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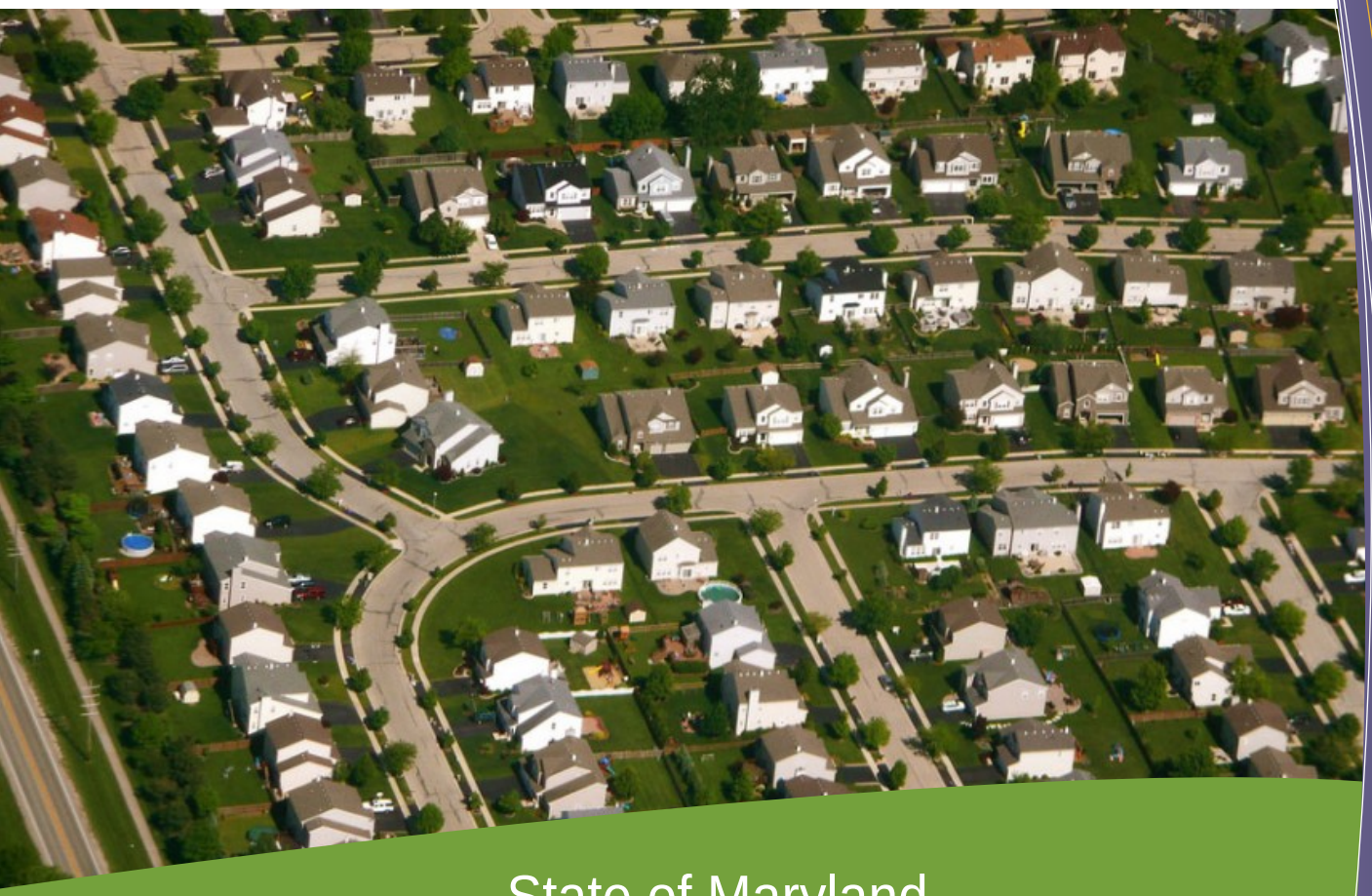
SMART DATA STRATEGIES



State of Maryland

Real Property Audit Pilot Summary

Real Property Audit™

Introduction

A Real Property Audit™ is an independent review of an agency or jurisdiction's tax records and the various GIS and CAMA database components that comprise the supporting records to insure fair and equitable taxation. This Pilot project will aid in giving the state an opportunity to find and correct inaccuracy in their data and possibly find missed revenue.

The purpose of this document is not intended to focus on lost or potential revenue but merely to report on errors found. Ultimately, what is found will be the determining fact whether or not if tax revenue has been over or under calculated. In this document, we will be covering the fundamentals of how tax assessment is calculated and what features are reviewable.

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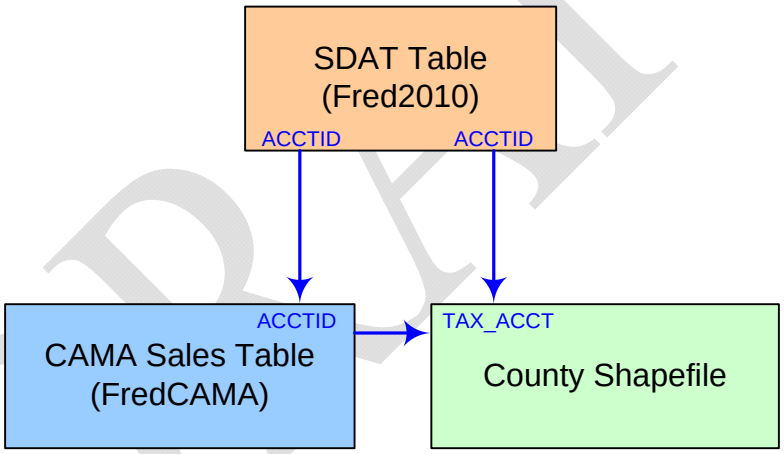
Data Structure

The data structure starts with the SDAT table, which basically holds the property details such as owner name, address, lot size, legal description and other miscellaneous information pertaining to the property. This is ultimately the starting point for all taxation.

The CAMA dataset contains additional residential housing characteristics that make up the sizes of improvements such as main structures, detached structures, pools, tennis courts, greenhouses and etc.

Lastly, the county shapefile is a graphic representation of the property size and location within the county. Attributes includes tax account, address, construction source in which the property is recorded from, calculated acreage and etc... This also has links to the SDAT table that is available on the states website.



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Existing Data

First, we need to understand how the current database is calculated before we make any comparisons or assumptions. Currently there is no sketch software or graphic data representing the taxable structure other than the tax worksheet. Currently this is tracked in the CAMA database broke down by each section of the structure. Below shows the database structure; Sec1_SQFT - Sec4_SQFT represents the square footage for each section. The Sec1_Story - Sec4_Story represents how many floors that section represents.

SEC1_CONST	Character Field	Width 3	Optional
SEC1_CDESC	Character Field	Width 24	*MdProperty*
SEC1_SQFT	Numeric Field	Width 11	Optional
SEC2_CONST	Character Field	Width 3	Optional
SEC2_CDESC	Character Field	Width 24	*MdProperty*
SEC2_SQFT	Numeric Field	Width 11	Optional
SEC3_CONST	Character Field	Width 3	Optional
SEC3_CDESC	Character Field	Width 24	*MdProperty*
SEC3_SQFT	Numeric Field	Width 11	Optional
SEC4_CONST	Character Field	Width 3	Optional
SEC4_CDESC	Character Field	Width 24	*MdProperty*
SEC4_SQFT	Numeric Field	Width 11	Optional

Construction material code (SEC1_CONST, SEC2_CONST, SEC3_CONST, SEC4_CONST) and description (SEC1_CDESC, SEC2_CDESC, SEC3_CDESC, SEC4_CDESC) of sections 1 through 4 of the dwelling:

001	siding aluminum or vinyl	008	stone
002	frame	009	1/2 brick and siding
003	wood shingle	010	1/2 brick and frame
004	asbestos shingle	011	1/2 stone and siding
005	stucco	012	1/2 stone and frame
006	block	013	log
007	brick	014	no data

Square feet of sections 1 through 4 of the dwelling (SEC1_SQFT, SEC2_SQFT, SEC3_SQFT, SEC4_SQFT).

SEC1_STORY	Character Field	Width 3	Optional
SEC1_SDESC	Character Field	Width 25	*MdProperty*
SEC2_STORY	Character Field	Width 3	Optional
SEC2_SDESC	Character Field	Width 25	*MdProperty*
SEC3_STORY	Character Field	Width 3	Optional
SEC3_SDESC	Character Field	Width 25	*MdProperty*
SEC4_STORY	Character Field	Width 3	Optional
SEC4_SDESC	Character Field	Width 25	*MdProperty*

Story height code (SEC1_STORY, SEC2_STORY, SEC3_STORY, SEC4_STORY) and description (SEC1_SDESC, SEC2_SDESC, SEC3_SDESC, SEC4_SDESC) of sections 1 through 4 of the dwelling:

001	1 story no basement	008	2 1/2 story with basement
002	1 story with basement	009	3 story no basement
003	1 1/2 story no basement	010	3 story with basement
004	1 1/2 story with basement	011	4 story no basement
005	2 story no basement	012	4 story with basement
006	2 story with basement	013	split foyer
007	2 1/2 story no basement	014	no data

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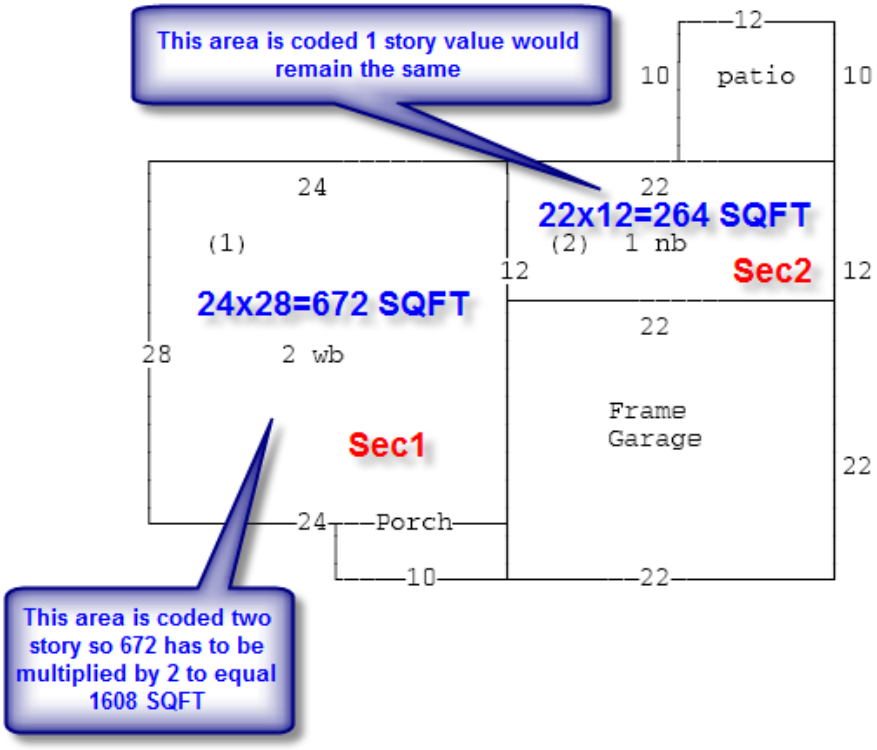
Each section (listed Sec1 - Sec4) of the structure is noted and coded in how many floors and square footage for that section. In this example, Sec 1 represents two floors so it has to be multiplied by 2. Sec2 only represents a single floor or the first floor only so nothing more needs to be done for the area. Sections are divided vertically has shown below.



Areas such as Porch, Patio and Garage in the example are not used to calculate the area in the foundation square footage. Once all of the section values are tallied it is totaled and populated in the ENCLS_SQFT field as what we would call livable square footage.

FNDAT_SQFT	Numeric Field	Width 11		Optional
ENCLS_SQFT	Numeric Field	Width 10	Decimal Places 2	Optional

Cumulative foundation square feet of all sections of the dwelling (FNDAT_SQFT) and cumulative total square feet of the dwelling, including both finished and unfinished areas multiplied by the story height of each section of the dwelling (ENCLS_SQFT). **Cumulative total square feet of the dwelling may not include the attic or basement finished areas.**

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Comparison Process

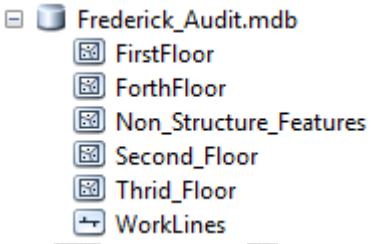
Each parcel that has a visual house or business that can be seen from the ortho should be reviewed for accuracy against the CAMA or Property record system. Each record in the appraisal system should have a breakdown of the square footage for each structure that is taxed. Some parcels will not have this information because of tax exemptions or parcels that are part of another jurisdiction not covered in this audit. All other parcels that should have structure information will be logged and not reviewed but simply noted that data is missing from the roll.

Some county systems have sketch software as another way to track the area of a structure. In the case of Maryland there is no software being used/provided to aid in the Property Audit. In this case, we only have the MDPV table and visual ground evidence to use as a guide. With this being said there would be a certain margin of error that would give a false positive of there being error in the property information. So a tolerance will be used to help identify building structures that might possibly be incorrectly represented in the MDPV data.

Sketch Creation Process

Each major structure should be checked against the parcel data table in the MDPV. To make a comparison you first need something measurable in order to compare the values found in the tabular data. To do this we need to create graphical data you can measure and track.

We start with a container for the many items we want to measure



Each floor gets its own level to make drawing the features easer to place. Basements are ignored in this step because it isn't a visual object seen from the ortho or in the obliques.

Work Lines - This is to aid in building the structures only.
First floor - Any part of the structure that is at the ground level and that can be seen from the ortho image.
Second Floor - Any Part of the structure that is found on the second floor.
Third Floor - Any Part of the structure that is found on the third floor.
Forth Floor - Any Part of the structure that is found on the forth floor.
Non-Structure Features - These are concrete pools, vinyl pools, green houses or tennis courts found on the property.

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Fcodes - Each feature will be assigned an fcode based on similar classification types found in the MDPV table. This will allow us to match and review each internal structure feature and make comparisons. The codes are as follows and are on each feature class to ease the coding scheme.

1 - Liveable SQ Area
2 - Porch
3 - Covered Porch
4 - Enclosed Porch
5 - Deck
6 - Covered Deck
7 - Garage
8 - Carport
9 - Detached Garage
10 - Detached Carport
11 - Detached Structure (Other)
12 - Patio
13 - Covered Patio

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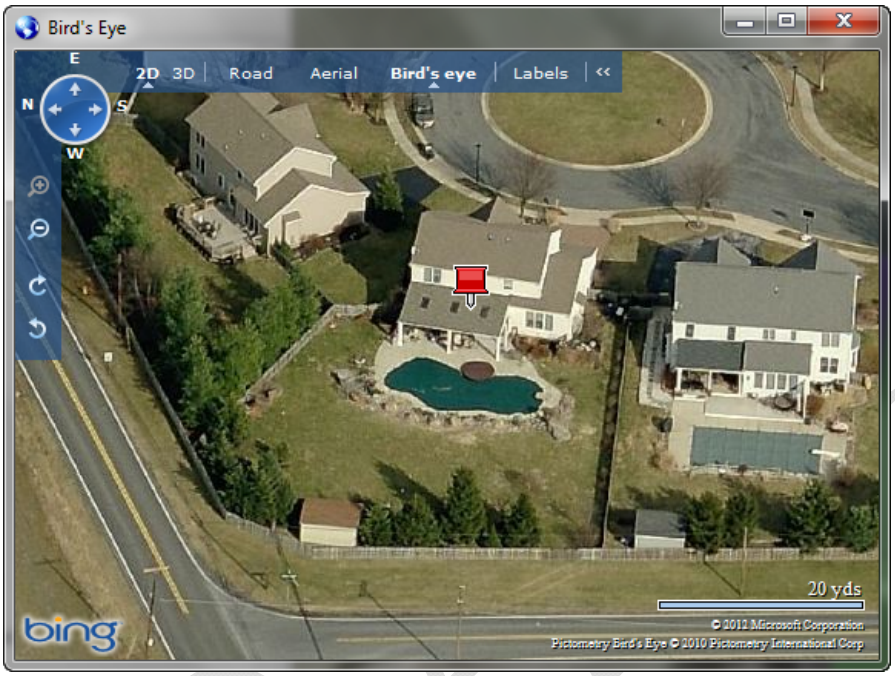
To aid in the placement and take some of the guesswork out of what you are seeing you can use the obliques using Microsoft's "bird's eye" viewer. This allows the user to identify features not seen from the standard ortho photo. Items such as covered porches, carports, enclosed porches, garages and etc. This will allow the user to use simple geometry to make an educated guess where to draw these features.



Note: There's a widget that is available from ESRI to use the "Bird's eye" and "Street view" in ArcMap where available. To get this, download the plug-in at;
http://resources.arcgis.com/gallery/file/arcobjects-net-api/details

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Manual Review

Once the shapes have been created, we need to assign tax account numbers to each polygon. This will allow us to compare them in an automated process later. First, we need to make sure what was sketched also matches the description found in the CAMA.
Let's take the example of four parcels that was found to be in an incorrect location. Reviewing Parcels from left to right the CAMA records line up using the SEC1_SDESC field. However, when looking at the parcel polygon the records are actually backwards.

fredcama

ACCTID *	SEC1_CONST	SEC1_CDESC	SEC1_SQFT	SEC2_CONST	SEC2_SQFT	SEC1_STORY	SEC1_SDESC	SEC2_STORY	ENCLS_SQFT
1126493838	002	frame	720	002	288	004	1 1/2 story with basement	001	1368
1126499232	006	block	891		0	002	1 story with basement		891
1126493781	002	frame	564		0	006	2 story with basement		1128
1126494397	002	frame	384	002	208	006	2 story with basement	001	976

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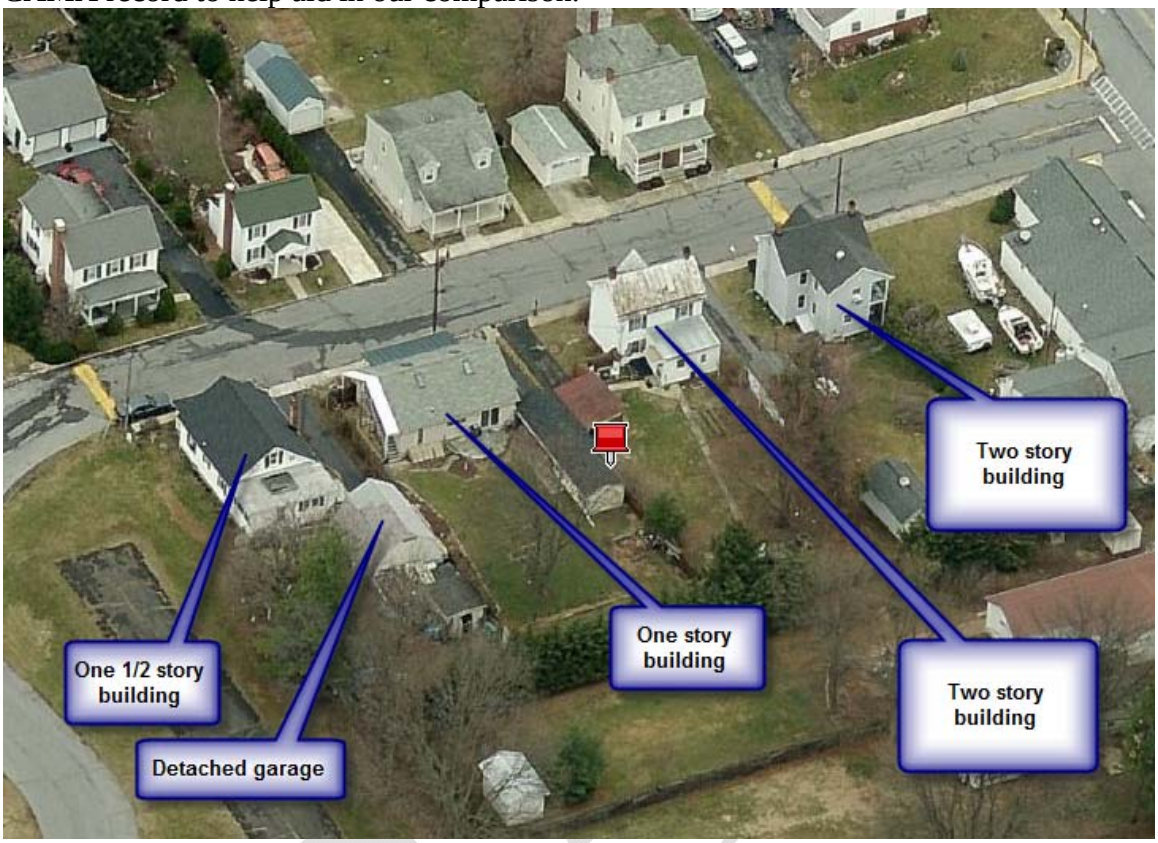
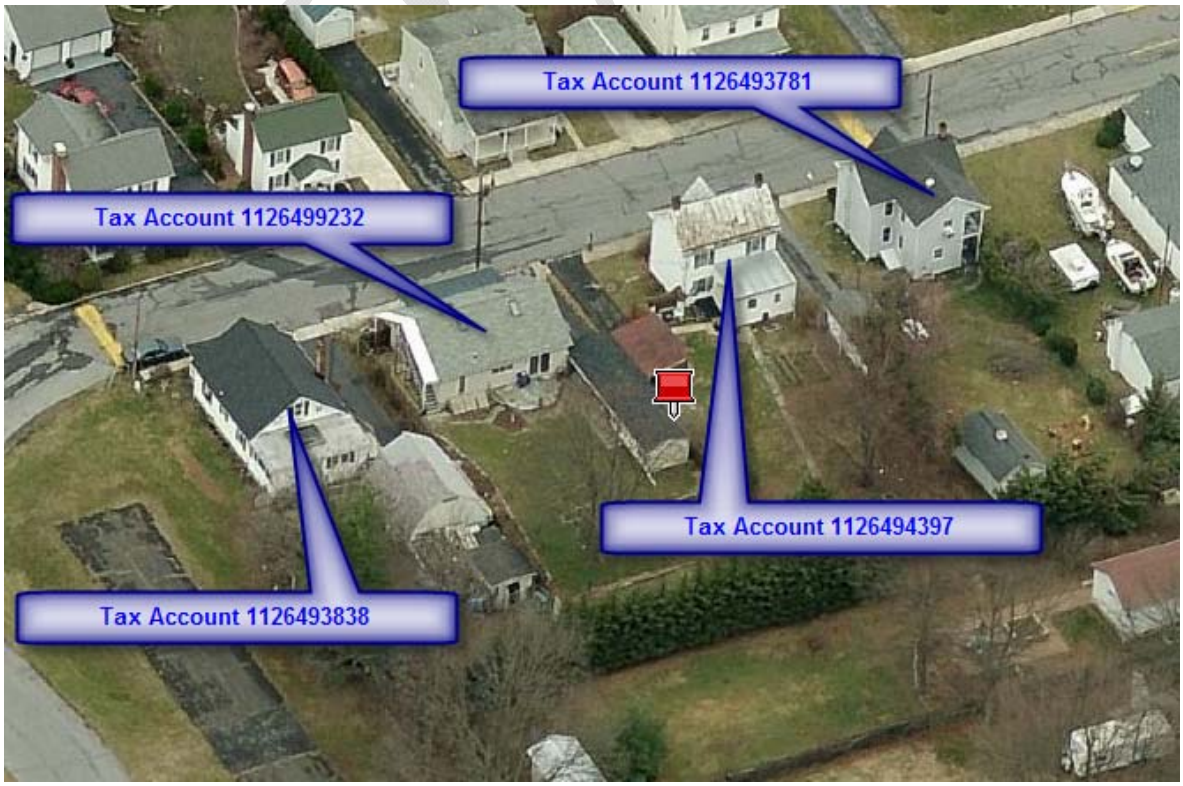
Using the obliques, we can verify the number of stories along with any other structures found in the CAMA record to help aid in our comparison.





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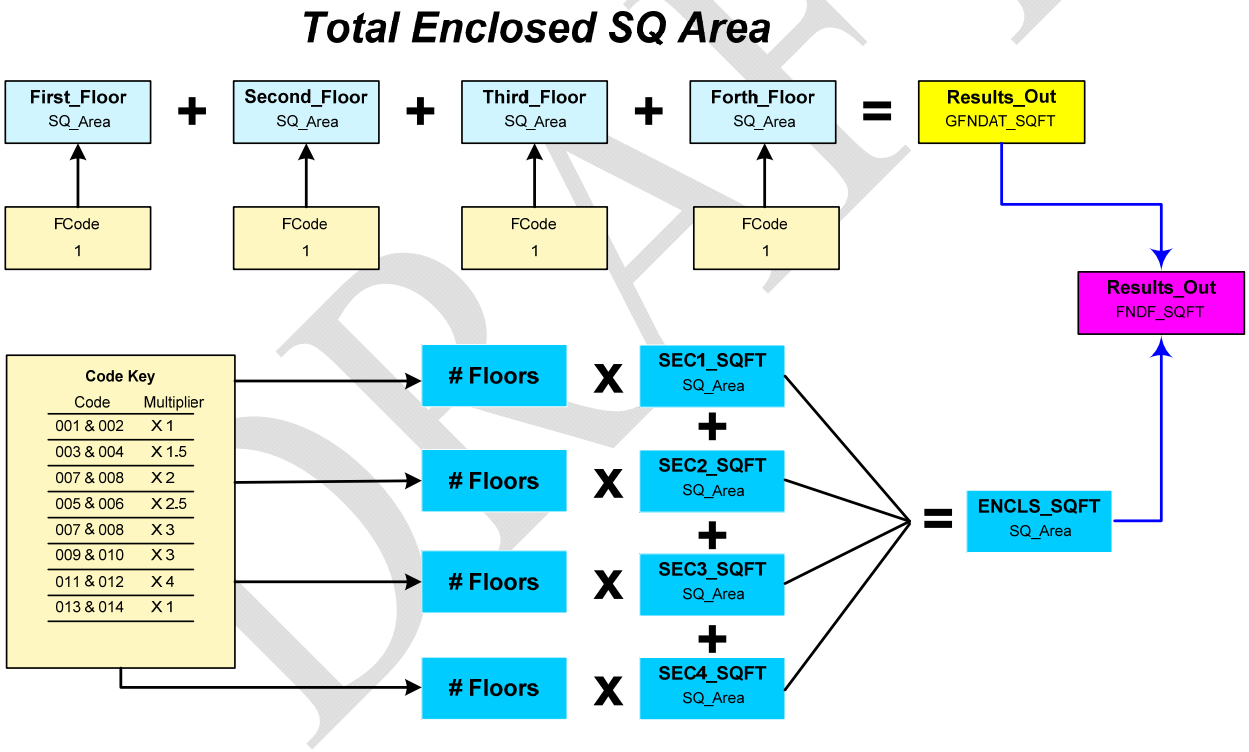
Automated Structure Review

Once the tax account has been determined for each building, we can measure the square footage of the structure and compare that to the CAMA record.

In order to make those comparisons there has to be routines and formulas to calculate the data. Since we are using more than one source and feature class a complex routine has to be put in place in order to replicate the comparisons.

Using the Schema from above we can create the GDB platform in order to build the query routines. A SDE geodatabase is a good format that allows routines or "views" to be built and calculated. Using this we can build a table with the results of the tabular and graphic data differences. These routines will use formulas to build the results we need to show possible error in the data. The following formula suggested is used to compare the enclosed area results.



Other formulas are also used to check features such as;

Garages
Porches
Decks
Patios
Carports
Detached Garages
Detached Carports
Pools
Tennis Courts
Greenhouses

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Acreage breakdown and Divergence

Taxable land area is one of the most important and easiest ways of finding missing tax value in an appraisal system. There are several reasons why these values would be different from the actual size of the property. Possible reasons could range from bad source information to miss interpreting of ground evidence.

Process

Each parcel should be checked and reviewed for possible skewed values. Performed for each property should be a comparison between calculated acreage and Appraisal acreage. Each county and state Land roll system is different but the values should be available as an acreage or square footage field.

In ArcMap use the Join feature class to attach the MDPV (Fred2010) file to the Shapefile. Use the "Match only" option when joining; this eliminates any null and missing records that cannot be checked. Open the properties of the joined table and turn off all of the fields in the feature class except Tax_acct, area, acreage and LandArea. Then export the table to a DBF file to be opened in Excel.

In Excel create a formulas to calculate three separate fields called difference, divergence and divergence percentage.

Formulas as follows

a) *Difference* - Subtract MDPV value from the calculated acreage from the shapefile.

b) *Divergence* - To get the raw divergence;

(MDPV_AC - Calculated Area) / MDPV_AC * 100)

c) *Divergence Percentage* - To get the percentage value, first make the field a Percentage field then use one of the formulas below;

(MDPV_AC - Calculated Area) / MDPV_AC)

If the Divergence value is negative then use this formula

(Calculated Area - MDPV_AC) / Calculated Area)

Once the all of the formulas have been calculated then percentage brackets can be tallied and grouped to represent the margin of error.

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Data Findings

Acreage Divergence

Here are the findings just using a basic join from the SDAT table.

Note: some of the values will not correctly align with the results requiring a further look. Example parcel 1119391450 has two records in the Graphic data creating one record that has 0.000107 Ac and another that has 2.5 Ac. Since this was a simple join, no dissolving was done to eliminate these records for the results therefore creating some skewed results. There are approximately 696 unique account numbers with multiple polygons.

Records in red represent negative values.

Percentage Range	#Records
Null	307
100% - 90%	210
90% - 80%	99
80% - 70%	114
70% - 60%	137
60% - 50%	204
50% - 40%	270
40% - 30%	462
30% - 20%	762
20% - 10%	1,880
10% - 5%	2,051
5% - 0%	18,656
0% - 5%	23,828
5% - 10%	1,876
10% - 20%	1,630
20% - 30%	796
30% - 40%	407
40% - 50%	284
50% - 60%	246
60% - 70%	144
70% - 80%	97
80% - 90%	82
90% - 100%	119

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Livable SQFT Divergence

77 random properties were sampled to measure livable square area. On each property, the structure was drawn compared to the ortho and measured. Each floor was drawn and matched as close as possible to the structure on the parcel. From this data, we compared the values in the CAMA table using the above formulas.

Note: Basement areas were not figured in on this review.

The Square foot for the livable area worked out to the following results;

70 properties totaling 25,923 SQFT over the recorded CAMA values.
7 properties totaling -2,522 under the drawn structures.

Location accuracy

Each property was also reviewed to see if the structure matched what was found on the ground. This was accomplished by using the attributes found in the CAMA table. By compiling the following attributes, we can determine if the structure belongs with the parcel. Items used to compare these features are;

- Number of stories
- Exterior construction material
- Roof Covering
- Number of detached Garages or Carports
- Number of non-structure features such as pools, tennis courts or green houses
- Building Square footage of the foundation footprint
- Address ranges

During our review there were there were 8 properties that were not found to be on the correct parcel. The following records were believed to be on the wrong parcel;

- ✓ 1126490537
- ✓ 1126493781
- ✓ 1126493838
- ✓ 1126494397
- ✓ 1126499232
- ✓ 1126504236
- ✓ 1126505631
- ✓ 1126506557