Process Narrative: Creating the 2010 Parcel-Based Land Use Inventory for Northeast Illinois

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Introduction

The Chicago Metropolitan Agency for Planning (CMAP) has transitioned its land use monitoring design to a parcel base, using GIS data provided by the seven counties in the CMAP region. By using parcel data as the primary input, many aspects of LUI are more accurate. Land use delineation is now based on land ownership, with the boundaries provided by the agencies responsible for maintaining these data. Along with geometry, county assessment data serve as an aid in identifying land use.

While the burden of manually delineating land use activities was removed with this approach, several challenges arose, not the least of which was developing a means to rapidly code the 2.5 million-plus parcels in the region. While certain land use classes can be identified through simple queries of Assessor data, the CMAP classification scheme works at a finer level of detail. Assessor data for a parcel can tell us if it's Commercial, Residential, Industrial, Agricultural or Exempt; improvement value often serves as an indicator of the level of activity on a parcel.

Examples of land uses that usually can't be identified through assessor data alone:

- Whether a residential property is attached or detached;
- Whether a commercial property is retail, an office building, or an apartment complex;
- Whether an industrial property functions primarily as manufacturing, warehousing, or mineral extraction.

Some classification was handled through automation. For example, non-condominium residential parcels over a certain size with an improvement value above a certain threshold were generally assumed to be single-family detached residential (1111).

In the end, developing a parcel-based Inventory was nearly as laborious as the earlier "polygon-based" Inventories. The payoff will come down the road as we prepare the next update: with assessment data (at the parcel ID, or PIN level) serving as a major input, updates will be based on parcel-level changes (i.e. change in assessor's "use code" or a sharp increase in improvement value), and by the creation of new parcels. See the "Looking Ahead" section at the end of this document for details.

This document provides an overview of the steps involved in developing the parcel-based Inventory. Since data were derived from seven county datasets (with varying levels of detail), we frequently had to devise seven different approaches to certain tasks. Specific examples are provided for a particular county are not necessarily indicative of how the other counties were handled.

Pre-Processing

Each county maintains their parcel and assessment data differently from the others; as a result, each required a different approach to develop standardized datasets consistent with the geodatabase schema created for the production phase. All work was performed in the ESRI ArcGIS environment, with data stored in the file geodatabase (.gdb) format. The steps below are a generalized outline of how county data were prepared:

1. Initial observations: how condominiums are handled (one-to-many relate or stacked parcels), formatting of PIN, presence of multiple polygons with same PIN, general topological cleanliness, assessment data level of detail.

2. Develop a walkover table of assessor class codes to CMAP general ("Pass 1") land use; determine if a final land use can be assigned based on class code in combination with another attribute. See Appendix A: Assessor Class Codes and CMAP PASS1 Use for county walkover tables.

3. Clean up larger topological issues and assign fabricated PIN numbers where necessary. Small "sliver" overlaps were not addressed due to their sheer number (the exception being Lake County, which was topologically flawless). Examples of cleaning for consistency include:
    a. Enforce a "one record per PIN" rule by dissolving on ten-digit PIN numbers. This resulted in numerous multi-part polygons which persisted through production and are evident in the internal "all-parcel" version.
    b. Manipulation of Cook County "elevated" parcels into merged "stack" parcels with underlying base parcels. A PIN number was fabricated that included the first seven digits of the PIN, plus "s01."

4. Condominiums required special attention due to the one-to-many nature of property records to parcel boundaries:

a. DuPage, Kendall, McHenry and Will County "stacked" parcels. In these counties a single condominium development would have multiple identical parcels representing the property footprint, with one polygon for each condo unit in the development. These were converted to single polygons identified as RESC (Residential, Condominium) with the number of contributing parcel records serving as an estimate of the number of residential units. A PIN number was fabricated that included the first seven digits of the PIN, plus "x01." If there were more than two condo properties within the same Assessor Block (7-digit PIN level) it would be assigned "x02," and so on.
b. Lake County and "generic" polygons. Many condominium and townhome developments were represented by a single polygon encompassing the entire development with a generic PIN number of "8888888888." The Lake County data delivery included a point feature class of all properties including individual townhome and condominium records. Summaries of all points falling within these generic polygons were used to characterize the general land use type, and a fabricated PIN consisting of the assessor block PIN (first seven digits) plus "000."
c. Condominiums in Cook and Kane Counties are recorded on separate tables associated with a single parcel polygon through a relate; condo data were summarized at the parcel level to characterize the general land use type.

5. After condo and other county-specific cleanup tasks were complete, a ModelBuilder script loaded polygons and relevant assessment fields (PIN, assessor class code, property owner) into a geodatabase feature class preformatted with the production schema, with the Pass 1 land use code assigned based on assessor class or other information generated while working with the condominium data.

6. The final step was to break counties up into individual township-level feature classes (based on PIN-2) for production.

The Production version of the geodatabase resulting from the pre-processing steps described above was developed to include selected fields from county assessor data, the CMAP interim (Pass 1) land use code, as well as empty fields to hold the final land use code and associated use-specific data (such as open space management type and residential unit estimate) and tracking fields to say who coded the parcel and when it was coded. Appendix B, Production Geodatabase Design, lists all of the fields used in the county production feature classes, along with domains where relevant.

Production Phase 1: Automated Parcel Classification

Not all of the region's 2.5 million parcels required manual review. Assessor data, in combination with other reference sources, allowed us to pre-code 57% of the region's parcels. Cook County, with its highly-detailed property classifications, had a 79% pre-coding rate (roughly 1.1 million out of 1.4 million parcels).

Examples of parcels coded through automated means:

Agriculture

The CMAP description of the Agriculture (2000) code is "Land identified in county parcel data as agricultural, where the parcel is dominated by: row crops, field crops & fallow field farms & pasture, horse, dairy, livestock, and mixed, including dairy and other livestock agricultural processing." While the assessor data for all seven counties have a "Farm" category (most distinguishing between those that are just land and those that have a building i.e. farmhouse on it), in reality land designated by the assessor as "Farm" in a rural setting is often any land that does not have a developed use (Residential, Commercial, Industrial…) ascribed to it by the assessor; lands which may, in the CMAP scheme, qualify as Vacant as opposed to Agriculture.

For automated coding of agricultural parcels, we used the U. S. Department of Agriculture's 2010 Cropland Data Layer (CDL). This is a 30-meter grid cell dataset, suitable for comparison with larger parcels (such as 40-acre and above lots). CDL land cover classes were aggregated into "ag" and "not ag" categories; cells were then converted into a vector (point) feature class and spatial-joined to assessor-defined Farm parcels. Any parcel where 25% or more of the points were classed as agriculture was automatically coded 2000 Agriculture.

Residential, Single-Family Detached

Approximately two-thirds of the region's parcels fit the definition of single-family detached residential, so this was an important category to try to automate. Since assessor data were different for each county, steps were not identical but generally followed this rationale:

1. Parcel is classified as residential. Assessor classes ranged in specificity from "Residential" (Lake County) to "Two or more story residence, over 62 years of age up to 2,200 square feet" (Cook County).

AND

2. Assessed value above an observed minimum threshold. Value was reported in different ways depending on the county, from a single equalized value figure to "Non-Farm Building Value." Value thresholds were chosen per county that would generally guarantee that a residential structure occupied the parcel.

AND

3. Parcel is greater than a *X* square feet. Attached (townhome) properties are frequently grouped in the same assessor class as single-family detached; setting a lower limit on parcel size helped filter out many townhome parcels.

Query parameters were modified for each county to identify value thresholds and parcel sizes. Once a query for a county provided a satisfactory result, those parcels were coded "1111" with a Residential Unit Estimate code of "1."

Since CMAP Residential parcels include where possible adjacent undeveloped lots owned by the same party, a script was developed that would identify residential-vacant properties where the owner had the same (or similar) name. Selected parcels were coded "1111" with a Residential Unit Estimate of "0."

Cook County Parcels

As mentioned above, Cook County has over 200 property classes. Some other uses that were automatically coded based on property class were: Row House (1112, Single-Family Attached), Apartment Building (1130, Multi-Family), Motel (1250, Hotel/Motel), Bank Building (1215, Urban Mix), and Bowling Alley (1240, Cultural/Entertainment).

Production Phase 2: Manual Parcel Classification

All manual classification was managed with ESRI ArcMap 10.0/1, with 2010 aerial imagery (6" color, leaf-off) as a backdrop and numerous GIS datasets serving as reference layers. Manual classification procedures involved selecting multiple parcels sharing the same land use and running one of a series of land use-specific ArcGIS models to update all selected parcels at once. Parcels were chosen either through on-screen selection, or by running an attribute or spatial query which would capture parcels that are likely to have a particular use, and then manually verifying or un-selecting parcels that did not belong to the land use in question. The sections below describe the various aspects of the manual classification phase in greater detail.

Thematic Approach

All analysts were instructed to work on a township-by-township basis through their assigned counties in a series of thematic "sweeps," focusing on specific land uses and reference layers. After exhausting the references for one particular theme, the analyst would move on to the next. Specific procedures varied from county to county due to availability of reference sources and the level of detail in the assessor record for the parcel. Using the tools and reference sources (described below), analysts would work through each township in their county. Appendix C, Coding Instructions Example, describes the steps for the work in McHenry County; instructions were written generically for all counties and then modified for individual counties to reference unique, county-specific resources. Questions about specific situations were directed to the project manager, who sent the response to all analysts so that everyone involved understood (and applied) the rationale to their own work.

Staff developed an in-house wiki site, "Field Guide to Land Use Inventory Classifications" containing all land use codes and definitions from the Classification Scheme document, with additional space for discussion, visual examples, and Q&A. As questions regarding the coding of specific situations arose, the question and answer were transferred to the wiki for future reference. Figure 1 is a screenshot from the wiki for higher education (1322) facilities.

User Interface

The standard ArcMap (10.0/1) interface was used for parcel classification. The only customization was to provide a Selection Options toolbar to rapidly change between interactive selection modes (i.e. add-to or remove-from current selection set). Coding tools were accessed through the ArcCatalog window in ArcMap. A prerequisite for this type of work is a second computer monitor: one screen displays the ArcMap interface while the other show the attribute table as well as a web browser for Internet research of difficult properties.

Production Tools

To minimize error, land use codes were assigned using a series of custom tools created with ESRI's ModelBuilder. Tools were developed for different land use types (i.e. "Residential," "Commercial"), and within each a pre-set list of codes for that category that would appear in a drop-down window, along with specific modifiers for particular uses (i.e. open space management type for 3000-series, and parcel platted-as for agricultural properties platted for a different use).

Analysts would interactively select parcels with the same land use and open the appropriate tool, picking the land use from the drop-down list. As the tool runs, it first checks to verify that a selection set exists; then it assigns land use code, analyst's initials, and the date, before clearing the selection and refreshing the screen. Figure 2 is an example of a ModelBuilder-based coding interface.

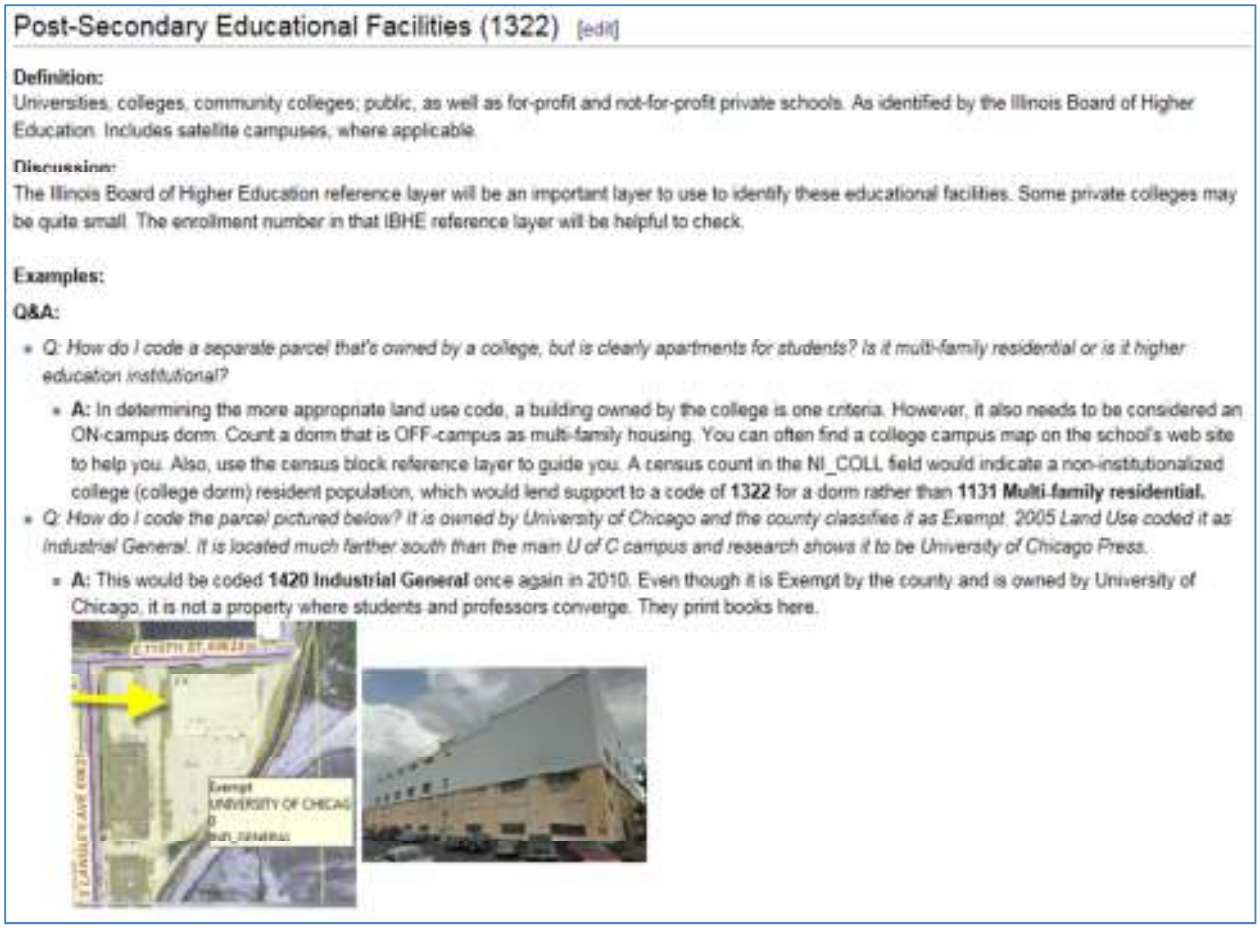

Figure 1: Wiki article for post-secondary educational

Figure 2: ModelBuilder coding tool for Open Space parcels

Reference Data Sources

The interface was pre-loaded for all analysts with region-wide and county-specific reference datasets. Reference datasets were grouped thematically (in group layers), and analysts were instructed to restrict visible references to those relevant to the theme being investigated. Figure 3 is a screen grab from a coding session for Cook County.

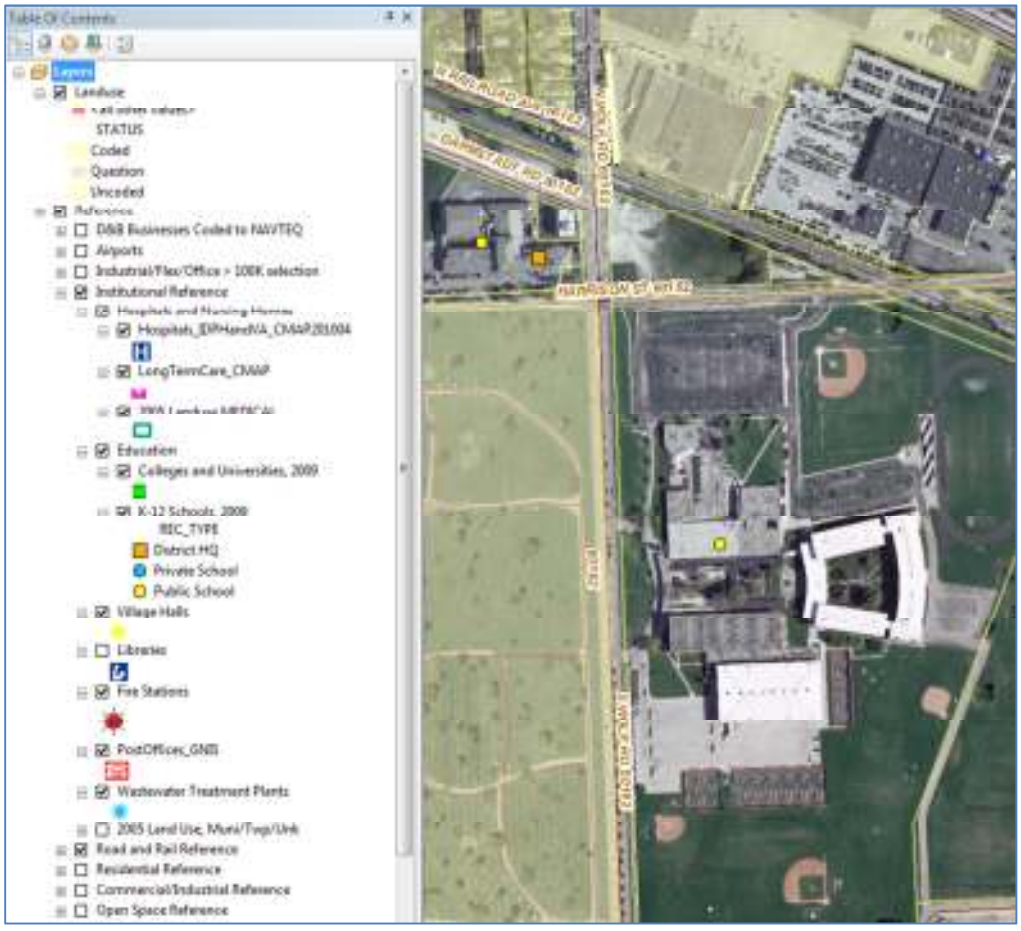

Figure 3: ArcGIS interface with reference layers

Examples of reference datasets and how they were used in the production phase:

- Shopping Centers from CoStar: to distinguish between shopping malls (1211) and regional/community retail centers (1212);
- Business data from Dun & Bradstreet: the NAICS code helped identify manufacturing activities on industrial parcels and office-type activities in commercial parcels;
- Illinois State Board of Education data, converted into a point shapefile, helped identify all public & private K-12 schools;
- Aerial photography: not only 2010 high-resolution orthoimagery, but GoogleMaps and Bing as well for identifying individual properties using their respective street and oblique views.

See Appendix D, Supplemental Datasets Used in the 2010 Land Use Inventory, for a more complete list of reference datasets used in production.

Post-Production

After all townships were completed for a county, they were loaded into a single county-wide feature class and reviewed for consistency across township boundaries. At this stage names were also assigned to facilities for selected land use categories. The table below lists those land uses where names were assigned and rules for naming:

Code	Name	Rule
1211	Shopping Malls	All. Use CENTERNAME field in *CoStar_Shopping_Centers* reference layer for source.
1322	Post-Secondary Educational Facilities	All "Main" (no satellite) campuses for these types: • Community College • Public University • Private Not-For-Profit Name source: SCHOOLS field in *HigherEducation_IBHE* reference layer.
1330 (part)	Military Facilities	• Great Lakes Naval Training Center (Lake) • Joliet Army Training Area (Will)
1380	National Laboratory	• Argonne National Laboratory (DuPage) • Fermi National Accelerator Laboratory (DuPage & Kane)
1530	Aircraft Transportation	All public-use airports, using the DISPLAYNAME field in *AirportsPubUse_CMAP_2009* reference layer

Table 1: Land Use naming rules

Quality control was handled through the selection of a five-percent random sample of all parcels; since this is still a very large number to review, all parcels that had an identical classification in 2005 received a "pass" (this was handled through a point-in-polygon spatial join of parcel centroids to 2005 land use polygons). The remaining sample points were manually reviewed by an analyst who was not involved in the production phase for that county, flagging "fail" parcels as they were discovered; additional fail points were added if errors were discovered in the course of the sample point work.

Corrections were applied to all fail parcels, and a summary report listing the number of unique combinations of analyst/wrong code/correct code was generated to identify potential systematic errors; in cases where a particular combination occurred repeatedly, other parcels assigned that code by that analyst were reviewed and corrected as necessary.

	Cook	DuPage	Kane	Kendall	Lake	McHenry	Will	Region
Total parcels	1,410,005	278,553	176,461	49,645	251,253	139,738	259,882	2,565,537
Sample points	70,753	13,788	8,890	2,458	12,688	6,857	13,125	128,559
Sample points with LU05 match	57,501	12,494	6,864	1,403	10,544	5,364	10,188	104,358
Sample points to check	13,252	1,294	2,026	1,055	2,144	1,493	2,937	24,201
Fail points	513	43	195	33	279	162	322	1,547
Fail rate	0.7%	0.3%	2.2%	1.3%	2.2%	2.4%	2.5%	1.2%
Added fail points	131	14	214	49	28	33	207	676

Table 2: Quality control statistics

At this point an "all-parcel" version was created by removing all fields needed for pre-processing and coding (including assessment data); property owner name was removed for residential parcels. This all-parcel set is an interim product that is restricted to internal use by CMAP staff due to its representation of individual parcels and inclusion of some Assessor data fields.

Generating the Final Version

Final steps in the creation of this public release version include:

1. Developing categorized estimates of residential density (units/acre). This was done by counting the estimated number of residential units (as reported in the RES_UNITS field) for all parcels coded **1111 Residential, Single-Family Detached** within each grouping of parcel blocks (PIN numbers common to the first seven digits). This figure was divided by the total size (in acres) of these parcels to calculate density. These values were then coded to ranges "A" through "E." See metadata for further information.
2. Parcels were dissolved on common land uses within PLS (PIN-4 common) sections. This involved creating a new field that concatenated the Land Use, Density Class, PIN-4, Facility Name, Open Space Management, Platted and Modifier fields. Dissolves were based on this field, with multi-part polygons not allowed. After this step, residential density estimate codes were replaced with "Z" codes in residential polygons that were below ½-acre, or were informed by fewer than three residential units.
3. All county-associated attribute information was removed from the attribute table, with the exception of the first four digits of the PIN (township and section number).
4. Polygons were created for rights-of-way and other parcel-less areas to provide 100% coverage of the region. These polygons were assigned general codes (see the 6000 series in the Classification Scheme).

5. Topological clean-up: gaps and overlaps, including slivers, were for the most part eliminated.

Appendix E, Land Use Inventory Gap Assignment, describes steps 4 and 5 in greater detail.

Looking Ahead: The 2013 Update

As of this writing CMAP is in the process of creating a 2013 update, using 2013 parcel and assessment data to identify land use change. This update will be more streamlined since it is based on flagging changes in county-provided datasets. Early estimates indicate that perhaps only seven or eight percent of the region's parcels will be flagged for review. The process will be based on two sets of comparisons:

Identifying Change in Assessor Data

While assessor data can't always predict a specific CMAP land use, it can be especially helpful in identifying land use change by comparing assessor records at the parcel level between two years. Change can be identified through:

- Change in assessment class. Examples:
    - Agriculture to Commercial (new development)
    - Industrial to Residential (redevelopment such as a loft conversion)
    - Vacant to Exempt (new library/school/church)
- New parcels/disappeared parcels, suggesting subdivision for new use
- Change in improved value relative to similar properties in area: new construction or demolition.

Identifying Changes in Parcel Geometry

Presumably changes in the Assessor data will identify most new subdivisions; parcels from the new parcel file will replace the obsolete parcel. There are also changes based on corrections to parcel geometry; original GIS files were often based on digitized plats, and the counties have been gradually making corrections. Even though a parcel's PIN and land use may be unchanged, our goal is to have the geometry follow the most current data available through the counties.

Both of these processes are being managed through automation (Python scripts, for the most part). While script development is another time investment (each county will require custom scripting due to the variances in their datasets), this will streamline the process even further. The ultimate goal is to develop a rapid-turnaround Inventory that will be updated every two or three years.

Appendix A Part 1:
Assessor Class Codes and CMAP PASS1 Use, Cook County

Code	Count	Major type	name	Notes	PASS1 USE	LANDUSE	LU_CODE	RES_UNITS	CRITERIA	resolve
000	94,622	OTHER	OTHER: Exempt	All tax-exempt. Can use ExemptAgencyCode to take a stab at type	EXM					none
100	63,928	VACANT	VACANT: Vacant Land	Not always truly vacant; spotted at least one example of it being res-common	XX					none
190	2,287	OTHER	OTHER: Other minor improvement which does not add value	unpredictable	XX					none
200	213	OTHER	OTHER: Residential land	possibly vacant residential, but not enough to go by	RES					none
201	8,668	OTHER	OTHER: Residential garage	unpredictable	RES					none
202	130,041	RESIDSINGL	RESIDSINGL: One Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
203	350,872	RESIDSINGL	RESIDSINGL: One Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
204	47,638	RESIDSINGL	RESIDSINGL: One Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
205	52,922	RESIDSINGL	RESIDSINGL: Two or More Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
206	23,596	RESIDSINGL	RESIDSINGL: Two or More Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
207	43,698	RESIDSINGL	RESIDSINGL: Two or More Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
208	9,927	RESIDSINGL	RESIDSINGL: Two or More Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
209	5,145	RESIDSINGL	RESIDSINGL: Two or More Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
210	7,843	RESIDSINGL	RESIDSINGL: Old Style Row House	Single-family attached: duplex & townhome. Some are attached to a "295" which is also townhome; should have unique addressese	RESS	RES_SF_ATTACH	1112	1	cannot have multiple records with same property address	script
211	156,500	RESIDMULTI	RESIDMULTI: Two to Six Apartments	multi-family res, 2-6 units	RESM	RES_MF	1130			script
212	14022	MIXEDCOMRS	MIXEDCOMRS: Mixed use commercial/residential building with apartment and commercial area totaling 6 units or less with a square foot area less than 20,00 square feet, any age	Good match for Mixed Use w/res component 1216	MIXR	URBMIX_WRES	1216			script
213	366	RESIDMULTI	RESIDMULTI: Cooperatives (must have cdu of co)	might be townhome style or MF style	RES					none
224	108	OTHER	OTHER: Farm buildings	bizarre...mostly in residential but sample townships don't have ag	XX					none
225	45	OTHER	OTHER: Qualified single room occupancy improvements (must have cdu of sr)	multi family? Or SRO?						none
234	98,237	RESIDSINGL	RESIDSINGL: Split Level Residence with Lower Level Below Grade	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
236	2	COMMERCIAL	COMMERCIAL: Any residence located on a parcel used primarily for industrial or commercial use		XX					none
239	1,017	OTHER	OTHER: Farm land under use-value pricing	Should verify each since there are so few	AG					none
240	2	OTHER	OTHER: Farm land under market pricing	Should verify each since there are so few	AG					none
241	24,031	VACANT	VACANT: Vacant land under common ownership with adjacent residence	This is sometimes common open space in a subdiv; other times it's the adjacent undeveloped parcel with same owner. These are two different codes	RES					none
278	90,450	RESIDSINGL	RESIDSINGL: Two or More Story Residence	single-family res	RESS	RES_SF_DETACH	1111	1	cannot have multiple records with same property address	script
288	110	OTHER	OTHER: Home improvement exemption	misellaneous res land, no imp value	RES					none
290	2,589	OTHER	OTHER: Other minor improvements	Land associated with residential property, often but not always Common Open Space	RES					none
295	58,845	RESIDSINGL	RESIDSINGL: Individually Owned Row Houses or Townhouses	Single-family attached: duplex & townhome. Some are attached to a "210" which is also townhome; should have unique addressese	RESS	RES_SF_ATTACH	1112	1	cannot have multiple records with same property address	script
297	817	OTHER	OTHER: Special residential improvements	more miscellaneous, some with imp vals	RES					none
299	452,526	RESIDMULTI	RESIDMULTI: Residential Condominium	This includes properties which would be ATTACHED as well as MF. Will need to calc res unit estimate for all and assign actual code during production	RESC					pre-proc
301	47	OTHER	OTHER: Garage used in conjunction with rental apartments		RESM	RES_MF	1130			script
313	333	OTHER	OTHER: 2 or 3 story building	probably residential, but not clear on purpose. Handle case=by=case	RES					none

Code	Count	Major type	name	Notes	PASS1 USE	LANDUSE	LU_CODE	RES_UNITS	CRITERIA	resolve
314	3,400	RESIDMULTI	RESIDMULTI: Two or three story non-frprf. crt. and corridor apts or california type apts		RESM	RES_MF	1130			script
315	6,259	RESIDMULTI	RESIDMULTI: Two or three story non-fireproof corridor apartments		RESM	RES_MF	1130			script
318	2,633	MIXEDCOMRS	MIXEDCOMRS: Mixed use commercial/residential with apts. above seven units or more or building sq. ft. over 20	spot check of sample townships suggests this is good, but this may include hi-rises with much higher res:com ratio which should be coded res	MIXR					none
390	950	OTHER	OTHER: Other minor improvements	too vague	XX					none
391	1,026	RESIDMULTI	RESIDMULTI: Apartment buildings over three stories		RESM	RES_MF	1130			script
396	265	RESIDSINGL	RESIDSINGL: Rented mdrn row houses	townhomes, but with single poly for development; will need res unit estimate	RES					none
397	609	OTHER	OTHER: Special rental improvements		RES					none
399	2,411	RESIDMULTI	RESIDMULTI: Rental condo units in a sngl. dvlp. of 1 or more contig. parcels w 7 or more rental units	one-to-many--treat like condos	RESC					pre-proc
401	3	COMMERCIAL	COMMERCIAL: Not for profit garage		COM					none
417	134	COMMERCIAL	COMMERCIAL: Not for profit One story store	clubs & associations	COM	URBMIX	1215			script
418	1	COMMERCIAL	COMMERCIAL: Not for profit Two or three story frame stores		COM					none
422	3	COMMERCIAL	COMMERCIAL: Not for profit One story non-fireproof public garage		COM					none
428	10	COMMERCIAL	COMMERCIAL: Not for profit bank buildings		COM	URBMIX	1215			script
430	1	COMMERCIAL	COMMERCIAL: Not for profit supermarket		COM					none
435	138	COMMERCIAL	COMMERCIAL: Not for profit golf course improvement	golf, private	OS	GOLF - XXXX	3200			production
480	4	COMMERCIAL	COMMERCIAL: Not for profit other industrial improvements		COM					none
483	1	COMMERCIAL	COMMERCIAL: Not for profit industrial quonset huts and butler type buildings		XX					none
490	230	COMMERCIAL	COMMERCIAL: Not for profit other minor improvements	too vague	COM					none
491	30	COMMERCIAL	COMMERCIAL: Not for profit improvement over three stories	county wide SBL shows these as offices	COM	OFFICE	1220			production
492	84	COMMERCIAL	COMMERCIAL: Not for profit Two or three story building containing part or all retail and/or commercial space		COM					none
493	39	INDUSTRIAL	INDUSTRIAL: Not for profit industrial		IND					none
497	200	COMMERCIAL	COMMERCIAL: Not for profit special improvement		COM					none
499	62	RESIDMULTI	RESIDMULTI: Not for profit condominium	one-to-many--treat like condos	RESC					pre-proc
500	11	COMMERCIAL	COMMERCIAL: Commercial land		COM					none
501	152	COMMERCIAL	COMMERCIAL: Garage used in conjunction with commercial improvements		COM					none
516	42	RESIDMULTI	RESIDMULTI: Non-fireproof hotel or rooming house (apartment hotel)	class as hotel/motel; this should be a commercial category	COM	HOTEL	1250			production
517	24,248	COMMERCIAL	COMMERCIAL: One story store	Smaller properties can probably be counted as Urban Mix, but there are some very large (i.e. Wal-Mart)-style properties in here. Also some glaring errors (like a cemetery).	COM					none
522	4,747	COMMERCIAL	COMMERCIAL: One story non-fireproof public garage	not like a parking garage. Mostly automotive services, but some other businesses in there as well. Very confident that this can be coded URBMIX without further investigation	COM	URBMIX	1215			script
523	1,537	COMMERCIAL	COMMERCIAL: Gasoline station	Almost 100% correct on gas stations	COM	URBMIX	1215			script
526	45	COMMERCIAL	COMMERCIAL: Commercial greenhouse		COM					none
527	108	COMMERCIAL	COMMERCIAL: Theatres	very few in sample. Could be cult/ent, but some are not. Code to cult/ent if intersects with D&B with NAICS of 512131	COM	CULT/ENT (if criteria are met)	1240			production
528	1,467	COMMERCIAL	COMMERCIAL: Bank buildings	pretty reliable	COM	URBMIX	1215			script
529	648	COMMERCIAL	COMMERCIAL: Motels	pretty reliable; recommend coding to HOTEL if parcel has a D&B hotel (NAICS 721110) or NDD hotel	COM	HOTEL (if criteria are met)	1250			production

Code	Count	Major type	name	Notes	PASS1 USE	LANDUSE	LU_CODE	RES_UNITS	CRITERIA	resolve
530	621	COMMERCIAL	COMMERCIAL: Supermarket	same as shopping center. Not reliable	COM					none
531	949	COMMERCIAL	COMMERCIAL: Shopping center	strip malls to mega-malls. Code to COM and use CoStar to identify malls & 100K centers	COM					none
532	84	COMMERCIAL	COMMERCIAL: Bowling alley	84 parcels, but only 42 D&B bowling alleys. Code to cult/ent if intersects with D&B with NAICS of 713950	COM	CULT/ENT (if criteria are met)	1240			production
533	177	COMMERCIAL	COMMERCIAL: Quonset huts and butler type buildings		COM					none
535	145	COMMERCIAL	COMMERCIAL: Golf course	sample shows all commercial golf courses or driving ranges	OS	GOLF - XXXX	3200			production
550	9	INDUSTRIAL	INDUSTRIAL: Industrial land		IND					none
580	5,999	INDUSTRIAL	INDUSTRIAL: Other industrial minor improvements		IND					none
581	36	INDUSTRIAL	INDUSTRIAL: Garage used in conjunction with industrial improvements		IND					none
583	145	INDUSTRIAL	INDUSTRIAL: Industrial quonset huts and butler type buildings		IND					none
587	96	INDUSTRIAL	INDUSTRIAL: Special industrial improvements		IND					none
589	683	INDUSTRIAL	INDUSTRIAL: Industrial condominium units		IND					none
590	17,972	COMMERCIAL	COMMERCIAL: Commercial minor improvements	parking and other associated commercial property, for the most part. Some errors, but for the most part can be lumped with whatever it's associated with	COM					none
591	1,468	COMMERCIAL	COMMERCIAL: Commercial buildings over three stories	Very little 3+ story retail, so this is a pretty reliable indicator of office, although there are some parcels that are small and maybe don't qualify. Suggest to automatically code office if parcel is of a certain size and has D&B businesses that aren't retail	COM	OFFICE (if criteria are met)	1220			production
592	4,907	COMMERCIAL	COMMERCIAL: Two or three story building containing part or all retail and/or commercial space	Some office, some retail.	COM	Resolve in production: can be URBMIX or OFFICE				none
593	17,773	INDUSTRIAL	INDUSTRIAL: Industrial		IND					none
597	5,923	COMMERCIAL	COMMERCIAL: Special commercial improvements	many legitimate establishments. Auto dealers seem to be in here, and other larger stores. Also small hospital was spotted in one. Maywood racetrack	COM					none
599	5,461	COMMERCIAL	COMMERCIAL: Commercial condominium units	Many are office buildings, but not all.	COM					none
638	6	INDUSTRIAL	INDUSTRIAL: Industrial brownfield		IND					none
654	1	INDUSTRIAL	INDUSTRIAL: Other industrial brownfield minor improvements		IND					none
655	1	INDUSTRIAL	INDUSTRIAL: Garage used in conjunction with industrial brownfield incentive improvements		IND					none
663	1,195	INDUSTRIAL	INDUSTRIAL: Industrial		IND					none
668	1	OTHER	OTHER: Special improvements		XX					none
670	189	INDUSTRIAL	INDUSTRIAL: Other industrial minor improvements		IND					none
671	2	INDUSTRIAL	INDUSTRIAL: Garage used in conjunction with industrial incentive improvements		IND					none
673	9	INDUSTRIAL	INDUSTRIAL: Industrial quonset huts and butler type buildings		IND					none
677	3	OTHER	OTHER: Special improvements		XX					none
679	31	INDUSTRIAL	INDUSTRIAL: Industrial condominium units		IND					none
680	1	INDUSTRIAL	INDUSTRIAL: Other industrial minor improvements		IND					none
683	8	INDUSTRIAL	INDUSTRIAL: Industrial quonset huts and butler type buildings		IND					none
689	7	INDUSTRIAL	INDUSTRIAL: Industrial condominium units		IND					none
693	3	INDUSTRIAL	INDUSTRIAL: Industrial		IND					none
717	2	COMMERCIAL	COMMERCIAL: One story retail		COM	URBMIX	1215			script
723	3	COMMERCIAL	COMMERCIAL: Gasoline station		COM	URBMIX	1215			script
728	4	COMMERCIAL	COMMERCIAL: Bank buildings		COM	URBMIX	1215			script
729	6	COMMERCIAL	COMMERCIAL: Motels	same as 529	COM	HOTEL (if criteria are met)	1250			production
774	1	COMMERCIAL	COMMERCIAL: office building (One story		COM	OFFICE	1220			production
790	13	OTHER	OTHER: Other minor improvements		XX					none
791	13	COMMERCIAL	COMMERCIAL: Office building (one story	matches up with D&B well	COM	OFFICE	1220			production

Appendix A Part 1:
Assessor Class Codes and CMAP PASS1 Use, Cook County

Code	Count	Major type	name	Notes	PASS1 USE	LANDUSE	LU_CODE	RES_UNITS	CRITERIA	resolve
792	12	COMMERCIAL	COMMERCIAL: Two or three story building containing part or all retail and/or commercial space		COM					none
797	2	COMMERCIAL	COMMERCIAL: Facilities (tennis		COM					none
817	194	COMMERCIAL	COMMERCIAL: One story retail		COM					none
823	11	COMMERCIAL	COMMERCIAL: Gasoline station with/without bay		COM	URBMIX	1215			script
827	1	COMMERCIAL	COMMERCIAL: Theatres		COM					none
828	8	COMMERCIAL	COMMERCIAL: Bank building		COM	URBMIX	1215			script
829	2	COMMERCIAL	COMMERCIAL: Motels	same as 529	COM	HOTEL (if criteria are met)	1250			production
830	15	COMMERCIAL	COMMERCIAL: Supermarket		COM					none
831	3	COMMERCIAL	COMMERCIAL: Shopping center (regional		COM					none
833	4	COMMERCIAL	COMMERCIAL: Quonset huts and butler type buildings		COM					none
880	33	INDUSTRIAL	INDUSTRIAL: Other industrial minor improvements		IND					none
883	2	OTHER	OTHER: Quonset huts and butler type buildings		XX					none
887	2	INDUSTRIAL	INDUSTRIAL: Special industrial improvements		IND					none
890	119	OTHER	OTHER: Other minor improvements		XX					none
891	1	COMMERCIAL	COMMERCIAL: Office building		COM	OFFICE	1220			production
892	6	COMMERCIAL	COMMERCIAL: Two or three story building containing part or all retail and/or commercial space		COM					none
893	110	INDUSTRIAL	INDUSTRIAL: Industrial buildings		IND					none
897	20	OTHER	OTHER: Facilities		XX					none
899	23	COMMERCIAL	COMMERCIAL: Commercial/industrial condominium units/Garage		COM					none
913	39	OTHER	OTHER: 2 or 3 story bldng		XX					none
914	290	RESIDMULTI	RESIDMULTI: 2 or 3 story non-freprf crt and corridor apts or california type apts		RESM	RES_MF	1130			script
915	718	RESIDMULTI	RESIDMULTI: 2 or 3 story non-frprf corridor apts		RESM	RES_MF	1130			script
918	90	COMMERCIAL	COMMERCIAL: 2 or 3 story frame stores		COM					none
919	3	COMMERCIAL	COMMERCIAL: 2 or 3 story old style store		COM					none
990	140	OTHER	OTHER: Other minor improvements		XX					none
991	204	RESIDMULTI	RESIDMULTI: Apartment buildings over three stories		RESM	RES_MF	1130			script
996	67	RESIDSINGL	RESIDSINGL: Rental mdrn row houses		RES					none
997	127	OTHER	OTHER: Special rental improvements		XX					none
	1,859,138									

Appendix A Part 2:
Assessor Class Codes and CMAP PASS1 Use, Other Counties

DuPage County		
CODE	NAME	PASS1
A	Apartment - 2 to 6 units	RESM
B	Organizational Assessment Freeze	XX
C	Commercial	COM
D	Historical Residence Rehab Freeze	RES
E	Exempt	EXM
F	Farm	AGR
H	Farm Home Site	AGR
I	Industrial	IND
K	Model Home	RES
L	Lease	RES
M	Apartment - 7+ units	RESM
N	Non-Residential	RESV
O	Open Space/Conservation Easement	OPSP
R	Residential	RES
S	Subdivision	XX
T	Leasehold	XX
U	Residential Common Area	RES
V	Vacant	VAC

Kane County		
CODE	NAME	PASS1
0000	0000 UNASSIGNED	XX
0011	0011 Farm Land with Buildings	AGR
0021	0021 Farm Land without Buildings	AGR
0028	0028 Conservation Stewardship	XX
0029	0029 Wooded Transition	XX
0030	0030 Residential Vacant Land	RES
0032	0032 Residential Vacant Land 20G4	RES
0040	0040 Residential	RES
0041	0041 Residential Model Home	RES
0050	0050 Comm Res More than 6 Units	RES
0052	0052 Comm Vacant Land	VAC
0060	0060 Commercial	COM
0062	0062 Commercial Vacant Land 20G4	VAC
0070	0070 Commercial Office	COM
0072	0072 Commercial Vacant Land Office 20G4	VAC
0080	0080 Industrial	IND
0082	0082 Industrial Vacant Land 20G4	VAC
5060	5060 Commercial Non-Carrier Railroad	TCU
8000	8000 Exempt	EXM
8011	8011 Farm Land with Bldgs Partial Exempt	AGR
8021	8021 Exempt Farm without Buildings	AGR
8030	8030 Partial Exempt	XX
8040	8040 Residential Partial Exempt	RES
8050	8050 Comm Res Partial Exempt	RES
8060	8060 Commercial Partial Exempt	COM
8070	8070 Comm Office Partial Exempt	COM
8260	8260 Commercial Leasehold	COM
9000	9000 Railroad	TCU

Kendall County		
CODE	NAME	PASS1
0011	HOM-DWEL20g/FARM-20	AGR
0021	FARM LAND 20e	AGR
0022	VAC LOTS-LANDS/6 UNITS	VAC
0030	RES VAC LOTS LAND	RESV
0032	10-30 RES VAC LAND	RESV
0040	RES IMPROVED	RES
0041	MODEL HOME 10-25	RES
0042	RES CONDO GARAGES	RES
0050	COMM VAC LOTS-LAND	COM
0052	10-30 COMM VAC LOTS	COM
0060	COMM IMPROVED	COM
0062	10-30 CVAC COMM LOTS	COM
0070	COMM OFFICES	COM
0072	10-30- VAC COMM LOTS	COM
0080	INDUSTRIAL	IND
0081	INDUSTRIAL VACANT LAND	IND
0082	10-30 VAC IND LOTS	IND
0083	UTILITY WITH IMPROVEMENTS	TCU
0090	TAX EXEMPT PROPERTY	EXM
4500	STATE ASSESSED	XX
5000	RAILROAD	TCU
7100	COAL ASSESSMENT 20	XX
7200	OIL LEASES	XX
7300	MINERAL LIMESTONE	IND
7400	MINERAL SAND-GRAVEL	IND
7500	MINERAL FLUORSPAR	IND
7600	MINERAL MISC.	IND

Lake County	
PARCELUSE	PASS1
(no use given)	XX
COMMERCIAL	COM
FARM	AGR
Farm Leaseholds	AGR
INDUSTRIAL	IND
OTHER	XX
RESIDENTIAL	RES
Reselect where TAXEXEMPT = "Y"	
TAXEXEMPT =Y	EXM

McHenry County		
CODE	NAME	PASS1
(no code)	(unknown)	XX
0000	0000 UNASSIGNED	XX
0011	0011 FARM Homesite-Dwelling	AGR
0021	0021 FARM Farmland	AGR
0030	0030 RES Vac Lots-Lands/6 units	RESV
0032	0032 RES 10-30 Res Vacant Land	RESV
0040	0040 RES Improved Lots	RES
0041	0041 RES Model Home 10-25	RES
0050	0050 COM Multi-Family/Dwelling	RESM
0052	0052 COM 10-30 Comm. Vacant Land	COM
0060	0060 COM Improved Commercial	COM
0062	0062 COM 10-30 Comm. Vacant Land	COM
0070	0070 COM Commercial Improvements	COM
0072	0072 COM 10-30 Comm. Vacant Land	COM
0080	0080 IND Industrial	IND
0082	0082 IND 10-30 Ind. Vacant Land	IND
0090	0090 EXEMPT Tax Exempt	EXM
5000	5000 LRR Railroad	TCU
7400	7400 MIN Min - Sand/Gravel	IND

Will County		
CODE	NAME	PASS1
C	Commercial	COM
E	Exempt Property	EXM
F	Farm	AGR
G	Residential Developers Relief	RES
H	Commercial Developers Relief	COM
I	Industrial	IND
J	Industrial Developers Relief	IND
K	Industrial Land, Farm Leased	AGR
M	Industrial Recreational Land	XX
R	Residential	RES
U	Mineral Rights	IND
X	Commercial Recreational Land	XX
Z	Commercial Land, Farm Leased	AGR

Key	
AGR	Agriculture
COM	Commercial
EXM	Exempt
IND	Industrial
OPSP	Open Space
OS	Open Space
RES	Residential
RESC	Residential, Condominium
RESM	Residential, Multi-Family
RESS	Residential, Single-Family
RESV	Vacant Residential
TCU	Trans/Communication/Utility
VAC	Vacant
XX	Unknown

Field name	Type/Length	Contents	Source	Domain	Comment
PIN	Text, 10	County's 10-digit PIN	County		Without hyphens or 4-digit suffixes for condominiums. Some PIN numbers were fabricated from the root 7-digit number where parcels were stacked.
COUNTY	Text, 3	County 3-digit FIPS	CMAP/Automated		Example "031" for Cook
CO_PIN	Text, 14	Concatenation of County FIPS and 10_digit PIN, separated by underscore	CMAP/Automated		Example: 031-0101123456
PARCELDATE	Text, 6	Year/Month that parcel data is current as of, as *YYYYMM*	CMAP/Automated		Based on when each county's file was received.
CO_USECODE	Text, 20	Land use code assigned by county, if any	County		Tables for county code keys can be found in **ReferenceData\CountyLUcodes.gdb**
TAXNAME	Text, 100	Owner/taxpayer	County		
LU_PASS1	Text, 4	Generalized land use based on automated analysis of county LU code	CMAP/Automated	**PASS1_USE:** RES Residential COM Commercial IND Industrial AGR Agriculture EXE Exempt OTH Other	
LANDUSE	Text, 4	CMAP full land use code	CMAP/Coder, some automated	**LANDUSE:** *See Land Use Classification Scheme*	
RES_UNITS	Long	Number of residential units (single-family only)	CMAP/Automated, some coder		To be used only in the single-family (attached or detached) categories. Some numbers will have been automatically generated for multi-family condo buildings; those can be left in for the time being.
HAS_RES_EST	Text, 1	Residential estimate included in RES_UNITS field (to distinguish between "0" res units and "0" not estimated yet	CMAP/Automated	**YESNO:** 1 Yes 2 No	This was a tracking step for the pre-processing phase, and can be disregarded.
FAC_NAME	Text, 100	Name of facility (larger properties, specific land uses only)	CMAP/Coder		See **NamingRules_2010.docx** for list
OS_MGMT	Text, 4	Code characterizing open space management (3100-3300 & 3500 only)	CMAP/Coder	**OSMGMT**: MUNI Municipality/Township/Park District CNTY County STA State FED Federal XXX Private or Unknown	Mandatory for all 3100, 3200, 3300 & 3500 uses.
PLATTED	Text, 1	Ag or Vacant land is platted for a developed use	CMAP/Coder	**PLATTED:** R Residential C Commercial I Industrial O Other	
STATUS	Text, 1	Coding status	CMAP/Coder	**STATUS:** C Coded X Uncoded Q Question	If flagged as "Q," the issue needs to be explained in the COMMENT field
INITIALS	Text, 3	Coder's initials. These are hard-coded into each individual's models.	CMAP/Coder	**CODER:** Domain based on analyst's initials.	
DATE_	Date	Date parcel is coded. Field is updated automatically when model is run using *date()*	CMAP/Coder		
COMMENT	Text, 254	Comments, generally for notes on "Q" (question) parcels.	CMAP/Coder		
PARCELMOD	Text, 1	Flag indicating if parcel was modified at CMAP	CMAP/Automated	**YESNO:** 1 Yes 2 No	
MODNOTE	Text, 100	Comment on CMAP parcel modification	CMAP/Automated		
MODIFIER	Text, 1	Code for explaining certain circumstances for some land uses	CMAP/Coder		Currently only used to identify church/school combinations sharing a parcel

Also…Parcel value data (varies by county)

Appendix C: Coding Instructions Example

Theme-based approach to coding land use, MCHENRY COUNTY:
26 September 2012

Many of the parcels in your county have already been coded through automated processes when enough info could be gleaned from the Assessor data to make a reliable judgment. What remains are parcels that require some sort of review prior to coding.

You will be working township-by-township, with data stored in a workspace that you set up on your local drive (C:\LUIwork*McHenry*\). This is to minimize the amount of processing time when running the coding models. The reference data you work with is stored elsewhere on the CMAP network.

These instructions present a "thematic" approach to coding land uses. You will be coding parcels of a certain land use type (i.e. Schools) before moving on to the next. There are a large number of reference datasets available in your MXD, and the process will be less chaotic if you focus on only one or two reference sources/themes at a time.

The reference data we work with have varying levels of reliability. The instructions will indicate which ones are reliable and which need to be taken with a grain of salt. Many of these reference sources are point-based, with the point feature falling within the parcel. However, since many of these properties have multiple parcels, using a select-by-location with these points won't select all of the participating parcels. For these land uses, each point feature should be zoomed-to, and then all parcels that make up that land use should be selected and assigned the proper land use code.

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1. OPEN SPACE

1a. Forest Preserves
Uses: **3300 Conservation Open Space**, **3200 Golf Course**, **1330 Government** (for HQ or maintenance facilities)
Reference Layer: *McHenry County Conservation District* within the *Open Space Reference* group layer.

1. Select by location all forest preserve features that intersect Landuse parcel polygons, and turn that selection set into a feature layer. Clear the selection from the original forest preserve shapefile and turn off. Set the new forest preserve feature layer so it is not selectable.
2. Open the attribute table for your forest preserve feature layer and zoom to each property; select the associated parcels and, after verifying that the property is actually owned by the Forest Preserve district, assign the appropriate land use. Forest preserves are by default 3300 Conservation Open Space except when:
    a. Parcel is district headquarters or a maintenance building (1330 Government)
    b. Parcel is golf course (3200 Golf Course)
    c. Parcel is entirely a linear trail (3500)

3. Remember, for all 3300, 3200 and 3100 open space land uses, you must include the Open Space Owner Code ("CNTY" for all forest preserve properties).
4. Dismiss the forest preserve feature layer when you are done with this step.

Note—if a parcel is part golf course and part conservation, code it to whichever use takes up more than 50% of the parcel.

1b. "MUNI" (Park District, Muni or Township Open Space)
Uses: **3100 Recreation Open Space, 3200 Golf Course, 3300 Conservation Open Space (infrequent)**
The primary reference layer is *McHenry County Open Space*. After you have identified all of the MCCD properties, turn this layer on to identify locally-managed parks and recreation areas. Some (not all) MCCD properties are also included in this set, but you will already have coded them in the previous step. Zoom to each feature and code the parcel as appropriate. In McHenry County there are a fair number of "conservation" open space properties managed by park districts.

1c. Golf Courses, Private (3200, with OS Owner code XXXX)
Use the 2005 Land Use Inventory with this query: "LANDUSE" = '3200' AND "OSOWNCODE" = 'XXXX'. When running the OPEN SPACE model, code the golf course as "3200" and the Open Space Owner Code as "XXXX"

1d. Trail or Greenway (3500)
The 3500 code for trail/greenway is reserved for linear parcels dedicated to recreational use that are not part of a larger park or preserve parcel. In many cases these will be old railroad rights-of-way which have been converted to rail-trails. In other cases they were built by a community trying to create safer routes for cyclists/pedestrians, or for connecting two parks.

The reference layer is located in your Open Space Reference group layer: *Existing Trails 2011*. You will turn on the features in this layer and follow each to identify any qualifying parcels. Before you work with it, though, go into the layer properties and open the Definition Query tab; to filter out features like bike routes on streets, change the definition query to read:

"STATUS" = 'Existing' AND "FACTYPE" = 'Path'

The actual alignment of these features is poor, so doing a select-by-location will not work. It will be better to just zoom in and follow each feature, selecting any linear parcels that contain a trail, are owned by a public agency (might be a park district, county, or the IDNR), and aren't a part of a larger use. It is not necessary to add the Open Space Owner Code to this set. (*Note: if the parcel is owned by a gas or electric utility company, do not code as 3500—it will instead be coded as a Utility Right-of-Way*)

1e. State Parks & Conservation Areas
This reference shapefile (in the *Open Space Reference* group layer) shows all state-owned open space as of 2010. In McHenry, the state-run open space is concentrated on the eastern side of the county. Turn this layer on and, if any features are found within your township, zoom to

those areas and code; most properties will fall under the 3300 (conservation) category. Be sure to set the Open Space Owner code to "STA."

1f. Dedicated Nature Preserves

This layer (in the *Open Space Reference* group layer) identifies all state-dedicated nature preserves. A Nature Preserve can be found within a state park or forest preserve, or on private property: they are defined by a certain level of protection, and not by who owns them. Turn on this layer and see if there are any nature preserves which have not been coded in any of the earlier steps. If any are located, the parcel should code to **3300**, with the Open Space Owner code assigned as appropriate based on who owns the parcel.

2. INSTITUTIONAL

We have reference data for most institutional uses. Please work in this order, in keeping with the instructions in the Classifications document: "The order presented below implies a sequence for selection. For example, a hospital within a public university would be coded 1310, Medical Facilities."

2a. Medical Facilities (1310)

Primary reference: *Hospitals and Nursing Homes* group layer. Work with each reference source individually:

Hospitals:

Since there are at most only a handful of hospitals in any township, you should just zoom to each one individually and code them. Hospitals often take up multiple parcels and might have different county use codes (not just Exempt) among the parcels making up the hospital property.

Long-Term Care:

This list originated with the Illinois Department of Public Health, and should be considered reliable. Zoom to each point as you did the Hospitals layer and code as appropriate, with these considerations in mind:

- If the facility is a larger complex that may house both nursing and independent living units (which would code to **1130 Multi Family**), and parcels can be used to distinguish between the two, then code each parcel to the appropriate use. Google the facility name to get more information about the place; disregard the hundreds of commercial "ratings" websites and refer only to the actual website for the facility, if one exists.
- If the facility is a mixture of nursing and independent living within a single parcel, code to **1310 Medical** unless there is evidence that the "medical" part is only a very small percentage of the overall use.
- The *Census Blocks* shapefile (housed in the *Residential Reference* group layer) can also be used as a resource here—it includes the field I_NURS, which stands for the number of people in nursing homes (a subset of the population living in all Institutionalized Group Quarters). The Census block containing the facility should have a non-zero value in that field. If not, then possibly the facility has closed

2005 Land Use, MEDICAL

After exhausting the Hospital and Long-Term Care layers, do a final check with the 2005 Medical polygons. While most of them should already have been coded at this point, there will probably be some '05 polygons that have not been picked up. For each of these, you need to determine whether the underlying parcels:

- Represent a legitimate Medical use not picked up in the other reference layers (code as **1310**),
    - Note: if it is a medical office building, then it should be coded to **1220 Office**. These can be identified by these symptoms:
        - Property is classed Commercial by the county;
        - Dun & Bradstreet shows a large number of small, medical-related offices as opposed to one large business/employer (like a hospital or nursing home).
- *Was* a Medical use, but is now closed:
    - if property is occupied by another use, code appropriately
    - if property is vacant, flag as Question
- or, was never a medical use (determine correct use and code as appropriate).

2b. Education (1321, 1322)

Primary reference: *Education* group layer within *Institutional Reference* set.

K-12 Schools (1321):

These features should first be converted into a township-wide feature layer:

1. Select by location K-12 Schools which intersect the Land Use parcel layer. Apply a search tolerance of 100' to catch any school points which might fall in a right-of-way.
2. Create a layer of this subset (right-click on K-12 Schools, Selection, Make Feature Layer from Selection). Import the symbology from the parent K-12 Schools layer, and clear the selection/turn off the parent schools layer.

Then open the attribute table of your new feature layer and zoom/pan to each individual school and code as appropriate, being sure to select all adjacent parcels associated with that school.

Remember:

- If the point is for a District Headquarters and there is no school on the parcel, code as **1330 Government**.
- If the parcel is a combination church & school, and you can't identify individual parcels in a way that separate out the church and school properties, then code the parcel as a school, but then re-select those parcels and run the MODIFIER update tool, typing an "**R**" inside the quotes. (The MODIFIER tool does not clear your selection after running, so be sure to manually clear your selection after running this tool)

- Some smaller Montessori schools are "storefront" operations in leased Commercial buildings. If the school does not seem permanent (it could move and a dry cleaners could move in the next week), then don't count it as a school.
- Also, some pre-school outfits are included in this set; these actually belong in the **Urban Mix (1215)** category.

Colleges and Universities (1322):
Since there are so few colleges in most townships, you do not have to create a separate feature layer…you can just zoom to each and code them. Before doing this, however, set up a definition query in the layer properties to suppress the private for-profit schools, which we are not including. Query: **"TYPE" <> 'Private; for-profit'** will turn off the for-profit schools.

Some colleges have satellite campuses in office buildings or other commercial areas; in those instances the property should code to the Commercial, not the Educational use.

2c. Government Administration & Services (1330)
Reference layers:

- *Village Halls* Geocoded by CMAP to rooftop, highly reliable
- *Libraries* Geocoded by CMAP to rooftop, highly reliable except non-public libraries need to be turned off using the definition query **"instType" IN ('PUB', 'XPB')**
- *Fire Stations* Geocoded by CMAP to rooftop
- *PostOffices GNIS* From USGS Geographic Names Information System. Not reliable.

Since the first three reference layers are higher-quality and should fall within landuse parcels, use a select-by-location to select all parcels that intersect these three layers; then using the land use attribute table, zoom to each to select/unselect additional parcels that belong to the property. (An alternative: create a graphics layer of the point features, then zoom to each, code the associated parcels, and then delete the graphic and move to the next).

Post Offices: for this resource, just zoom to each feature and determine whether or not a post office is in the area. If it isn't evident, move on to the next. Most post office properties are federally-owned and should be indicated in the TAXNAME field. Also, look for the trademark white trucks in the parking lot, although usually the photography is taken during times that the trucks are out on delivery.

2d. Prison & Correctional Facilities (1340)
Use the *2005 Inventory* (1340 PRISON) as a reference. Select all 2005 polygons where: LANDUSE = "1340" and then use Select by Location to reselect only those that overlap the township parcel polygons. This is not a very common land use, so there are several townships where you won't find any. Create layer from selected features, open the attribute table & zoom to each, verifying & coding as you go.

2e. Religious Facilities (1350)
Defined as "Houses of worship, along with associated structures and property." The only resource we have for this is one particular NAICS category in the Dun & Bradstreet data: "813110 - Religious Organizations." This NAICS category is a little more broad than what we're after, as it can include any location where a church or other religious organization has a business address. We want to include only those DnB businesses that fall on Exempt parcels and where the primary activity is a religious, not business, function. Also, if the primary activity appears to have more of a social service function, the **1370 (Other Institutional)** category might be more appropriate.

1. Select by Attributes from the Land Use layer all uncoded polygons marked as Exempt: "LU_PASS1" = 'EXM' AND "STATUS" = 'X'
2. Select by Location those *DnB_CodedToAddressPoints* features that intersect the selected features in the Land Use layer,
3. Select by Attributes from the Current Selection those features in DnB feature set where: "NAICS_6" LIKE '813110%'
4. Create a layer from the selected DnB features (right-click, Selection, Create Layer from Selected Features).

Once you have this reference created, open the attribute table for your church layer. Starting with the top record, zoom to each and select the parcel (keep in mind there can be storefront churches occupying unlikely-looking parcels; as long as the parcel is Exempt and the DnB point falls on the property (and there is a building there), select the parcel; also select any nearby Exempt parcels owned by the same organization. In tighter urban settings the parking lots are often across the street from the church, so be sure to check for those.

In more rural settings, look for properties which might be owned by a religious organization, but have a different purpose, such as a camp or retreat, which would code to **3400 (Non-Public Open Space)**

Remember: some churches have already been classified during the "schools" phase.

An exception to the "nearby parcel" rule are houses which are owned by the church (such as a rectory), when such parcels are separate from the primary religious parcel and are in a residential setting. Those will get coded **1111** during later clean-up operations.

2f. Cemeteries (1360)
Since these are very slow to grow/change, using the 2005 Inventory (1360 CEMETERY) will be your most reliable reference. Set up a definition query on the 2005 "1360" polygons and zoom/code each as appropriate.

3. COMMERCIAL

3a. Shopping Centers

Primary reference: *CoStar Shopping Centers* in the *Commercial/Industrial Reference* group layer.
Uses: **1211 Shopping Malls**, **1212 Regional/Community Retail Centers, 1214 Single Large-Site Retail, 1565 Stormwater Management**
Review the *Field Guide* for these four categories (including Q&A) before proceeding with this step.

1. Make a township-level subset of this region-wide dataset:
    - Select by location *CoStar shopping centers* which intersect the Land Use parcel layer. Apply a search tolerance of 100' to catch any centers which might fall in a right-of-way.
    - Reduce your selected set by applying this Select by Attributes query: Select from Current Selection where "RBAGLA" >= 100000, so only those centers that would get a 1211 or 1212 code are visible. (This figure is the Gross Leaseable Area, or GLA, which is what we use to determine the size of the shopping center).
    - Create a layer of this subset (right-click on CoStar, Selection, Make Feature Layer from Selection). Import the symbology from the parent CoStar layer, and clear the selection/turn off the parent CoStar layer.
    - Open the attribute table for the selection layer

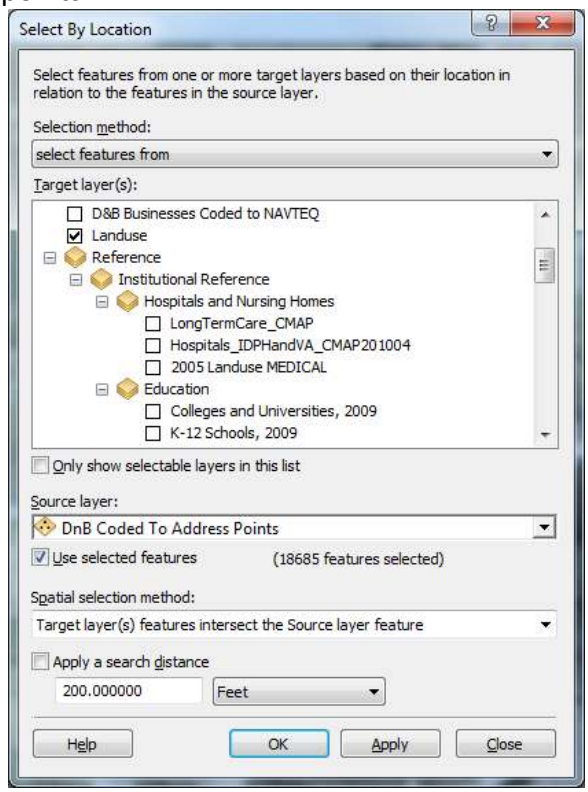
2. Zoom to each shopping center feature. For each:
    - Does the point location make sense? Does it fall on a commercial parcel?
    - Is the "center" actually a single stand-alone big box store (Wal-Mart, Home Depot) which would actually get a 1214 designation?
    - Select the parcels which make up the main shopping center & parking area. Do not select peripheral stores along the major roads which are separate from the centers. Assuming they are service/retail, they should be coded **1215 (Urban Mix**). If they are office buildings, they should be coded **1220 (Office).**
    - Run the Commercial model with appropriate code for each center which qualifies. After you have worked through the entire set, dismiss the CoStar selection set and move on.
    - In many newer shopping centers, you will also encounter adjacent polygons that qualify as **Stormwater Management** (**1565**, in the TRANS COMM UTIL model). You should code those as you work.

3b. Office Buildings (1220)

This step is intended to pick up commercial properties that qualify as "office" in the CMAP scheme. In this step you will identify commercial properties that house businesses which are more likely to be in an office setting, and then you will check each parcel to verify that they are office. *NOTE: in McHenry the geocoding referenced addresses in the parcel file, so your results may not be as thorough as they were in Will where we had an actual point-based address file to work with.*

1. Run the following query on the *DnB Coded to Parcels (*or *Address Points)* layer: "NAICS_2" in ('51' , '52' , '53' , '54' , '55' , '56' , '61' , '62' , '92') AND "EMPS" > 5
   Refer to the NAICS-2 handout to see which business categories are included in this query.

2. Use Select By Location to select all Land Use parcels that intersect the <u>selected</u> business points:



3. Clear your D&B selection, but leave the land use parcels selected.

4. Use Select by Attributes on the Land Use layer to create a subset of this group ("Select from current selection"), containing only uncoded commercial parcels: "LU_PASS1" = 'COM' AND "STATUS" = 'X'.

5. What you do next depends on just how many selected parcels you see. If there are just a handful, then zoom to each individually & follow the instructions in Step 6. If there are several (say, more than 10), then
   - Turn the selection set into a layer,
   - Clear all selections,
   - Make your layer un-selectable,
   - Open the attribute table for the layer,
   - Individually zoom to each feature in the layer, and then select qualifying parcels based on the instructions below:

6. Using the Identify tool, for each parcel check <u>all</u> of the DnB businesses that coded to that parcel, verifying that the majority of businesses have a NAICS-2 category suggesting

an office-style activity, and not a Retail (44/45) or Accommodation/Food Service (72) category, which would code to Urban Mix.

- If the parcel qualifies as "office," then select any adjacent developed parcels associated with that property.
- If it is not an office, or turns out to be part of a larger development which is better characterized as Urban Mix, then remove the parcel from the selection set.

3c. Cultural & Entertainment (1240)

Be sure to review the definition of this category before proceeding. Certain activities which are part of a larger land use should be coded to the more dominant use (i.e. a movie theatre connected to a mall should be coded as a part of the mall). In this step you will query a few NAICS codes in Dun & Bradstreet to identify some possible C&E sites. The codes you are querying on are: 512131 & 512132 (movie theatres and drive-ins, respectively), and 713950 (Bowling Centers). In the NAICS classification list there are numerous other categories that qualify, but in reality they are small businesses that don't qualify as places of public assembly.

1. In the *DnB Coded To Address Points* layer, select where:
   "NAICS_6" Like '51213%' or "NAICS_6" LIKE '713950%'
2. Then use Select by Location to reduce this selection set to only those points that intersect the land use polygons for this township.

Zoom to each and verify, adding associated adjacent parcels such as associated parking lots, etc.

3d. Hotel/Motel (1250)

Two reference layers are available here: Dun & Bradstreet, and a file generated from CMAP employment data called *Hotels/Motels* in the *Commercial/Industrial* group layer.

1. Select from *DnB Coded To Address Points*:
   "NAICS_6" LIKE '721110%', and turn the selection into a layer.
   Then reduce the set by using Select by Location to filter it down to only those that intersect with the township.
2. Turn on Hotels/Motels reference layer
3. Then, use Select by Location:
   - First, create new selection of parcels that intersect selected D&B features,
   - Then, add to current selection those parcels that intersect the Hotel/Motel reference layer.

Zoom to each selected parcel; in many cases you'll see points from both reference layers falling inside the parcel, which makes it a good bet that it indeed qualifies as Hotel/Motel. If a parcel only has a D&B point falling in it, you should verify using either Bing Maps, or Googling the business, to make sure that it is a hotel. Beware of putting too much trust in the NAICS code—there are lots of really bizarre code assignments out there!

4. INDUSTRIAL

4a. Manufacturing/Warehousing/Office over 100,000 Sq. Ft.

Please read the entire entry below before proceeding

The "Industrial/Flex/Office > 100K" reference layer within the Commercial/Industrial Reference group layer is the best available reference for locating the larger industrial properties. Ideally, any industrial activity that has more than 100,000' of building area should code into either **1431** (Manufacturing/Processing), **1432** (Warehousing/Distribution) or **1433** (Flex/Indeterminate). Included in this reference layer is also larger office buildings, which you can use to identify some of the larger **1220** (Office) properties (assuming they weren't picked up already in the Commercial round).

When determining whether an industrial property is Manufacturing/Processing or Warehouse/Distribution, you can sometimes tell from above: in general, warehousing operations have a large footprint, not much area devoted to car parking (not many employees), a large number of docks/bays for trucks, and relatively feature-less roofs. Buildings housing manufacturing operations will have more parking and will more likely have heating/cooling units on the roof.

Beyond simple visual judgment, you should also check what businesses are on the property. The Dun and Bradstreet *DnB Coded to Address Points* reference layer will tell you the name of the business in that space as well as what they do. You can turn on Map Tips for this layer, which will give the name of the company and a description of the type of business, based on the company's NAICS (North American Industry Classification System) code. Be aware that multiple businesses may have geocoded to that property—the Map Tips will only show you one business at that location (and not necessarily the dominant one), but if you click on that point with the Identify tool you may find that there are two, five, or even twenty businesses at that site. Use the NAICS Description field in the DnB reference layer along with visual cues to help decide the use. The **1433 (Flex/Indeterminate)** category is available if you can't tell, or if the building seems to house a mix of the two (or contains sizeable office operations on the parcel as well).

The CoStar data are not perfect—some properties no longer exist, or the points were not located at rooftop, and sometimes point to buildings obviously smaller than 100,000'; also, it is not all-inclusive—there are plenty of properties over 100K' not represented in the CoStar set. Using this reference layer is a good start in the > 100K' category, but keep an eye out as you work for neighboring properties with similarly-sized buildings not represented in the CoStar layer, and code those as appropriate.

Important!! Especially with more modern industrial buildings, it's really difficult to tell from the air whether or not a building's purpose is primarily manufacturing or warehousing. In many cases these buildings were built on spec to accommodate either activity. Because of this, consider the default code for such properties to be **1433 (Flex/Indeterminate),** and only assign the **1431 Manufacturing** or **1432 Warehousing** codes when there is strong evidence that the property can support one activity to the exclusion of the other. A note about the NAICS codes:

they describe what industry the company is involved in, but not necessarily the activity at the site. A company that is primarily involved in manufacturing might also have warehouse space.

For this step, only focus on properties identified in the CoStar layer, and any adjacent properties that might qualify.

4b. Storage (1450)

This category is specific to storage-type activities that are not classified as warehousing. The most common of these are the public storage operations, but also includes things like automotive junkyards and yacht storage. This query on the parcel data will help zero in on the public storage properties:

"STATUS" = 'X' AND "LU_PASS1" in ('COM' , 'IND') AND "TAXNAME" LIKE '%STORAGE%'

This locates uncoded commercial and industrial properties that have the word "storage" in the owner's name. Once the set is selected, zoom to each to verify that it looks reasonably like a public storage facility (most resemble a series of long sheds, but some older commercial & industrial buildings have been repurposed for this). If a D&B point falls in the parcel, verify that the company occupying the space is in the "storage" business. If it's still questionable, use the Google and Bing views to assess.

5. TRANSPORTATION, COMMUNICATION & UTILITIES

5a. Wastewater Treatment Plants (1562)

Reference layer: *Wastewater Treatment plants*, found in the *Trans/Comm/Utilities Reference* group layer.

This is a very reliable source. Zoom to each and code.

5b. Intermodal Facilities (1570)

Skip this step for McHenry…no Intermodal in the county

This category is new to the Inventory, so we can't use the 2005 Inventory as a reference. Instead, we have a point shapefile of *intermodal* locations, found in the *Trans/Comm/Utilities Reference* group layer.

Intermodal facilities are found for the most part in Will and southern Cook counties. These places are huge, so the point might fall in an adjacent township, but the property itself could extend into the township you are working on.

The parcels that actually get coded Intermodal include the railyard and any railroad-owned properties that appear to be directly involved in the transfer of freight from rail to truck and vice-versa. There are usually truck terminal and warehousing operations in close proximity, but those parcels will get coded **1520** (for truck terminals) or **1420/1432** (warehouse/distribution, depending on size).

5c. Aircraft Transportation (1530)
This is more than just O'Hare and Midway. There are many small airports/air fields scattered throughout the region. Be sure to go through these steps with every township you work on.

A reference layer for *public-use airports* is also in the *Trans/Comm/Utilities Reference* group.

This reference layer is a group layer containing a point with the airport information, and a polygon representing the airport's extent from an earlier year. Use this as a reference, but be sure to verify that the current land use parcels within the airport polygon boundary are still a part of the airport; check as well for adjacent parcels outside of the polygon which might have been recently added to the airport property.

Since the reference layer only shows public-use airports, as a final check turn on the 2005 Land Use (all) layer and do a quick definition query ("LANDUSE" = '1530') to see if there are any small, private airfields from the old inventory which should also be coded. Also included in this set will be heliports—these should also be coded 1530 provided they are not associated with another land use (such as a hospital).

5d. Landfills (1563)
The only reference data for this theme is the 2005 Land Use Inventory. In 2005, there was a single code, 1560 Utilities and Waste Facilities, which covered:

> "…electric, gas, water, sewage, solid waste, and other pipelines. Also includes electric generation plants and substations; natural gas production plants and storage tanks; water pipelines; water treatment plants; water towers and accompanying land; sewage treatment plants; refuse and garbage plants; incinerators; sanitary landfills. Does not include refineries or storage tanks."

Wastewater treatment plants were hopefully all caught in an earlier step. The purpose of this step is to catch the landfills, which will get a code of **1563** in this Inventory.

Set up a definition query on the *2005 Land Use (all)* layer: "LANDUSE" = '1560'. Check all features that received that code in '05 and, if they turn out to be a landfill, assign the appropriate code. Note the definition for landfill includes "closed landfills, unless converted to another active use (i.e. golf course)."

Since landfills are difficult to identify from the air, check the name in the TAXNAME field; landfill owner names are usually self-evident (i.e. "Waste Management Corp."). Also, keeping in mind that they are usually much higher than the surrounding area, you can use the *Contours* to see if anything there indicates a landfill.

5e. Other Linear Transportation (1520)
This definition for this category is for the most part unchanged from the 2005 Inventory, with the exception that Intermodal facilities now have their own code (1570). Since you have already coded Intermodal in an earlier step, you can use the *2005 Land Use (all)* layer with a "1520" definition query to help locate the remaining Other Linear properties.

Included in the Other Linear category are Metra stations and any associated parking. Use the Metra station reference layer in the TCU Reference group layer to locate these. For most Metra stations, the track portion will code as **1511 (Rail ROW),** but any station-associated parcels such as parking will get the **1520** code.

5f. Utility Rights-of-Way (1561)
This code is reserved for ROWs only—electrical substations and the like code to **1564 Other Utility/Waste**. If there is a "passive" activity on the ROW (ag, park), then it should code to ROW. If the parcel is dominated (>50%) by an active use (industrial or commercial activity), then it should code to that use instead.

This query should select Commonwealth Edison properties. After selecting, each parcel should be checked to make sure that it truly is a R.O.W.
"STATUS" = 'X' AND ("TAXNAME" LIKE '%EDISON%')

This query should select those properties owned by the natural gas utility, Nicor:
"STATUS" = 'X' AND ("TAXNAME" LIKE '%NICOR%')
Again, verify each selected parcel prior to coding.

6. RESIDENTIAL

When the county parcel data was going through the pre-processing steps, there were some automated routines run to select and code single-family residential properties. Since the county doesn't make the distinction between attached and detached housing, the queries had to be run in a way to best try to filter out the duplexes and townhomes by selecting parcels of a certain size or larger. The unfortunate result is that you will see many single-family detached residences that are not coded because they fell below the minimum lot size in the query. Conversely, you will also see single-family attached homes that were accidentally coded as detached properties because their lot configuration happened to push them above the size threshold.

6a. Mobile Home Parks/Trailer Courts (1140)
There is a reference layer for this theme loaded in the *Residential Reference* group layer. This is a fairly reliable reference, although the points were geocoded to street addresses and will not necessarily fall within the parcels. Some parks will be single large polygons, and some will have the individual units parceled out. All get coded 1140, and there is no need for a residential unit estimate.

6b. Homeowner Association Land in Residential Subdivisions (1151)
The common open space areas within residential subdivisions are usually held by a homeowner association (HOA), and get the 1151 code unless the entire parcel is roadway. This query will do a decent job of selecting these properties assuming the name in the Assessor's database is either "Homeowner Association" or "HOA."

"STATUS" = 'X' AND ("TAXNAME" LIKE '%HOME%ASSOC%' OR "TAXNAME" LIKE '% HOA')

Note that in this query there is a space between the **%** and the **H** in the final part of the query—this is important to include or else your returned results will include privately-held properties where the owner just happens to have that combination of letters in his name.

Once you have run the selection, zoom to each selected parcel and determine whether it belongs in 1151, or if it is a roadway (1512) or some other use. Be sure to review the discussion and Q&A in the Field Guide before taking this step on.

7. CODING THE REMAINDER
At this point, the remaining work in your township will involve zooming to individual uncoded parcels and coding them. Reference data (in particular the 2005 Land Use data) will still come in handy for certain uses, but much of what's left will rely on your air photo interpretation skills and Internet resourcefulness.

You should continue to work thematically, meaning focusing strictly on one PASS1USE type, such as IND or RES, at a time. If you set up a definition query on your Land Use file, you can filter out all of the parcels not belonging to a particular category, which might help you focus on that particular land use type. The benefit to working thematically is that you only have to keep a small collection of land use types (with their particular set of rules and exceptions) in your head, and only a few relevant reference layers turned on, reducing screen clutter and allowing for a more efficient work flow.

For Commercial, Industrial, Exempt and Open Space properties, you don't need any further instruction beyond what has been covered in this document as well as the information available on the Field Guide wiki page. The rest of this document covers special instructions for dealing with the remaining Residential land, as well as Agriculture, Vacant, Under Construction and Water. Please read this section through in its entirety before proceeding.

Agriculture
Many of the Ag parcels were already pre-coded, using a satellite-based dataset produced by the U.S. Department of Agriculture to verify that the parcels classified by the county as being "agriculture" actually had crops growing on them during the 2010 growing season.

Those parcels that didn't pass that first test have to be manually verified. Although the county classified them as "agriculture," this does not necessarily mean they pass our criteria for farm

land. Each parcel should be inspected, keeping in mind what the Field Guide says about farm land, in particular that the parcel has to contain at least 25% cropland/pasture/orchard, etc. You can use the **NAIP_2010** reference photography, which was shot in the middle of the growing season, for verification of agricultural activity.

Keep in mind that pasture/grazing land will often just look like a grassy field. Things to look out for are random-looking paths (livestock trails), or a livestock fence (in the Bing oblique view).

If the parcel does not qualify as an Ag parcel:

- If there is no activity on the parcel at all (just a mix of grass, trees, wetland) it should code to **4140** (Other Vacant).
- If there is evidence that there is some sort of activity on the parcel which carries over onto an adjacent, developed parcel, then this parcel should receive the same code as the developed parcel. This "activity" should take up at least 25% of the parcel to receive the developed land use code.

Residential

The remaining residential land will be a more manual/aerial interpretation exercise, going neighborhood to neighborhood, coding as you go. Here are some things to keep in mind:

- "Vacant" residential owned by an adjacent landowner: don't forget that these get the same code as the adjacent occupied parcel, so code "1111" and verify that the ResUnits count is 0.
- Duplexes/townhomes mis-coded as 1111 (detached) residences: as explained above, the automated process did that if the parcel was above a certain size. Keep an eye out for these and re-code them to 1112 as you see them.
- Single-Family Attached (1112) vs. Multi-Family (1130): Please be sure to read carefully the complete description, discussion, and Q&A portions of the Field Guide for these two categories. There are some newer multi-unit building configurations that defy easy categorization. Perhaps the easiest generalization that I can make about these categories is this: if people live next to each other, it's SF-Attached; if people live on top of one another, then it's MF.
- A reminder that residential unit estimates are required only for the 1111 (Single Family Detached) and 1112 (Single Family Attached) categories (and 2000-Agriculture). You will find some estimates already loaded into some buildings considered Multi-Family. Leave those numbers in there because they might come in handy later. Those numbers were generated because they are condominium properties, so we were able to make an estimate based on property ownership records.
- **Apartment buildings**:
    - McHenry County is inconsistent in their coding of apartment buildings…some are classed as "Residential" and others as "Commercial." Some of the Residential-classed parcels were already coded during the automation phase as 1111; these need to be identified and recoded where possible.

    - One reference layer to work with to help identify these apartment complexes is the **CoStar MultiFamily** reference layer in the Residential Reference section. This is not an exhaustive list of multi-family developments, but it can help point you to the general location of multi-family.
    - One more thing: When Erik started working on McHenry, we had a slightly different classification scheme. Originally we had multi-family coded as **1131** instead of **1130**. When you start work on Residential parcels, you can re-code these all at once by selecting where LANDUSE = '1131' and then running the Update Residential model to re-code to 1130.
- While residential unit estimates have been generated for most Single-Family Detached and Attached properties, you may find some instances (such as a rental townhome development) where there won't be a residential unit estimate. In these cases, you will need to make the estimate and enter it using the **Update RES and Change Unit Count** tool. To make the estimate, use Bing Oblique, Google StreetView (if available), and the Census residential unit block counts to come up with a reasonable figure.

Under Construction & Vacant

Properties are considered under construction if there are construction activities evident in the aerial photography. Indicators include roadways begun, scraped earth, partially completed structures, or missing/incomplete landscaping.

There can sometimes be confusion within certain circumstances where a development is platted out, infrastructure is in place (roads, etc.), but no buildings are going up. This is more common in Commercial and Industrial developments where a business park is laid out but buildings are only built when the demand is there. This is also found (these days) in many Residential developments which got "caught out" during the real estate bust. In these situations, the parcels should be coded vacant.

Water: Parcel should be coded 5000 Water if it is entirely or almost entirely (say, 90%) water and there is no significant activity (i.e. part of a shopping center) on the remainder.

Appendix D:
Supplemental Datasets Used in the 2010 Land Use Inventory

Aside from county-supplied parcel and Assessor data, a number of GIS and tabular (converted to GIS) datasets were used as reference to aid in classifying parcel land uses:

CMAP Resources

2005 Land Use Inventory: used as a general reference when coding land uses, and useful in particular with certain land uses that are not obvious through the Assessor data (Multi-Family, Landfill). Also used as a screen during the quality control phase: parcels with a 2010 coded land use identical to the 2005 use were exempted from manual review.

Northeastern Illinois Development Database (NDD): Development-monitoring database used to determine end-use of under-construction parcels.

Trails from the Regional Greenways and Trails Plan: Used to aid in identifying right-of-way parcels converted to recreational use (3500, Trail or Greenway).

Wastewater Treatment Plants: Shapefile developed at CMAP, used to identify Wastewater Treatment Facilities (1562).

Other Government Agencies

Federal:

U.S. Department of Commerce, Bureau of the Census

2010 Census block-level data aided in identifying Medical (1310), Prison (1340) and Other Institutional (1370) uses through the Population Living in Institutionalized Group Quarters variables. Block-level housing unit counts were also useful in identifying concentrations of multi-family (1130) Residential.

U.S. Department of Education, National Center for Education Statistics

2010 Data obtained through the Integrated Postsecondary Education Data System (IPEDS). Locations geocoded at CMAP; to aid in identifying locations in the Higher Education (1322) category.

U. S. Department of Transportation, Research and Innovative Technology Administration (RITA)

Shapefiles from the 2010 National Transportation Atlas Database (NTAD), published by RITA's Bureau of Transportation Statistics, were used to identify freight rail corridors (1511, in part) and airports (1530, Aircraft Transportation).

State:

Illinois Department of Natural Resources (IDNR)

IDNR Nature Preserves and State-Owned Properties shapefiles sent in May of 2010 were used to identify Conservation Open Space(3300) parcels.

Illinois State Board of Education (ISBE)

Public school, district headquarters, and non-public school locations were drawn from the ISBE's 2009 Directory of Educational Entities. Geocoded at CMAP; to aid in identifying K-12 Educational Facilities (1321).

Illinois Board of Higher Education (IBHE)

The Institutional Profiles section of the IBHE website was used to provide supplemental information on Higher Education (1322) facilities identified through the IPEDS data (above).

Illinois Department of Public Health (IDPH)
The IDPH supplied CMAP with 2010 shapefiles of: Hospitals, Home Health Agencies, Hospices, Ambulatory Surgical Treatment Centers, and End Stage Renal Disease Centers. To aid in identifying Medical (1310) establishments.

Illinois State Library
The State Library provided CMAP with a spreadsheet of all public libraries in the CMAP region in 2010. Addresses were geocoded at CMAP to aid in identifying certain Government (1330) uses.

County and Regional:
Aerial Photography
Digital high-resolution (6" pixel, color) imagery taken in the spring of 2010 for the 7-county region by the Northeastern Illinois County GIS Cooperative Program (NEIL). Primary reference for interpretation of land use.

Cook County Zoning
A geodatabase of municipal zoning feature classes for Cook County, used to determine "type" of vacant land (residential, commercial, industrial). Provided by the Cook County GIS Department.

Forest Preserves
Forest Preserve/Conservation District shapefiles were provided by: the Forest Preserve District of Cook County, the Forest Preserve District of DuPage County, Kane County GIS, Kendall County GIS, Lake County GIS, the McHenry County Conservation District, and the Forest Preserve District of Will County.

Regional Transportation Authority
The RTA provided shapefiles of Metra rail lines and stations as well as CTA rapid transit lines and stations to aid in identifying parcels in the 1520 (Other Linear Transportation) category.

Commercial Sources
NAVTEQ streets
Street centerline shapefiles with associated address information. Used for geocoding of addresses and as a general reference to aid in the interpretation of ground features. Obtained through interagency agreement with the Illinois Department of Transportation.

Dun & Bradstreet
Data on the region's businesses, with address, business type (NAICS category) and size (number of employees). Addresses geocoded at CMAP. Location and NAICS type used to determine specific commercial and industrial activities on land use parcels. Subscription service, exported in April 2010.

CoStar
Commercial, industrial and multi-family real estate data, with supplied lat/lon coordinates. Used to identify building square footage to assign retail (Mall, Regional Center, Big Box and Urban Mix) and industrial (greater than 100,000 sq. ft.) land uses. Also to aid in distinguishing between manufacturing and warehousing activities at larger industrial properties, and to locate residential apartment complexes assessed as "commercial." Subscription service, exported in April 2010.

Appendix E: Land Use Inventory Gap Assignment

Areas not covered by parcel data (AKA gaps) were classified after each county's "All Parcel" LUI was finalized. Gap assignment was conducted using the "No Parcel" and "Dissolved LUI" datasets. The "No Parcel" dataset divides unclassified areas into Township, Range, and Section. The Dissolved LUI dataset simplifies the full-parcel LUI by merging adjacent parcels which have the same land use classification. Right-of-way (ROW), Hydro Polys, and Open Space GIS data formed the basis of gap assignments. 5 foot buffers of these datasets were used to minimize slivers when combined with the parcel-based LUI.

1. ROW creation from polyline: Kane and McHenry County

ROW polygons were available for 4 of the 7 counties, and ROW polylines were available for 2 counties. Since many of the polyline segments formed unclosed areas, manual editing was required to generate ROW polygons. The final polygon represents the portion of the "No Parcel" dataset located between ROW polylines.

a. Explode "No Parcel" dataset using the Multipart to Singlepart tool.
b. Select features that "share a line segment with" ROW and export.
c. At a 1:24,000 scale, manually edit 1b to create the final ROW polygon. Split, clip, and edit to remove polygon areas not contained between ROW polylines. Use the 2010 aerials as guidance for polyline segments that form unclosed areas.

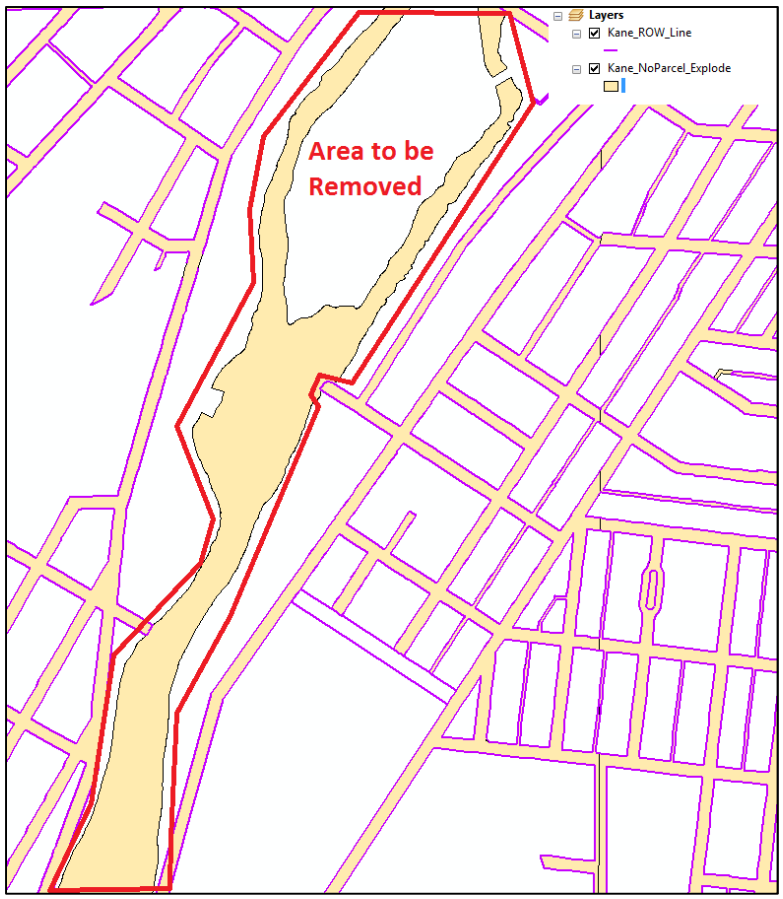


Figure 1: Example area to remove from "shared-line-segment" export

2. ROW creation from road segments: Will County

Will County does not maintain a ROW dataset, so unclassified areas intersecting road segments were manually edited to create the ROW polygon. It represents the portions of the "No Parcel" dataset that intersect Road segments and are not classified as Open Space or Water.

a. Explode "No Parcel" dataset using the Multipart to Singlepart tool.
b. Erase 5ft buffer of Hydro Polys from 2a.
c. Erase 5ft buffer of Open Space from 2b.
d. Select by location and export features within 2c that intersect road segments.
e. At a 1:24,000 scale, manually edit 2d to create the final ROW polygon. Split, edit and remove polygon areas that extend beyond the length of road segments, using the 2010 aerials as confirmation.

Figure 2: Example area to remove from "intersects road segment" export

3. Initial gap assignment: 6100, 6200, and 6300

5ft buffers of ROW, Hydro polys, and Open Space GIS datasets were used to assign the 6100, 6200, and 6300 classes though a series of erases and intersects. This was completed on a county-by-county basis, and the operation order preserves ROW over Water over Open Space.

a. Intersect ROW with "No Parcel" dataset. Calc field LANDUSE as 6300 (Non-Parcel ROW).
b. Erase 5ft buffer of ROW from 3a.
c. Intersect 5ft buffer of Hydro poly with 3b. Calc field LANDUSE as 6200 (Non-Parcel Water).
d. Erase 5ft buffer of Hydro poly from 3c.
e. Intersect 5ft buffer of Open space with 3d. Calc field LANDUSE as 6100.
f. Erase 5ft buffer of Open Space from 3e.
g. From 3f, select and delete areas along county borders.
h. Merge 3a, 3c, 3e, and 3g with the original county LUI.

4. Additional gaps: manual assignment, eliminate tool, and 6400

Large Null polys were assigned manually, and the eliminate tool automatically merged smaller Null polys with neighbors. Unassigned polygons with an area larger than 1,000 square feet but smaller than 10,000 square feet were classified as 6400 (Non-Parcel NEC). Additional iterations of the eliminate tool reduced slivers.

a. Select and export where "LANDUSE" = '6100' OR "LANDUSE" = '6200' OR "LANDUSE" = '6300' OR "LANDUSE" IS NULL. Explode using the Multipart to Singlepart tool, then Dissolve using LANDUSE, LUI2010_ID, and SECTIONID as the dissolve fields. Ensure that allow multi-part polygons is unchecked.
b. Select from 4a where "LANDUSE" IS NULL and "Shape_Area" >= 10000. Manually assign a non-parcel Land Use for these parcels, based on aerials and context clues from surrounding land use.
c. Select from 4b where “LANDUSE” IS NULL, and run the eliminate tool with the “Eliminating polygon by border” option selected.
d. Merge 4c with the original “Dissolved LUI” for the county.
e. Select from 4d where “LANDUSE” IS NULL and "Shape_Area" < 1000 and run the eliminate tool with the “Eliminating polygon by border” option selected.
f. Assign remaining NULL Land Use values as “6400”.
g. Select from 4f where "LANDUSE" = '6100' OR "LANDUSE" = '6200' OR "LANDUSE" = '6300' OR "LANDUSE" = '6400', then select from current selection where "Shape_Area" < 500, and run the eliminate tool with the “Eliminating polygon by border” option selected.

5. LUI2010_ID field and geometry checks

A Python script was used to automatically generate unique LUI2010 IDs for non-parcel polys. County-level geometry checks helped flag null geometry, self-intersections, and other geometry problems for cleanup.

a. Select where “LUI2010_ID” IS NULL and calculate as [SECTION_ID] & left([LANDUSE],2) & "0001".
b. With the selection still in place, calculate the following fields as “” to replace Nulls with blanks: DENSCLASS, OS_MGMT, FAC_NAME, PLATTED, and MODIFIER.
c. Run “LUI_GapFill_UpdateIDs.py” script, which uses an update cursor to auto-increment duplicate non-parcel IDs. Note that you’ll need to point the “fc_update” variable to the correct county geodatabase and feature class.
d. Delete extraneous fields: TWP, RNG, SEC, TwnRngSec, TwnRng, SECTION_ID.
e. Run the Check Geometry tool and investigate any results, manually cleaning up as needed.

```
### Purpose: Generate unique Land Use IDs for non-parcel polygons
### Author: Zach Vernon
### Updated: 06/23/14

import arcpy
from collections import Counter

# Set feature class and field
fc_update = 'S://Projects//LandUseInventory//LUI_2010//Workspace//Relea
fields_update = ('LANDUSE','LUI2010_ID')

# Set land use types to update
landuse_list = ['6100','6200','6300','6400']

i = 1
id_list = []

# Create dictionary with occurence counts
with arcpy.da.UpdateCursor(fc_update, fields_update) as cursor:
    for row in cursor:
        if row[0] in landuse_list:
            id_chunk = row[1][:9]
            id_list.append(id_chunk)
lui_ID_dict = Counter(id_list)


# Create and write unique LUI IDs for non-parcel polys
proc_list =[]
with arcpy.da.UpdateCursor(fc_update, fields_update) as cursor:
    for row in cursor:
        if row[0] in landuse_list:
            id_chunk = row[1][:9]
            id_counter = lui_ID_dict[id_chunk]
            print 'id chunk', id_chunk, ' ', id_counter
            id_counter -= proc_list.count(id_chunk)
            print 'id subtract', id_chunk, ' ', id_counter
            if id_counter < 10:
                id_concat = str(id_chunk) + '000' + str(id_counter)
            else:
                id_concat = str(id_chunk) + '00' + str(id_counter)

            row[1] = id_concat
            cursor.updateRow(row)
            proc_list.append(id_chunk)
```

Figure 3: LUI_GapFill_UpdateIDs.py

6. Combine gap-free LUIs

The final regional dataset was created by combining the county-level LUIs, identifying and removing slivers, and addressing overlap areas along county borders. Geodatabase topology rules were created to identify slivers and overlaps.

a. Data preparation:
   i. Dissolve county boundaries into a regional file; merge counties and erase from regional file in order to identify unassigned slivers.
   ii. Convert county borders into polyline and create 500ft buffers, select sliver polys by location and categorize into county border (border slivers) vs. non-border areas (interior slivers).

b. Slivers:
   i. Check for any interior slivers > 500 sq. feet; assign manually if any exist.
   ii. Remove interior slivers by merging with the county LUI, then running the eliminate tool with the “Eliminating polygon by border” option selected.
   iii. Merge the border slivers into a single regional file and follow the same assignment procedure used in Step 3 and 4a-4f to assign non-parcel ROW, water, open space, and NEC.

iv. Union result of previous with the section polygons, and select and export the 4 non-parcel categories. Convert from Multipart to Singlepart, and dissolve based on the land use and the section ID (ensure that “allow multi-part polygons” is unchecked).
v. Select polys where "LANDUSE" = '6100' OR "LANDUSE" = '6200' OR "LANDUSE" = '6300' OR "LANDUSE" = '6400', then select where "Shape_Area" < 500 and run the eliminate tool with the “Eliminating polygon by border” option selected.

c. Overlaps:
   i. Create a geodatabase topology and Add “Must Not Overlap" as a rule; validate topology to identify the overlaps.
   ii. Use the “Export Topology Errors” to export polygons identifying overlap.
   iii. Erase from the combined LUI, and then merge back with the LUI. This will create Null polygons, which can be assigned with the Eliminate tool.
   iv. Select polys where "LANDUSE" IS NULL and run the eliminate tool with the “Eliminating polygon by border” option selected.
   v. Add “Must not have gaps” as an additional topology rule, and run another topology validation to identify any remaining errors. There will be a handful that weren’t picked up in the first validation. Fix these using the topology toolbar.