# Guide to Maintaining Standardized Assessor Parcel Maps in Massachusetts
(May 2017)

INTRODUCTION

Statewide standardized parcel mapping was first identified as an important objective in a MassGIS newsletter from spring 1988! More recently, the [Strategic Plan for Massachusetts Spatial Data Infrastructure](#) (2007) highlighted the importance of this dataset and recommended state funding to complete it statewide.
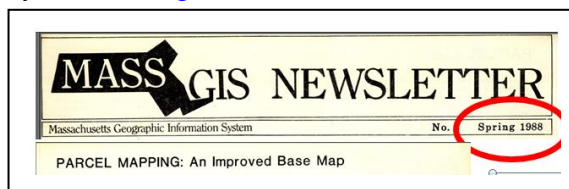
In Fiscal Year 2011, working with a number of service providers, MassGIS started a project to standardize assessor tax mapping for use in GIS software. The primary impetus for state funding of the project was the needs of the State 911 Department's Next Generation E-911 Project. The specification for this work was "Level 3" of the MassGIS Standard for Digital Parcel Files, Version 2.x (available on the MassGIS web site at www.mass.gov/itd/massgisstandards). Level 3 was developed as a simplification of the previous Level 2 standard in response to comments from a wide variety of users. Standardized data for two-hundred sixty communities was delivered to MassGIS before July 2012. The remaining communities, except Boston, were completed byJuly 2013. The nearly three million dollars spent on this project have demonstrably, and often significantly, not only improved the parcel mapping in many communities, but also resulted in improved data quality in assessing databases and a better match rate between the map and the tax record, while raising the awareness of the importance of the relationship between parcel mapping and assessor databases.

Maintaining standardized mapping, including use and maintenance of the standard's unique parcel identifier, the locational Id ("LOC_ID") in assessing databases is now becoming generally accepted. Maintaining standardized mapping and LOC_IDs is endorsed by the Massachusetts Association of Assessing Officers (MAAO) as a best practice for assessors and recommended by the Department of Revenue's Bureau of Local Assessment (BLA); the BLA oversees the activities of municipal assessors.

Since MassGIS embarked on the standardized parcel mapping project, the GIS consulting firms working in Massachusetts have supported and promoted the project. Similar support has come from the regional planning agencies (RPAs) who provide map maintenance services for some communities[1]. Likewise, after being approached by MassGIS, the principal providers to

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[1] GIS consultants on the project included Tighe and Bond, James W. Sewall Co, Color and Colantonio, CDM Smith, Cartographic Associates, and Applied Geographics; the RPAs who participated were Berkshire Regional Planning Commission, Pioneer Valley Planning Commission, Central Massachusetts Regional Planning Commission, Northern Middlesex Council of Governments, and Merrimack Valley Planning Commission

Massachusetts communities of computer assisted mass appraisal (CAMA) software (the state-supported CSC, Patriot, PK-Systems, Vision Government Solutions, and Tyler Technologies/Univers) have supported this initiative. They developed a new standard report, the "MassGIS extract", supported their customers by bulk-loading LOC_IDs into CAMA databases and shifted to using the LOC_ID as the key for linking CAMA records with their corresponding map parcel.

Thus, 25 years after it was first articulated in that early MassGIS newsletter, the vision for standardized assessor parcel mapping has finally been realized. The next challenge for MassGIS is working with communities to facilitate use of the standardized parcel mapping in their daily operations and, most importantly, to maintain the standardized mapping (as of December 2015 approximately 320 communities are or have committed in writing to maintaining standardized mapping and about 275 communities are or have committed in writing to maintaining LOC_IDs in their CAMA database).

Below is a short description of the essential concepts you need to understand before editing the standardized data followed by a discussion of some of the obstacles to maintaining standardized data. Then the body of this guide contains a short review of the advantages of standardized parcel mapping, provides an overview of the structure of the standardized data, and finishes with guidance on how to maintain the standardized data.

Overview

The essential concepts to understand before editing standardized parcel data are:

1. That there are two primary feature classes, *TaxPar* and *OthLeg,* and how they differ;
2. Why some parcel polygons in the *TaxPar* feature class are classified as "TAX" polygons, why some "TAX" polygons are multi-part polygons, and the relationship between "TAX" polygons in the *TaxPar* feature class and "FEE" polygons in the *OthLeg* feature class;
3. The LOC_ID identifier and why it is important (how to create them is covered below).

The standardized data from MassGIS are in a file geodatabase[2]. They are organized a little differently from what you may be used to, and have some unfamiliar attributes. However, maintaining standardized parcel mapping is not significantly different from maintaining any other version of your community's parcel data:

- You still edit parcel boundaries using information

> *Note: If you maintain parcel attributes that are not part of the standardized data you should transfer those attributes to the standardized data; contact MassGIS' Craig Austin (craig.austin@mass.gov) if you need assistance with that transfer.*

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[2] A shape file version is also available, although if you use ArcGIS we strongly recommend using the file GDB version of your data. The fGDB version can be imported into a personal GDB or exported to shape files.

from plans, deeds, and other sources;

- You still edit attributes (but you have to be familiar with the additional attributes required by the standard – see summary from standard at the end of this document); and
- You still edit annotation or equivalent text features.

In considering use of the standardized data, remember that, in many communities, funding provided through MassGIS probably significantly improved the geographic accuracy of the lot lines, the connection between the maps and the assessing data, or both; these improvements were typically worth thousands of dollars.

Obstacles to Maintaining Standardized Data

Finally, MassGIS is well aware that for some communities, there are obstacles to using and maintaining the standardized data. These obstacles include:

- Feature classes have different names as do their attributes and this disrupts existing dependencies in desktop and on-line uses of parcel data,
- Parcel dimension text features or derived data layers (e.g. zoning) do not line up correctly with parcel lot lines adjusted in the standardization process,
- ArcGIS symbolization may be based on attributes not in the standardized data, and
- You may have used of a different unique ID for associating parcels to assessing records.

Note: MassGIS would welcome ideas for how the parcel standard might be extended to better meet the needs of municipalities, particularly in the area of parcel dimension information. If you have suggestions for extending the standard, please send them to Neil MacGaffey or Craig Austin at MassGIS.

Some communities have adopted the standardized data despite these obstacles and are making the necessary changes elsewhere in their GIS operations. Some communities are adopting the standardized data, but renaming the *TaxPar* feature class and some attributes to match the equivalent names they have been using; when they provide updates to MassGIS they will change names to match those used in the standard. If you find these changes are more than you think you can or are willing to undertake, please send email to Neil MacGaffey at MassGIS (neil.macgaffey@mass.gov). MassGIS is committed to helping communities resolve these issues if they are willing to use the standardized data.

ADVANTAGES OF MAINTAINING STANDARIZED PARCEL MAPPING

The advantages of using and maintaining standardized parcel mapping are that:

1. In many communities it provides better quality mapping
2. It eliminates the many-to-many relationship between assessor data and mapping

3. It ensures a very high match rate between maps and CAMA and vice versa
4. It provides seamless integration with parcel data from adjacent communities, whether for supporting emergency response, complete abutter notifications, planning, or development review.
5. It provides a map maintenance specification for a consultant
6. It lowers software application costs because consultants don't have to modify their application for your parcel data structure
7. It enables tight integration between parcel data and other land records (for example, permit records and registry records)
8. It enables much better address matching
9. It enables state or regional level on-line viewing of parcel data
10. The Department of Revenue's current recertification guidelines for assessors promote using the MassGIS standard for tax maps used in a GIS.

OVERVIEW OF STANDARDIZED PARCEL MAP DATA

Standardized parcel mapping for each community is available through the MassGIS web site (see www.mass.gov/itd/datalayers) as a file geodatabase (fGDB). This fGDB contains three feature classes and three database tables:

> Note: The standard enforces a naming convention for municipal data. In that convention, "Mxxx" appears frequently. The "xxx" refers to a unique three digit municipal ID ("town ID") ranging from 001 to 351. This format provides MassGIS with a consistent naming structure for feature classes and data tables.

Feature classes

1. *MxxxTaxPar* = This feature class's name is short for "tax parcels" and it contains almost all the parcel polygons in a community. Different types of polygons (e.g., parcels, water, rights-of-way, etc) are identified in the POLY_TYPE attribute. This feature class is the equivalent to your parcel data layer.

2. *MxxxOthLeg* = The name of this feature class is short for "other legal interests" and contains polygons that completely or partly overlap polygons in the *TaxPar* feature class. This includes easements, which are stored as polygons, not lines. Different types of polygons, each representing specific legal interests, are identified in the LEGAL_TYPE attribute. This approach is consistent with property ownership consisting of a "bundle of rights" that can be sold off individually (e.g., development rights, easements, air rights, etc.). When rights are sold, they may only be sold for part of a property. Therefore, this feature class contains polygons representing different ownership rights.

3. *MxxxMisc* = This feature class contains any "miscellaneous" features in the source file or maps that do not belong in the other two feature classes. This feature class does not have to be retained if you have the equivalent information in some other part of your GIS database.

Database tables

1. *MxxxAssess* = the extract of assessing information; joins or relates to *TaxPar* feature class using the LOC_ID

2. *MxxxUC*_LUT = a look-up table that translates assessor use codes, both statewide and any custom codes for that community, into a description (e.g., 101 = "single family residential")

3. *Mxxx*_LUT = a look-up table that translates the values in either the LEGAL_TYPE attribute of the *OthLeg* feature class <u>OR</u> the MISC_TYPE attribute of the *Misc* feature class. This look-up table is required because the allowed values of LEGAL_TYPE and MISC_TYPE can be expanded by the communities.

The standard also requires use of a standardized parcel identifier, the LOC_ID ("locational ID"). All the above components are described in more detail below, starting with the LOC_ID.

The LOC_ID Identifier

Standardizing the link between parcel mapping and assessing records is a pre-requisite for statewide standardized assessor mapping. That link is the LOC_ID identifier. The LOC_ID is not intended to replace any existing identifiers. Its principal purpose linking assessor records to their parcel and vice-versa.

The LOC_ID is derived from an X,Y coordinate pair inside each map polygon (plus a letter, "F" or "M", indicating whether the source units are feet or meters), is unique statewide, and is the foundation for consistent linking of maps and assessing data across all communities. A LOC_ID looks like this: M_247721_956656.

Traditional map identifiers based on map, block, lot or equivalent will not disappear anytime soon. However, an ID for linking maps and assessing data that does not depend on map-derived information is simpler and easier to maintain; for example, it would not be impacted by a decision to change your map grid layout. Developing applications that link assessor maps and data is also easier with a standardized ID. New LOC_IDs can be produced (see last two pages of this document) without knowing anything about the underlying mapping such as map, block, or lot numbers.

The *TaxPar* Feature Class

This feature class (FC) (MxxxTaxPar) contains polygons or multi-part polygons, each of which links to one or more assessor tax records (unless it is a polygon for which a tax record does not exist, i.e. public right-of-way, most water features, etc.).

The POLY_TYPE attribute of this FC identifies each polygon as to what type of parcel it represents. Most polygons will be classified as "FEE" which refers to "fee simple" ownership. Polygons classified as "TAX" are discussed below. Typically only "FEE" or TAX" polygons link to an assessing record.

Polygons classified as "WATER" only appear in this FC if they participate in defining the boundaries of a parcel; water polygons that do not link to a tax record (this includes water polygons that cross parcel boundaries) and that are entirely within a parcel polygon are placed in the *Misc* FC or eliminated altogether in favor of a separate "water features" data layer in a community's GIS database.

In most communities, polygons in *TaxPar* classified as POLY_TYPE = "TAX" are a small minority of all parcels. They exist because of two situations where more than one polygon on the map is associated with a single assessor record. One goal at Level 3 of the standard was eliminating these situations, because they complicate managing parcel data in a GIS. Classifying some parcels as "TAX" parcels was part of achieving that goal, as explained below.

In the first situation (see Figure 1, below) two or more contiguous parcels have common ownership but only one of the parcels will join to an assessor record (actually that one parcel might join with many assessing records if there are condominiums involved). Typically in these cases, the assessor is maintaining a single tax record (i.e., sending a single tax bill) for all these properties, either as a convenience to the assessor or to the property owner. In these cases, the standard requires that:

a) The parcels involved are copied to the *OthLeg* feature class (along with their map ID which goes into the MAP_PAR_ID attribute).

b) In *OthLeg* these polygons are identified in the LEGAL_TYPE attribute as "FEE" polygons and they must also have their attribute TAXPAR_ID updated to contain the LOC_ID of the corresponding "TAX" parcel in the *TaxPar* FC

c) In *TaxPar*, the internal boundaries of these parcels are dissolved; this creates a single polygon corresponding to the single assessor tax record. The POLY_TYPE attribute is also set to "TAX" and the MAP_PAR_ID attribute is set to null (because this information is likely different for the constituent parcels and it is now

carried as an attribute of those parcels in the *OthLeg* feature class). Other attributes are updated as noted in the standard.

Figure 1: first situation
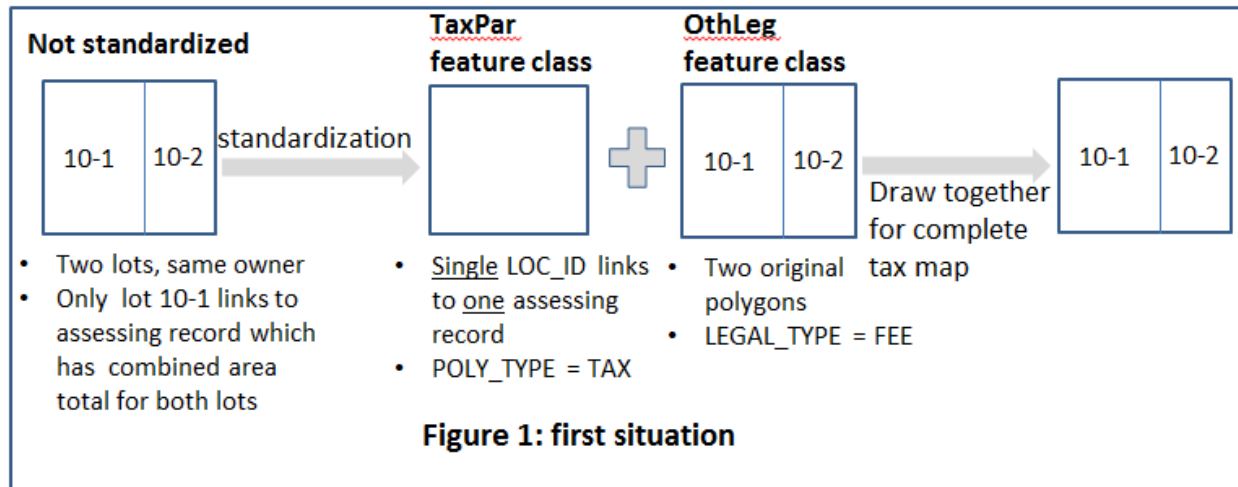
The second situation (see Figure 2, below) is where two or more non-contiguous parcel polygons share common ownership, link to a single tax listing, AND have different map IDs. Common examples are town-owned parcels or parcels split by a road but owned by the same person and described on one deed.   The standard requires that:

a) The parcels are copied to the *OthLeg* feature class (along with their map ID which goes into the MAP_PAR_ID attribute)
b) Once in *OthLeg*, the parcels are identified in the LEGAL_TYPE attribute as "FEE" polygons and they must have their attribute TAXPAR_ID updated to contain the LOC_ID of the corresponding "TAX" parcel in the *TaxPar* FC
c) In *TaxPar* these polygons are then converted to a multi-part polygon; each multi-part polygon links to one (or multiple if condominiums are involved) assessor tax listings.
d) In *TaxPar* the multi-part polygon is identified in the POLY_TYPE attribute as "TAX".

Figure 2: Second situation
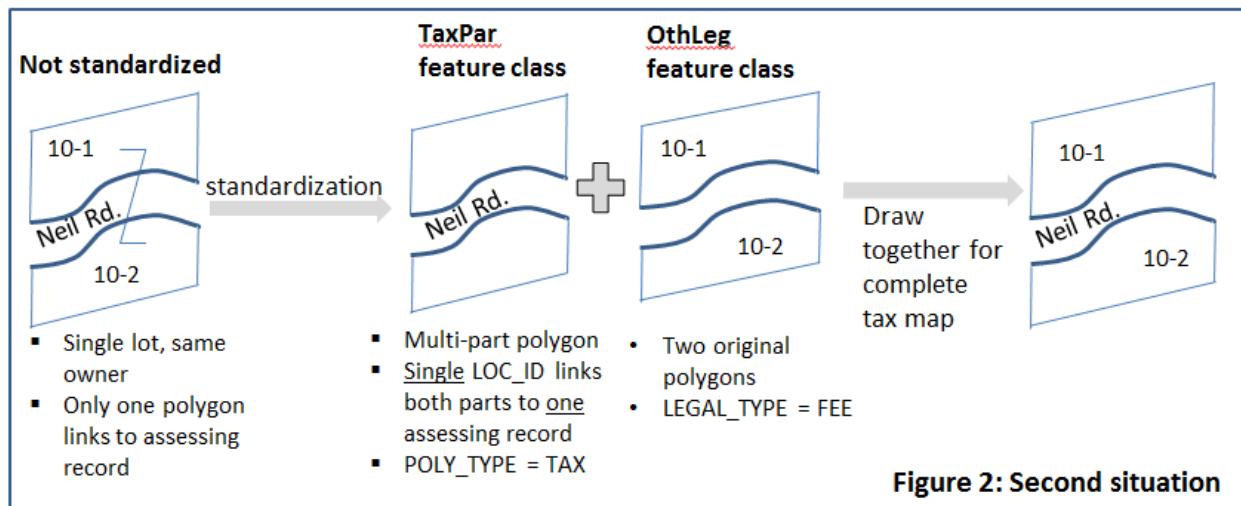
If two geographically separate polygons have the same map IDs <u>and</u> should be linked to the same tax listing, then a one-to-one relationship with the tax record can be established by converting them to a multi-part polygon. The multi-part polygons have a single LOC_ID that links them to the corresponding tax listing; no polygons need to be copied to the OthLeg feature class.

Because of these two situations, when you draw your assessor map using standardized data you need to draw both *TaxPar* and *OthLeg* together if you want all parcel boundaries to show. Also, as you probably still want to label all parcels on the map, you will need to do map ID labeling twice, once for *TaxPar* and once for *OthLeg*, in both cases based on the MAP_PAR_ID attribute. Note that you will need to draw both feature classes anyway if you want to show easements and other features in the *OthLeg* feature class.

The *OthLeg* Feature Class

This feature class (MxxxOthLeg) contains polygons representing other legal interests in land. <u>Polygons in *OthLeg* overlay all or parts of one or more polygons in *TaxPar*.</u> As discussed above, these other legal interests (LEGAL_TYPE attribute) include polygons classified as "FEE" ("fee simple") property parcels corresponding to combined parcel polygons ("TAX" parcels) described above in the *TaxPar* feature class. Other legal interests in this feature class include various types of easements.

> Valid values (the domain) for both the LEGAL_TYPE and the MISC_TYPE attributes are <u>extensible</u>, provided the additions are added to the Mxxx_LUT discussed below.

The *Misc* Feature Class

This feature class (MxxxMisc) contains map features from the assessor parcel maps not accounted for in the other feature classes. This feature class is where map features the assessor expects to see, such as water, wetlands, traffic islands, etc., can be stored; the polygon classification is recorded in the MISC_TYPE attribute.

The *Assess* Database Table

This table is a standard extract from the assessor database containing about 25 elements including property valuation, site address, state use code, owner, owner address, and a selection of information about the structure. A fiscal year field is added to this table and the value represents the vintage of the assessed value of the parcel. All the major vendors of computer assisted mass appraisal (CAMA) software[3] have developed a "MassGIS extract" report; if you or your assessor are unaware of this new report, contact the CAMA software provider's customer service and request that this extract be added to the standard report choices.

A key benefit of the standardized mapping specification is the very high match rates required between the map and the assessing database extract and vice versa. You can preserve this benefit by working with MassGIS, your assessor, and their CAMA software vendor to have the LOC_ID from the standardized data added to their CAMA database. Having the LOC_ID in the CAMA database means that every time you receive the MassGIS Extract from your assessor you will be able to join/relate it immediately to the parcel data layer (the *TaxPar* feature class).

The LOC_ID resides in the "GIS key" or equivalent field[4] in the CAMA system database. This field is also in your CAMA system's MassGIS extract.

> Note: if the standardized version of your community's parcel mapping was developed in FY11 or FY12, then the standardized mapping will not be fully current and there will probably be new records in the CAMA database for which a corresponding LOC_ID does not yet exist. Once new LOC_IDs for the corresponding new parcels exist, the assessor can add them to the corresponding assessing database record. See discussion below on creating new LOC_IDs.

The Mxxx_LUT

This is a look-up table for the MISC_TYPE attribute of the *Misc* feature class and the LEGAL_TYPE attribute of the *OthLeg* feature class. The domain for these two attributes is extensible provided new domain values are included in this look-up table.

The MxxxUC_LUT

This is a look-up table for the state use codes found in the assessing extract and other custom codes that may be used by the assessing office.

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[3] CSC (state assisted municipal consortium), Patriot, PK-Systems, Vision; also Tyler Technologies' Univers (7 MA customers) and IAS World customers (this is the product to which the CSC communities will be migrating)

[4] CSC, Patriot, PK-Systems, Vision, and Univers have indicated that this field exists and that it is a logical home for the LOC_ID.

UPDATING STANDARDIZED PARCEL DATA

Many communities have developed digital parcel files for use in GIS. These files have typically placed all the parcel polygons into a single shape file or ESRI feature class. This is largely true in the MassGIS standard, with almost all parcel polygons being stored in the *TaxPar* feature class. So when you have updates to make, you will most likely be editing *TaxPar*. The standardized parcel data does have topology rules (no gaps, no slivers). Editing while maintaining these topology rules requires either an ArcGIS Standard (formerly ArcEditor) or an Advanced (formerly ArcInfo) level of software license. HOWEVER, at the ArcGIS Basic (formerly ArcView) level you can use map topology to make sure you don't introduce gaps or slivers. See the ArcGIS help topic "About Creating a Map Topology" for more details or contact Craig Austin at MassGIS.

Note: MassGIS has developed a Python program that checks parcel data for compliance with the standard. Anyone is welcome to request this program which comes with instructions on how to set it up. This program runs using an ArcGIS Basic (ArcView) license, although it will skip some checks if you do not use it with an ArcGIS Standard or Advanced license. Contact MassGIS' Craig Austin (craig.austin@mass.gov) for a copy of this tool.

Editing Geography

Perform your edits as you would have before. As noted in the above paragraph, parcel polygons will mostly be in the *TaxPar* feature class, but will occasionally involve parcels in the *OthLeg* feature class; easement, private right-of-way, and conservation restriction polygons (and some other less common features) are maintained *OthLeg*.

Note: At both versions 10.0 and particularly 10.1 of ArcGIS, there were significant enhancements made to the editing tools. It will make your life easier and your editing more efficient if you are familiar with the current data editing capabilities of the software. As explained above, you also need to understand why some parcels in your original data may have been dissolved and why some parcels in your data may be multi-part polygons. If you find your maintenance involves either of these two situations and you are not sure you completely understand them, please contact Craig Austin at MassGIS.

Editing Attributes

When editing either the TaxPar or OthLeg feature classes, there are attributes that you will need to maintain; some of them you may already maintain except they have different names. Most of the attributes used in the standardized data are pretty easy to understand by looking at the standard; in particular, see Appendix A (included at the end of this document) and explanations on pages 19-22 of the standard. Reading the definitions for selected items in the standard may also be useful. Note that some attributes have a list of valid values (a domain) that must be used. As noted above both the LEGAL_TYPE attribute in the *OthLeg* FC and the MISC_TYPE attribute in the *Misc* FC are extensible.

Maintaining the LOC_ID attribute

The LOC_ID has two parts, the letter identifying the units of the coordinate from which the ID is drawn (either "M" or "F", for meters and feet, respectively) and the unique number developed from an X,Y coordinate pair inside the parcel. For example, M_241942_938482. The numeric portion is developed using the integer portion of the X and Y coordinate values. Here's how to produce new LOC_IDs (the Python code below is a modification of something originally provided by ESRI via George Dunbar in Plymouth):

> Note: All polygons in the *TaxPar* feature class must have a LOC_ID, even if they do not link to an assessing record.

1. Select all newly created or edited polygons, whether they link to an assessor record or not.
2. Open the attribute table <mark>BE SURE YOU ONLY HAVE SELECTED THE POLYGONS FOR WHICH YOU NEED A NEW LOC_ID, otherwise you may change existing LOC_IDs, thus breaking the link to the assessing data</mark>.
3. Click right on the column name, LOC_ID and choose Field Calculator.
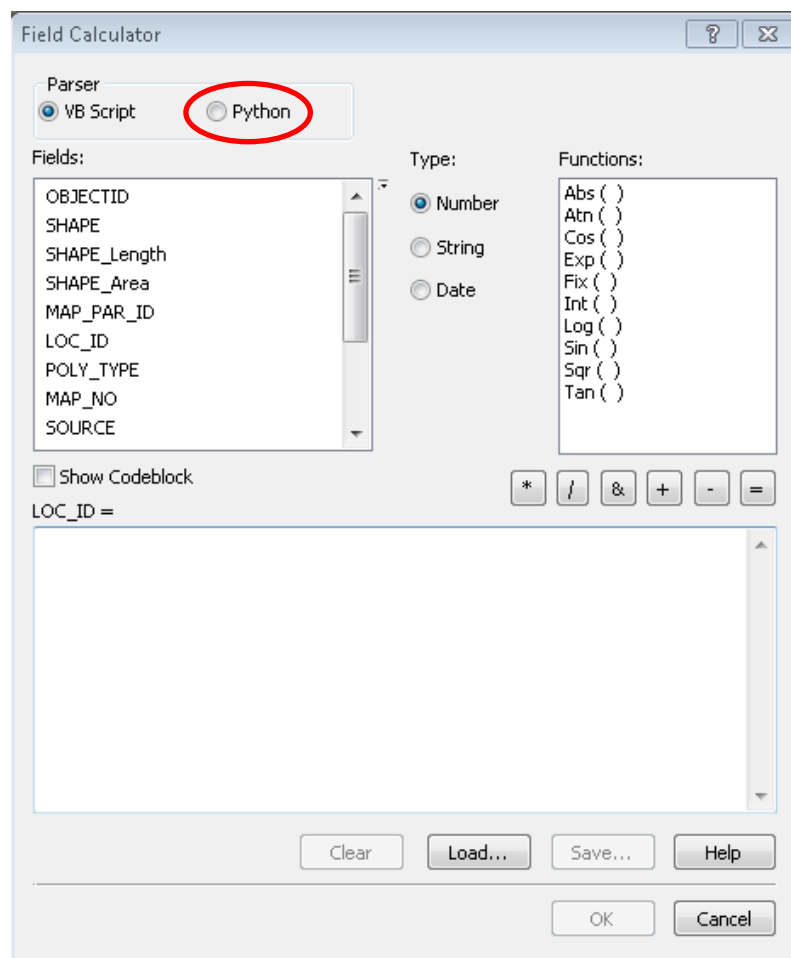
4. At the top of the above interface, change the parser radio button choice to "Python".

5. Copy or type the following string of Python code into the field calculator <u>as-is</u> (be careful not to introduce leading or trailing blanks):

"M_" + str(int(round(!SHAPE.LABELPOINT!.X,0))) + "_" + str(int(round(!SHAPE. LABELPOINT!.Y,0)))

==**If your parcel data's coordinates are in state plane <u>feet</u>, then edit the above string, replacing the "M" at the beginning with "F".**==

The above code uses LABELPOINT in place of CENTROID to ensure that the resulting LOC_ID is based on a location inside the parcel polygon, even if that polygon is oddly shaped (i.e., "U" or "L" shaped or some other configuration where the geometric center of the polygon is outside the polygon).

6. Click on "OK" and the LOC_ID field for the selected parcels will be updated.

IF your assessor has LOC_IDs for the standardized parcels in the CAMA database, you must give the LOC_IDs for the new or edited parcels, along with suitable parcel identifiers, to the assessor so they can update the corresponding new or altered tax listings. *If at all possible, you should provide this information to your assessor in a document format (spreadsheet, text file, etc.) such that they can copy and paste the new LOC_IDs from that document into their CAMA software interface; this will cut way down on data entry errors*.

FIELD DEFINITIONS

(Appendix A from Standard)

Field Name	Type	Size	# Dec. Places	Valid Values	Null allowed?
Attributes TaxPar Feature Class					
MAP_PAR_ID	C	26			YES
LOC_ID	C	18		M_<X>_<Y> (for meters) F_<X>_<Y> (for US Survey Feet)	NO
POLY_TYPE	C	15		FEE, TAX, ROW, PRIV_ROW, RAIL_ROW, WATER	NO
MAP_NO	C	4			YES
SOURCE	C	15		ASSESS, SUBDIV, ANR, ROAD_LAYOUT, OTHER	NO
PLAN_ID	C	40			YES
LAST_EDIT	N	8		format YYYYMMDD	NO
BND_CHK	C	2		null value (default), CC, NR, OK	YES
NO_MATCH	C	1		Y, N (default)	NO
Other Legal Interests Attributes					
MAP_PAR_ID	C	26			YES
LEGAL_TYPE	C	15		FEE, RAIL_OVER, ROW_OVER, EASE, CR, APR, CRX, APRX, (domain is extensible - see text)	NO
TAXPAR_ID	C	18		M_<X>_<Y> (for meters) F_<X>_<Y> (for US Survey Feet)	YES(1)
LS_BOOK	C	16			YES
LS_PAGE	C	14			YES
REG_ID	C	15			YES
Miscellaneous Features Attributes					
MISC_TYPE	C	15		WETLAND, ISLAND, TRAFFIC_ISLAND, WATER, OUTSIDE, BLDG (domain is extensible - see text)	NO

(1) Cannot be null for LEGAL_TYPE = "FEE"