division divides this reported value by its own estimate of productivity value. The resulting ratio shows the general level of appraisal of all land receiving productivity appraisal in a school district.

An appraisal district's ratio is calculated similarly and is based on the sum of the school district calculations. This ratio is not a median derived from a property sample. As a result, agency staff does not calculate measures of appraisal uniformity for land receiving productivity appraisal.

Finally, staff adds the estimated market value of rural real property not receiving productivity appraisal and the estimated productivity value for land receiving productivity appraisal. The total is the estimated total taxable value of Category D rural real property.

### Commercial Real and Personal Property (Categories F1 and L1)

Category F1 contains commercial real property (land and improvements), while Category L1 contains commercial personal property (furnishings, fixtures, movable machinery, equipment, and inventories). To estimate market values in these two categories, staff collects sales information and, if necessary, performs appraisals for each school district category sampled. Staff develops either a stratified or non-stratified weighted mean appraisal ratio from the sampled properties and divides each school district's reported category value by the weighted mean ratio to generate the division's estimate of category market value. This procedure is the same as that used to estimate value in other local property categories, with the notable exception of agricultural land qualified for productivity appraisal.

### Oil, Gas and Other Minerals (Category G)

The minerals category consists primarily of oil and natural gas producing properties and lignite and sulfur mines. The division samples mineral properties in school districts if the minerals category represents 5 percent or more of the total school district value. Minerals categories not meeting this criteria are assigned local value.

Staff uses computer models and specialized software to carry out discounted cash flow evaluation of mineral properties. Using computer models and information from a variety of sources including an in-house database, staff derives or calculates economic parameters such as wellhead prices, operating expenses, equipment costs, net salvage values, and discount rates. The future discounted cash flow is then generated based on forecasted production and economic parameters. The discounted equipment salvage value is then added to the future discounted cash flow to derive the market value for each oil and gas property. Discounted cash flow analysis also is used to appraise lignite and sulphur properties.

To produce the individual appraisal ratio for each minerals property in the sample, staff divides the appraisal district's value by the staff's estimated market value. Category G ratios are calculated similar to Category A, but Category G is divided into three subcategories.

### Utilities (Category J)

The utilities category consists of the real property and tangible personal property of telephone, electric, gas distribution, railroad, and pipeline companies, as well as the property of other companies commonly thought of as utilities, such as water systems.

The division staff chooses utility samples by a method that ensures sampling the highest-valued properties and other properties as appropriate. Utility staff use recognized unitary

valuation methods, including the cost, income, and market (sales comparison or stock and debt) approaches, as applicable. Appraisals are based on information published in annual company reports filed with federal and state regulatory agencies and furnished directly to the Comptroller by the utility companies. Staff also obtains information from business and industry publications. Staff determines the percentage of unit value attributable to each company's Texas operations to develop an overall estimated value for the company's Texas portion. Using information provided by the utilities and/or appraisal districts, staff allocates this Texas value to the various school districts in which the utilities own property.

The total appraisal roll value for the sampled utility properties divided by their total estimated market values produces a non-stratified weighted mean ratio for utilities. Dividing this ratio into the school district's total reported value for utilities generates the division's estimated total value of all utility property in the school district.

# Questions and Answers about Margins of Error and Confidence Intervals in the Property Value Study

# Questions and Answers about Confidence Intervals and Margins of Error as Used in the Property Value Study

## Definitions

(Note: These definitions will help you understand the questions and answers that follow.)

**95% confidence interval**: The 95% confidence interval or range of values means that, on average, 95 out of 100 samples would result in a value that lies within the computed range of values. The correct value is assumed to be within the computed range of values.

**standard error**: A "standard error" is a commonly used statistical term. It is a measure of the differences between an average and all the numbers that go into determining that average. Conceptually, it is somewhat similar to a coefficient of dispersion.

**"t-value"**: The "t-value" is an adjustment factor that increases the margin of error as the sample size decreases.

### 1. What is a margin of error? How is it calculated?

A margin of error (as computed in the Property Value Study) is approximately twice the "standard error" of a school district's estimated value (in the property categories "tested"), expressed as a percentage of such value. Consequently, the margin of error indicates statistical reliability.

The following procedures are used to calculate the PTD margin of error:

(a) Calculate the "standard error" (SE $) of the school district's estimated value.

(b) Multiply the "standard error" (SE $) by the appropriate t-value at the 95% "confidence interval." (See definition above.)

(c) Divide the product of the standard error (SE $) and the t-value (See definition.) by the school district's estimated value. *formula = (SE $ * t-value) / ISD $ estimate*

### 2. How is a margin of error related to a confidence interval?

The margin of error is equal to one half of the confidence interval expressed as a percent of total value "tested" in a school district. For example, assume that PTD staff estimates market value in sampled and censused property categories in school district ABC to be $100 million (before exemptions). The margin of error is computed to be plus or minus 5 percent of $100 million. Market value plus 5 percent is $105 million; market value minus 5 percent is $95 million (the $100 million estimate is known as a "point estimate"; the confidence interval of $95 million to $105 million is often called an "interval estimate.")

### 3. What is the purpose of a confidence interval?

A confidence interval provides one measure of whether the state's estimate of value in a school district is statistically significantly different from the self-reported appraisal roll value (i.e., "local value") in that district. In other words, a confidence interval is a measure of the reliability (or precision) of the Comptroller's estimate of school district value.

Assume that Comptroller staff estimates market value in ABC school district to be $100 million with a margin of error of 5 percent at the 95 percent confidence level. This means that the actual market value in ABC school district is probably somewhere between $95 million and $105 million. This range constitutes the 95 percent confidence interval. The 95 percent confidence interval means that, in repeated sampling of this school district, approximately 95 of every 100 computed confidence intervals would be expected to contain the true market value, which staff has estimated to be $100 million, while only five of these would not.

If the local value in the ABC school district lies within the calculated confidence interval, then the difference between the local value and the "point estimate" of value is statistically "insignificant." This means that the Comptroller has not "disproved" local value. In this case, the Comptroller certifies ABC's local value to the commissioner of education. If the local value lies outside the confidence interval, the Comptroller's estimate of value is certified to the Commissioner of Education. If local value lies outside the confidence interval, the Comptroller has "disproved" local value because the difference between the local value and the Comptroller's estimate is statistically significant.

The study contains a "hold harmless" feature. This feature means that if the school district's tested value is calculated to be within 5 percent of the PTD estimate of value, the PTD will automatically certify the school district's value. Also, if the school district's margin of error is calculated to be less than 5 percent, then the PTD will calculate (i.e., widen) the confidence interval as if it were 5 percent for purposes of certifying value. The actual percentage used in the calculation is set by management and could vary in future studies.

**4. Is the target margin of error the same in every school district?**

Yes. The target margin of error is also referred to as a "planned" margin or error.

**5. If the target margin of error is the same in every district, is the target confidence interval the same in every district?**

No, because they are expressed in different units. For example, the margin of error is expressed in percentage terms while the confidence interval is expressed in dollar terms. Assume there are two districts, ABC and XYZ. The Comptroller estimates the total value (in tested property categories) to be $100 million (in ABC) and $500 million (in XYZ). If the margin of error is 5 percent in both districts, the confidence interval of ABC would be $95 million to $105 million, while the confidence interval for XYZ would be $475 million to $525 million. Although the margin of error is the same for both districts, the "widths" of the confidence intervals are different because the districts' values are different. However, even if two school districts have identical margins of error and/or confidence intervals, this does not determine whether local or state value will be certified. The critical test is whether local value lies within the PTD computed confidence interval for the district.

**6. Are the confidence interval and margin of error for a school district computed on the basis of all value in the district?**

No. In computing a confidence interval for a school district, staff only includes property categories whose values were estimated from representative (i.e., random) samples taken in that school district. If a property category is not tested, that category value is excluded from the confidence interval and margin of error calculations for that school district.

For example, assume a school district with a Comptroller estimate of market value of $106 million before exemptions. Total local value in the district as shown on the self report is $98 million. The estimated margin of error is 5 percent. Assume further that staff does not sample any properties in Multi-family (Category B) and Vacant Lots (Category C) in the school district because they constitute less than 5 percent of value. The combined value of these "non-sampled" (i.e., non-tested) categories is 6 million. "Non-sampled" property categories are assigned local value.

The confidence interval for this district is computed as follows:

$106 million less $6 million = $100 million (the point estimate)

$100 million - 5% and $100 million + 5% = $95 million and 105 million (the confidence interval).

Since the local value for the "sampled" property categories (excluding Categories B and C) lies within the confidence interval, the Comptroller would certify local value for the district.

Remember that the Comptroller computes confidence intervals before deducting exemptions. If a school district's local value, before exemptions, lies within the Comptroller's computed confidence interval, then the Comptroller certifies local taxable value, after exemptions, to the commissioner of education.

**7. Are "technical" properties treated differently than "local" properties?**

Yes. In many cases, technical properties are treated as censused (i.e., "non-random") categories rather than sampled categories. (In a census, one studies every unit in a group to determine some characteristic of the group. In a sample, one studies a portion of the units in a group to estimate some characteristic of the group. Sampling requires far fewer resources than conducting a census.)

Censused properties are not used to calculate the confidence interval, but they are used to calculate the margin of error. All properties in a census are studied so there is no sampling error since the variance and standard error for censused properties is zero.

On the confidence interval detail sheet, censused properties are shown as "non-random" properties. To compute the margin of error, staff adds the value of censused properties to the combined value of the sampled property categories. One half of the confidence interval (as computed from sampled and censused properties) is divided by this total to produce the margin of error for the school district.

In effect, the censused (non-random) properties collectively comprise a separate subcategory.

All properties in the "J" Category (Utilities) as well as the "D2" Category (qualified agricultural acreage) sample are treated as censused properties.

**8. How does the Comptroller's use of confidence intervals affect the methodology used to select and appraise properties for the Property Value Study?**

It has no effect. Confidence intervals for each school district's market value are calculated after all sales and appraisals are entered into the system and all market values are calculated.

# Methodology Used to Compute Confidence Intervals in the Property Value Study

# Definitions

CAD = County Appraisal District

PTD = Property Tax Division of State Comptroller's office

For each ISD m, m = 1, 2, ...

Let h = category value stratum or total category, depending on whether stratification is used (h=1, 2, . . . L)

category A, B, C, D1, F1, L1, M, G, (random portion.)

$i$ = parcels ($i=1, 2, \ldots n_h$)

$x_{hi}$ = CAD $ value (local self-reported appraisal roll value) of $i^{th}$ parcel, value stratum or Category h

$TX_h$ = total CAD $ value, value stratum or Category h

$y_{hi}$ = PTD $ value of $i^{th}$ parcel, value stratum or Category h

$\hat{T}Y_h$ = estimated PTD $ value, value stratum or Category h

$\bar{x}_h$ = sample mean, CAD values, value stratum or Category h

$\bar{y}_h$ = sample mean, PTD values, value stratum or Category h

$N_h$ = total number of parcels (population), value stratum or Category h

$n_h$ = number of sample parcels, value stratum or Category h

$L$ = number of value strata/categories in a school district

$$\hat{R}1_h = \frac{\bar{x}_h}{\bar{y}_h} = \text{estimated weighted average level of appraisal, value stratum or Category h}$$

$$\hat{R}2_h = \frac{\bar{y}_h}{\bar{x}_h} = \text{inverse of estimated weighted average level of appraisal, value stratum or Category h}$$

$$\hat{R}2_h = 1 / \hat{R}_{1h}$$

$S_h^2$ is the PTD's measure of variability:

$$S_h^2 = RVx_h + RVy_h - 2RVx_hy_h$$

$$RVx_h = \left\{ \frac{1}{n_h-1} \left[ \sum x_{hi}^2 - \frac{(\sum x_{hi})^2}{n_h} \right] \right\} / \bar{x}_h^2$$

$$RVy_h = \left\{ \frac{1}{n_h-1} \left[ \sum y_{hi}^2 - \frac{(\sum y_{hi})^2}{n_h} \right] \right\} / \bar{y}_h^2$$

$$RVx_hy_h = \left\{ \frac{1}{n_h-1} \left[ \sum x_{hi} y_{hi} - \frac{(\sum x_{hi})(\sum y_{hi})}{n_h} \right] \right\} / \bar{x}_h \bar{y}_h$$

# Method Used to Compute Confidence Intervals

1. Compute variance (Var) of $\hat{R}2_h$ in each value stratum or category of the following property categories, if sampled: A, B, C, D1, F1, L1, M, and the randomly selected portion of G. If the Property Tax Division (PTD) used value-stratified ratios in estimating category values, then compute variances by value stratum. If not, compute variances by category.

   Recall that $\hat{R}1_h = \frac{\bar{x}_h}{\bar{y}_h}$; $\hat{R}2_h = \frac{\bar{y}_h}{\bar{x}_h}$; and $\hat{R}2_h = 1 / \hat{R}1_h$.

   $$\text{Var}(\hat{R}2_h) = \left[ \left( \frac{N_h - n_h}{N_h n_h} \right) (R2_h)^2 \right] S_h^2.$$

2. Let $TX_{ran}$ and $\hat{T}Y_{ran}$ equal total CAD $ value and total PTD $ value, respectively, of all categories sampled in Step 1 above.

   $$TX_{ran} = \sum_{h=1}^{L} TX_h$$

   $$\hat{T}Y_{ran} = \sum_{h=1}^{L} \hat{T}Y_h$$

   $$\hat{R}1_{ran} = \frac{TX_{ran}}{\hat{T}Y_{ran}}$$

   $$\hat{R}2_{ran} = \frac{\hat{T}Y_{ran}}{TX_{ran}}$$

   Note: the subscript "ran" denotes randomly sampled categories or representatively sampled categories.

3. Compute the variance of $\hat{R}2_{ran}$ as derived from categories sampled in Step 1.

   $$\hat{R}2_{ran} = \frac{\hat{T}Y_{ran}}{TX_{ran}} = \frac{\sum_{h=1}^{L} R2_h \, TX_h}{TX_{ran}}$$

   $$\text{Var}(\hat{R}2_{ran}) = \sum_{h=1}^{L} \left( \frac{TX_h}{TX_{ran}} \right)^2 \text{Var}(\hat{R}2_h)$$

4. Calculate the standard error (SE) of $\hat{R}2_{ran}$

$$SE(\hat{R}2_{ran}) = \sqrt{Var(\hat{R}2_{ran})}$$

5. Multiply SE ($\hat{R}2_{ran}$) by the "t - value" for $\hat{R}2_{ran}$ as derived from categories sampled in Step 1 above.

   The *t* values used by the PTD are approximations to those of exact Student's *t* distributions with corresponding degrees of freedom. To determine the degrees of freedom, subtract the number of value strata (from stratified categories) plus the number of non-stratified categories from the combined samples. In other words,

   $$\text{degrees of freedom} = \sum n_h - L.$$

6. Take the product of

   $[ SE(\hat{R}2_{ran}) * t \text{ value} ]$

   as a percent of $\hat{R}2_{ran}$ as derived from categories sampled in Step 1.

7. Multiply the percent obtained in Step 6 by $\hat{T}Y_{ran}$ as computed from categories sampled in Step 1. Call this ME$.

$$ME\$ = \left\{ \frac{[ SE(\hat{R}2_{ran}) * t\text{-value} ]}{\hat{R}2_{ran}} s \right\} * \hat{T}Y_{ran}$$

8. Recall $TX_{ran}$ and $\hat{T}Y_{ran}$.

   To these two sums, add the respective appraisal roll values and the PTD values of D2 (minus timber) and the sample in category J, the non-random portion of G and parcels with an "E" flag. Let these two sums be $TX_{TOT}$ and $\hat{T}Y_{TOT}$ respectively.

9. Compute the confidence interval for the school district. (Note: only tested categories are included in confidence interval computations.)

   $\hat{T}Y_{TOT} \pm ME\$$

   If $TX_{TOT}$ lies within this confidence interval [or within the "hold harmless" margin of error (see page 109)], PTD staff assigns local appraisal roll value to the school district. If $TX_{TOT}$ lies outside this confidence interval, staff assigns PTD estimated value to the district.

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**Revised January 2001**