Using Remote Sensing Technology
for
Appraisal Data Verification and Collection

by
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TEAM Consulting
Remote Sensing

“The science, technology and art of obtaining information about objects or phenomena from a distance and without being in physical contact with them.”

- Aerial Photography and Digital Imagery
  - Orthogonal
  - Horizontal
  - Oblique

- Planimetric Data

- Laser Measuring Devices
The Story

- Washington, D.C.
- Jackson County, Missouri  (Kansas City, MO)
- Wyandotte County, Kansas  (Kansas City, KS)
- Other
Using New Technology
The Washington, DC Experience

Presentation for
71st Annual International Conference on Assessment Administration
Anchorage, Alaska
September 19, 2005
by
Thomas Branham
Director of Real Estate Assessments
District of Columbia, Office of Tax & Revenue
and
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Principal Consultant
TEAM Consulting
Washington, DC Office of Tax and Revenue

• The Statistics
  – 61 square miles
  – 176,000 parcels
  – $105 billion market value

• New CAMA System
  – No sketches in system
  – Annual valuations

• Double Digit Increases in Value
Washington, DC’s Problem

- New CAMA System
  - No sketches in system
  - Annual valuations
- Data Inconsistencies
  - No comprehensive review in 10 years
  - Large portion of properties could not be modeled because of data
- Double Digit Increases in Value
Washington, DC Goals and Objectives

• Review of All Taxable Properties (except condos and coops)
• 125,000 Residential and Commercial Properties
• Outsource Data Review
• Use the Latest Technology
• Complete Project in Less than 12 Months
• Spend Less than $1,000,000
What Washington, DC Decided To Do

Issue an RFP

• Sketch Vectoring
  – Vision Appraisal System

• Data Verification
  – Manatron, Inc.
  – Mobile Video Services, Inc.

• Project Quality Control
  – TEAM Consulting
Appraisal Data Verification (ADV+)
Appraisal Data Verification (ADV+) Process

Combines mass appraisal’s best methods, GIS/GPS, remote sensing, data analysis techniques and mobile data collection technology to re-engineer the appraisal data field verification process.
Appraisal Data Verification (ADV+) Process

- Photos
- X-Y Coordinates
- Street Address
- Appraisal Data Review
- Analysis
- Update CAMA System
Property Imaging
Reflects Overall Value & Minimal Obstructions
X-Y Coordinates

Intelligent points linking each structure’s x-y coordinate to its parcel number, verified address, CAMA file and street-view photograph.
Address Verification

- Site Address Verified to Address on Face of Structure
- Data Segments Collected in National Emergency Numbering Association (NENA) Format
- x,y Coordinate for each Primary Address
- Corrections Identified with Attributes
  - Corrected Street Name
  - Correct Number
  - Confirmed or Unverified
  - Multiple Address
Verify Appraisal Data
Data for Field Verification

The Data that was taken into the field included the following:

- CAMA Data
- PRC JPEG
- Property Sketches
- GIS
- Orthophotographs
- Planimetric Footprints
- Oblique Imagery
Verify Appraisal Data

Objective Property Characteristics

Parcels requiring additional review identified with Field and Sketch Review Attributes

- Property Class-Use
- Style
- Effective Age
- Exterior Walls
- Story Height
- Roof Material
- Attic
- Basement
- Foundation
- Air Conditioning
- Out Buildings
- Parking

Jurisdiction specific factors
Verify Appraisal Data

Subjective Property Characteristics
Parcels requiring additional review identified with Field and Sketch Review Attributes

- Grade
- Condition
- Location Factors
- Jurisdiction specific factors

The integration of data with GIS, sketch and imaging provides for a high-quality review and enhanced productivity.
Verify Sketch and Measurements

In-Field Sketch
Comparison to:

• **Structure**
  Verify sections, levels and labels

• **Planimetric Footprint**
  Verify perimeter measurements

• **Orthophotography**
  Identify additions and obstructed view
Verify Sketch and Measurements

Planimetric Footprint

The mass appraiser in the field collection unit compares the dimensions on the planimetric footprint (minus the estimated roof overhang) with the same walls on the CAMA sketch to see if the two are within allowable tolerances.
Oblique View

The use of Oblique Photography provides the mass appraiser with the ability to view the entire property to determine building orientation, outline, characteristics and context.
Data Entry and Processing

Workflow Processes

• Data organized into review levels
• Each review level has separate procedures for review and entry
• Problem data elements are pushed to higher review levels
• Data entry into CAMA system
  – Mass update when supported by CAMA system
  – Manual data entry due to software limitations
Data Entry and Processing

Image Management and Analysis Software

Focused Software Applications

- Analysis of data exceptions
- Virtual walk through neighborhood
- Linked to GIS and Pictometry

- Display and print comp report
- Maintain image warehouse
- Analyze sales and data
Data Entry and Processing

Data exceptions for 125,000 residential parcels

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<tr>
<th>Level</th>
<th>Count</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>372,990</td>
<td>Property Characteristics</td>
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<tr>
<td>2</td>
<td>2,190</td>
<td>Review Characteristics</td>
</tr>
<tr>
<td>3</td>
<td>7,252</td>
<td>Office Action Required</td>
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<tr>
<td>4</td>
<td>12,569</td>
<td>Office Action Complete</td>
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<tr>
<td>5</td>
<td>3,172</td>
<td>No Sketch</td>
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<tr>
<td>6</td>
<td>2,947</td>
<td>Field Action Required</td>
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<tr>
<td>7</td>
<td>2,817</td>
<td>Field Action Complete</td>
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<td></td>
<td>403,937</td>
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Residential
- Use Code 2,394
- Old Style 4,768
- Roof Covering 25,768
- Building Type 1,400
- Story Height 7,079
- Air Conditioning 1,235
- Exterior Finish 7,599
- New Style 103,198
- Parking 104,433
- Grade 44,409
- Condition 29,011

331,294
Data Entry and Processing
Resolution of Field and Sketch Review Parcels

Appraisal staff can investigate and resolve data exceptions at the desktop with software applications. Data exceptions are linked to GIS or Pictometry through address x,y points.

<table>
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<tr>
<th>Office Action</th>
<th>Count</th>
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<td>Count</td>
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<td>Description</td>
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<tr>
<td>2,932</td>
<td></td>
<td>Building Razed</td>
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<tr>
<td>2,948</td>
<td></td>
<td>Minor Addition (deck/porch/garage)</td>
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<tr>
<td>1,064</td>
<td></td>
<td>Correct Sketch Measurements/Labels</td>
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<tr>
<td>308</td>
<td></td>
<td>Verify Use</td>
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<tr>
<td>7,252</td>
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<table>
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<tr>
<th>Field Action</th>
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<tr>
<td>Count</td>
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<td>Description</td>
</tr>
<tr>
<td>664</td>
<td></td>
<td>Additional Sq. Ft. Not on Sketch</td>
</tr>
<tr>
<td>509</td>
<td></td>
<td>New Construction</td>
</tr>
<tr>
<td>1,774</td>
<td></td>
<td>Field Verify (significant variation)</td>
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<tr>
<td>2,947</td>
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Appraisal Data Verification Process
What We Learned

- Appraisal staff was more productive due to data:
  - Consistency
  - Accuracy
  - Timeliness

- Appraisal staff was able to focus on valuation work – not data collection

- The use of the best available qualified mass appraisers yielded a higher level of confidence in resulting data and final values

- There was a substantial reduction in the amount of field work during final review
Appraisal Data Verification Process
What We Learned

- Traditional data collection techniques are not necessary on most properties
- Dramatically reduces cost, while improving the quality and timeliness of property valuation data
- High tech alternative to “walk around” data collection methods used in past
- Win-Win for the Office of Tax and Revenue and taxpayers
  - Provides a quality data review at a reasonable cost
Appraisal Data Verification Plus (ADV+)

How Long Did It Take

- May 1, 2004 Project Start
- June 1, 2004 Begin Field Work
- October 27, 2004 Field Work Completed
- April 1, 2005 Project Completion
What Did It Cost?

- Approximately $8.00 per parcel
  - Picture
  - X,Y Coordinate
  - Address Verification
  - Data Review
  - Appraisers
  - Software
  - Quality Assurance
- Cut Cost by Using Your Own Appraisers
- $8 Vs. $30 Using Traditional Methods
## What Is the Payoff?

### Return on Investment

<table>
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<tr>
<th></th>
<th>DC</th>
<th>Other</th>
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<tbody>
<tr>
<td>Total Parcels</td>
<td>125,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Market Value Discovered</td>
<td>$948M (1)</td>
<td>$89M (2)</td>
</tr>
<tr>
<td>Effective Tax Rate</td>
<td>.91%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Tax Revenue</td>
<td>$8,729,900</td>
<td>$1,372,635</td>
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<tr>
<td>Contract Amount</td>
<td>$800,000</td>
<td>$200,000</td>
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<tr>
<td>ROI (minimum)</td>
<td>11:1</td>
<td>7:1</td>
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**NOTE:**

(1) From only three data elements (parking, grade and condition)
(2) Figure does not include effective age changes
Access this presentation online at:

www.mvideo.com/TEAMconsulting/WashDC_Anchorage.pdf
Jackson County, MO
Personal Property

- Tax revenue going to wrong tax districts
- Many accounts not on tax roll
- No connection between real property and personal rolls
- Billboards and Cell Towers
- Verified street address
- Street-view image
- X-Y tied to real parcel ID
- Name of business
• Generalized location of structure
• Identification screen
• Images of structure
• Location linked to real property ownership
Jackson County, MO
Summary

- Parcels Reviewed: 239,583
- Structures Found
  - 3,798 Unrecorded Structures
  - 1,499 Abandoned Structures
  - 3,067 Mobile Homes
- Personal Property Found
  - 230 Towers
  - 938 Billboards
  - 3,273 New Businesses
  - 947 Business Name Changes
- ROI: Over $4 Million in Taxes Found
  - $650,000 Cost to County
Wyandotte County, KS
Change Detection

CAMA Sketch

- Sketch visually placed on ortho
- Determine magnitude of missing information
- Review additional resources
- Field review ?
Wyandotte County, KS
Change Detection

Visual Comparison

- Visually compare images from different years
- Note differences
- Review other resources
- Field verify?
Other Remote Sensing Applications

- Laser Measuring Devices
- Color IR Handheld Cameras
  - Water Damage
  - Heat Loss
  - Insect Damage
Access this presentation online at:

www.teamconsulting.cc/presentations/clearwaterppt.pdf