# RESIDUAL ANALYSIS PRINCIPLES AND PROCEEDURES

# OVERVIEW

1. **Residual analysis or extractions, are a form of land valuation study.**
2. **This analysis relies on the improved sales (typically the largest group of sales in a jurisdiction) to provide data for the land value of a property assessment.**
3. **This data should be integrated with land sales to provide a complete view of the contribution of land value to an overall assessment.**

# THE RELATIONSHIP BETWEEN LAND SALES AND RESIDUALS

- Land sales are the primary source for land values *where a significant supply of land sales exist.*
- As the number of land sales diminishes, the importance of residuals increases.
- In urban areas, residuals will be the only reliable source for land data.

# ADVANTAGES OF LAND SALES

- Reflect direct unfiltered market transactions between buyers and sellers
- Offer chance for direct comparisons among neighborhoods
- Often best source of acreage and frontage values

# Example

## Excess Acreage

**40,000 SF Zoning**

**Sales of Individual Building Lots**

| Size | Neighborhood | Sale Price |
|---|---|---|
| 40,000 SF | One | $100,000 |
| 40,000 SF | Two | $110,000 |
| 60,000 SF | One | $105,000 |
| Five Acres | One | $140,000 |

***What Conclusions can we draw?***

# ANALYSIS

| Size | Nghb | Sale Price | Note |
|---|---|---|---|
| 40,000 SF | One | $100,000 | Base Lot Rate |
| 40,000 SF | Two | $110,000 | $10,000 More than Neighborhood #1 |
| 60,000 SF | One | $105,000 | About $5000 for An extra Half Acre |
| Five Acres | One | $140,000 | If base lot is worth $100,000, then excess 4+ acres worth $40,000 or $10,000/AC |

# SO…

Based upon the previous information, if a four-acre parcel in neighborhood #1 sells for $135,000 with 200 extra feet of road frontage, what can we conclude about the value of excess frontage?

# ANSWER

Sale Price = $135,000

Prime Lot = $100,000

$35,000

Acreage = $10,000 x 3 = $30,000

Remainder = $5000 for 200 feet:

$5,000/200 = **$25/FF**

# PROBLEMS ASSOCIATED WITH A SMALL NUMBER OF LAND SALES

- A small number of land sales can give a false impression of land values.
- Often a premium will be paid for the last remaining lot.
- Conversely, a lack of available vacant lots will bring inferior lots, that were passed over while good lots were still available, on to the market.

# WHY RESIDUAL ANALYSIS

- Residuals calculated from improved sales provide the largest sample available to the appraiser.
- Residuals will cover more areas in a community than land sales concentrated in small areas and in one type of housing stock.
- They provide better documentation for land values when presenting data to a skeptical public.

# PREREQUISTS FOR A MEANINGFUL RESIDUAL ANALYSIS

- Data quality should be insured for all sales that will be a part of the analysis.
- A field review of all sales used in the analysis must be completed prior to calculating residual land values.
- Building cost *must* be at 100% of market value.

# THE SIMPLE MATHAMATICS OF A RESIDUAL

- The function of a residual is to subtract the market value of the improvements from a land and building sale – the remainder being one indication of what land contributes to a sale.
- Selling price $300,000 less improvements of $175,000 = indicated land value of $125,000.

# WHY BUILDING VALUES MUST BE AT 100%

- **A residual assumes you are at 100% of market value because it takes all the variation between the selling price and the assessment and measures it against the land value only.**
- **Example: Selling price $300,000, level of assessment 95%, building $185,000, land value $100,000.**
- **Residual: $300,000 - $185,000 = indicated land value of $115,000.**
- **Land value $100,000 / $115,000 = ratio 87%**

# WHY BUILDING VALUES MUST BE AT 100%

- **Revised example: Selling price $300,000, level of assessment 95%, building $185,000, land value $100,000.**
- **Residual: $300,000 - $194,700 (100%) = indicated land value of $105,300.**
- **Land value $100,000 / $105,300 = ratio 95%**

# THE PYRAMID OF LAND VALUE ELEMENTS

Building a valuation model is like building a pyramid:  without a good foundation your model will not stand.

The foundation for your model is the land curve.

# THE HIERARCHY OF MODEL ELEMENTS

**Water Influence**

**Excess Land Values**

**Location Adjustments**

## Basic Land Costs

## Basic Building Costs

# BUILDING VALUE SOURCES

- **National construction cost manuals – price a sample house using the national manual and test it against your CAMA costs.**
- **Local contractors and builders – compare builders costs against CAMA costs.**
- **Building residual technique – subtract land sale value from an improved sale, residual is indicated building value that can be measured against the CAMA cost.**

# LAND VALUATION: THE MOST VOLATILE COMPONENT IN MASS APPRAISAL

- **Land has no intrinsic value, its only value is based on its use.**

- **Because it has no intrinsic value, changes in the marketplace happen in land values first.**

# LAND MODELING: ZONING SPECIFIC OR OVERALL PRIME-SITE

- **Following zoning allows the Assessor to say that the legal description of the property has been used.**
- **Zoning regulations can vary widely from one street to the next. They can vary from one side of a street to the other side of the street.**
- **A benchmark prime-site does not doesn't follow the legal description.**
- **A benchmark prime-site creates better uniformity.**

# LAND MODELING SAMPLE

| | | |
|---|---|---|
| **Land curve:** | **10,000 S.F.** | **$100,000** |
| | **20,000 S.F.** | **$125,000** |
| | **43,560 S.F.** | **$150,000** |
| **Excess acre rate** | **$20,000** | |
| **Sample value for 1 acre lot in different zones** | | |
| **R10 Zone** | **site** | **$100,000** |
| | **excess acres** | **$ 15,400** |
| | ***total value*** | ***$115,400*** |
| **R20 Zone** | **site** | **$125,000** |
| | **excess acres** | **$ 10,800** |
| | ***total value*** | ***$135,800*** |

# BUILDING A LAND CURVE WITH LAND RESIDUALS

- **Use sales from the base (predominate) neighborhood.**
- **Use sales of newer homes if possible and average grade if possible.**
- **Try to cover the range of your proposed land curve.**
- **Sample residual: sale $325,000, bldg. $180,000**
- **Lot size 25,000 S.F.**
- **$325,000 - $180,000 = $145,000/25,000 = $5.80**

# SAMPLE LAND CURVE FROM A RESIDUAL ANALYSIS

**Sample Residuals Values:**

**15,000 S.F. $75,000**

**27,500 S.F. $85,000**

**43,560 S.F. $94,000**

**43,560 S.F. $90,000**

**60,000 S.F. $95,000**

**87,120 S.F. $102,000**

| SIZE | PRICE | CURVE |
|---|---|---|
| 5000 | | $12.60 |
| 10000 | | $ 6.70 |
| 15000 | $5.00 | $ 5.00 |
| 27500 | $3.09 | $ 3.10 |
| 43560 | $2.16 | $ 2.05 |
| 43560 | $2.07 | $ 2.05 |
| 60000 | $1.58 | $ 1.58 |
| 87120 | $1.17 | $ 1.15 |

# DEFINING NEIGHBORHOODS WITH RESIDUALS

**Sample sale: $475,000, building $225,000, lot size 43,560 s.f.**

**$475,000 - $225,000 = indicated land value.**

**$250,000 / 43560 s.f. = $5.74 per foot.**

**$5.74 / $2.05 (base land price) = 2.80 or 280%**

**Indicated neighborhood factor = 280%**

# EXCESS LAND: VARIOUS MODELING APPROACHES

- Is there a value difference based on amount of excess road frontage?
- Neighborhood adjustments on excess land?
- Sub-dividable excess land valued as secondary sites or per front foot
- Review zoning regulations to tailor your model to reflect subdivision requirements.

# CALCULATING EXCESS LAND VALUES USING RESIDUALS

Sample: sale $350,000, building value $200,000, lot size 5 acres, prime-site value = $100,000 neighborhood factor (1.25)

| | | |
|---|---|---|
| $350,000 - $200,000 | = | $150,000 |
| Site value (1 acre) | = | $100,000 |
| Excess land | = | $ 50,000 |
| $50,000 / 4 acres | = | $ 12,500 |
| Excess by Nhbd. /1.25 | = | $ 10,000 |

# CALCULATING EXCESS LAND VALUES USING RESIDUALS

| Range of excess land by size: | | Excess land discount chart: | |
|---|---|---|---|
| 4 ac. | $12,500 | < = 5ac | = 100% |
| 10 ac. | $10,230 | 6 to 10 ac. | = 80% |
| 20ac. | $ 7,500 | 11 to 20 ac. | = 60% |
| 35 ac. | $ 6,500 | 21 to 74 ac. | = 50% |
| 75 ac. | $ 5,000 | > = 75 ac. | = 40% |

# CALCULATING EXCESS FRONTAGE VALUES USING RESIDUALS

**Sample: sale $350,000, building value $150,000, 6 acres, frontage 500ft. (100ft. required).**

| | |
|---|---|
| **Land residual** | **= $200,000** |
| **Less prime-site ($100,000)** | **= $100,000** |
| **Less ex. land (5 ac. x $10,000)** | **= $ 50,000** |
| **Value of frontage** | **= $ 50,000** |
| **$50,000 / 400 feet of excess** | **= $125 per ft.** |

# WATER INFLUENCE PROPERTIES

- Neighborhood adjustments:  builds the value for waterfront into the neighborhood value, uses land curve size adjustment, must be coordinated with view properties.
- Condition Factors / Special Calculations: percentage adjustments applied to base lot value, uses land curve size adjustment, can be linked with view adjustments.
- Front foot adjustments:  must develop its own size curve, not linked to view properties.

# EXTRACTING WATER INFLUENCE FACTORS USING RESIDUALS

**Sample: Sale $2,000,000, Bldg. $350,000,**

**1 acre lot (base price $200,000), nhbd. factor 2.5, water frontage = 200 ft.**

**A.) $2,000,000 - $350,000 = $1,650,000 / $200,000 (water front nhbd.) = 8.25 factor.**

**B.) $2,000,000 - $350,000 = $1,650,000 / $200,000 x 2.5 (WF nhbd.) = 3.30 water factor.**

**C.) $2,000,000 - $350,000 = $1,650,000 - $500,000 = $1,150,000 / 200 ft = $5,750 per foot.**

# RESIDUAL ANALYSIS SUMMARY

- Used to establish a preliminary land curve, used to define neighborhoods, used for final documentation.
- If used to define neighborhoods, building values must be finalized.
- Sample sizes should be large enough to provide realistic results (5 or more sales within each neighborhood).
- Bracketing neighborhoods were there are insufficient sales.

# RESIDUAL ANALYSIS PRINCIPLES AND PROCEEDURES

Question and Answer Session