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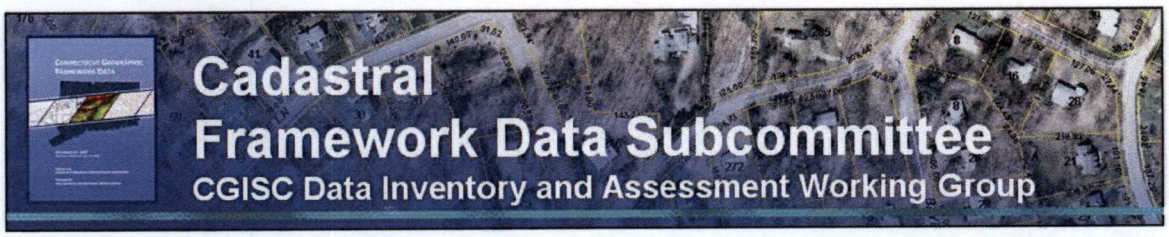

Cadastral Data Standards and Guidelines 1.0

January 2011

Connecticut Geospatial information Systems Council

The Connecticut Geospatial Information Systems Council (CGISC) was established by Public Act 05-3 of the June Special Session. The enabling legislation directs the CGISC to coordinate a uniform GIS capacity amongst the State, Regional Planning Organizations, municipalities, and others. Additionally, the CGISC is required to administer a program of technical assistance to these entities. The CGISC consists of 21 members representing state agencies, municipalities, Regional Planning Organizations, and a general GIS user.

Data Inventory and Assessment Workgroup

The CGISC has created of four working groups: Data Inventory and Assessment, Education and Training, Financial, and Legal and Security. The Data Inventory and Assessment Work Group has identified 12 framework datasets for Connecticut, and established individual subcommittees tasked to evaluate, document and provide recommendations for each framework dataset. This includes establishing policies, standards and general procedures for the submission, evaluation, maintenance, on-line access, and dissemination of all geospatial data within the purview of the Council.

Framework Data Themes:

- Addressing
- Administrative and Political Boundaries
- Basemap Imagery
- Cadastral
- Census and Demographics
- Critical Infrastructure
- Elevation and Bathymetry
- Geodetic Control
- Geographic Names and Places
- Hydrology
- Land Use Land Cover
- Transportation

For more information about the CGICS, or to be added to the CGISC newsletter mailing list, please visit www.ct.gov/gis

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1. Introduction

Cadastral data is the foundation for municipal GIS systems. This data is also useful by other government levels (regional, state and federal) as well as the private sector.

Why are these standards and guidelines needed?

1. National Studies
    a. 1980 Need for a Multipurpose land cadastre
    b. Follow up and related 1980's NRC studies
    c. 2007
2. Cadastre System (Land Information System)– GIS should be the hub
    a. Deeds
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3. Now.
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"Land ownership has been critical to the economic and philosophical development of the United States. Land parcel databases, which are also known as cadastres, describe the rights, interests, and value of property and its ownership, form the basis for all land use and zoning decisions, and represent the location of residences, businesses and public lands. In other words, almost every aspect of government and business can be associated with a land parcel." [1] In a National Research Council report regarding the status of Land property information is one of the most important and useful data maintained by local, regional and state governments.

1.1 Objectives

There are several objectives to this document:

1. Creation of a State-Wide Cadastral Dataset. Establish common data elements and framework that will allow municipal cadastral datasets as defined by the Production

[1] National Land Parcel Data. A vision for the future, Committee on Land Parcel Databases: A National Vision. Mapping Science Committee Board of Earth Sciences and Resources Division of Earth and Life Studies. National Research Council of the National Academies 2007.

Level Cadastral Standard to be merged and collated into a single statewide GIS dataset in the form defined by the Publication Level Cadastral Standard. It should also be noted that the Publication Standard for the State of Connecticut will be consistent with the National Cadastral Database Standard.

2. Define technical requirements and guidelines for municipalities to utilize when creating or upgrading cadastral datasets. Separate levels of this standard will allow municipalities to choose a level suitable for procurement, budget and resource considerations.
3. Educate the policy makers, administrative management, and the GIS community in the uses of and resources required in developing and maintaining cadastral GIS datasets.
4. Ensure that high quality and reliable cadastral information products are developed.

1.2 Scope

The Connecticut Geospatial Information System Council approved a Strategic Implementation Plan and a Business Plan on September 12, 2007. Within the Strategic Plan, four framework GIS layers were identified as GIS datasets of statewide importance. Recommendations for the procurement, development and maintenance are to be accomplished through the creation of standards and business plans. Cadastral data is one of those framework datasets.

1.3 Applicability

This standard should be implemented by municipalities and regional planning agencies that have or are developing cadastral datasets. Municipalities with existing cadastral datasets will be encouraged to migrate existing parcel datasets to this standard. Any state agencies that supplies funds to municipalities or regional planning agencies to develop or update cadastral datasets should require that this standard be used in the creation or update of the cadastral datasets.

1.4 Related Standards

Cadastral Data Content Standard for the National Spatial Data Infrastructure. With an ambitious goal of creating a nation wide parcel dataset, the National Cadastral Data Content Standard needs data that is collated from the local level to the national level to fit the national standard model. This goal has been considered in the creation of this standard.

State of Connecticut Addressing Standard. An important component to the assessors CAMA database and thus the parcel database is the parcel address. There needs to be a method of validating the address information in both the assessor database and the Address Point / Centerline address ranges. This will be dealt with in a later version of this standard

State of Connecticut Orthoimagery Standard. The most consistent geographic basemap is an othoimagery product. Having standards for spatial accuracy and quality of procured orthoimagery products is important to the spatial accuracy of parcel datasets.

1.5 Standards development procedures

The Connecticut Cadastral Data Standard is a new standard. Many interested GIS professionals and other related professionals have invested time and effort into the development of this standard. The subcommittee responsible for creating this standard has representatives from the following governmental agencies: City of Milford, City of Hartford, City of Meriden, Town of Manchester, Town of Avon, Town of Tolland, the Capital Region Council of Governments, the Northeast Connecticut Council of Governments, the Department of Public Safety, the Department of Transportation, the Office of Planning and Management, the Department of Environmental Protection, and the Department of Public Works. The subcommittee also has representatives from the following professional associations: the Connecticut Association of Land Surveyors, the Connecticut Association of Assessing Officers and the Connecticut User-to-User Network.

1.6 Maintenance authority

The Data Inventory and Assessment Working Group shall identify framework datasets for Connecticut, establish individual subcommittees tasked to evaluate, document and provide recommendations for each framework dataset, and establish policies, standards and general procedures for the submission, evaluation, maintenance, on-line access, and dissemination of all geospatial data within the purview of the Council. The Cadastral Data Subcommittee shall have the responsibility of creating, implementing, and maintaining this standard. This committee will also serve as a technical resource for state agencies, municipalities and regional planning agencies in regards to complying with the standard.

2. Production Cadastral Standard Overview

The cadastral production standard presented herein is broken into three separate levels. This is done to provide some flexibility for municipalities to achieve at least the minimum content level and provide guidance for those municipalities wishing to achieve a higher quality product. The key components of each of the levels are boundary compilation methods and sources, features and format, attributes, spatial accuracy, horizontal coordinate system and datum, quality assurance and quality control and FGDC compliant metadata. Higher levels will generally increase the requirements for the key components. Higher levels build upon the requirements of the previous level.

Cadastral Production Standard Levels

Level I contains the minimum attribute elements, basic CAMA integration, and minimum GIS features. The intent of this level is to accommodate existing cadastral datasets in the State of Connecticut. Many of the existing parcel datasets were created through an assessor/tax map conversion process whereby few survey sources if any were used to create the final product. This level contains the minimal components to support municipal GIS needs. Items like spatial accuracy and metadata are not considerations for inclusion at this level due to resource implications. It will be recommended in the Cadastral Business Plan that no new parcel creation projects be developed utilizing this level.

Level II applies to municipal parcel datasets that have been created through a more rigorous creation or maintenance process than Level I. The introduction of subdivision source maps and other survey products are required to improve a parcel dataset from Level I to Level II. This level also introduces the requirement for properly modeling the relationship between the GIS parcel and the assessor property record(s) especially for properties like condominiums where a many-to-one relationship exists between the assessor record(s) and the piece of land.

Level III is the highest level of the standard. It includes all elements of the previous levels plus additional components to ensure the highest possible spatial accuracy and attribute quality. Level III also specifies the ESRI Geodatabase as the data format. This requirement is based on several factors. First, the State of Connecticut Application Development Domain Technical Architecture specifies ESRI ArcGIS as the preferred statewide GIS software product and thus the geodatabase is the de facto state GIS data format standard. Secondly, the statewide cadastral dataset will be implemented with the Level III format. Finally, a geodatabase can be modeled as a comprehensive (features, topology, and domains) that can be made available via UML or XMI formats which can be used as a starting point for new projects or a container for migrating municipal existing cadastral datasets.

Production Cadastral Standard Components

Standardized Parcel Identification Attribute refers to a single identifier that allows for the parcel to be uniquely labeled. There are currently several different formats for this attribute ranging from Map Block Lot, Map Lot to Street and Addressing codes. These will remain a part of the Parcel Identification with the addition of the State (CT) and Town DOT code (001 to 169). This way, town systems are still part of the identifier and when a statewide product is created, no duplication of ID's are created.

Boundary compilation methods and sources are the ways a property boundary is created and the source information used to make the boundary. There are numerous valid methods in generating parcel boundaries. The method used is typically determined by the source and the means to translate the source into the parcel in GIS.

Features and format refers to the types of GIS features included and type of file(s) that the features are stored in. The generic feature types within a GIS are points, lines, polygons, annotation (text) and rasters (images). Lines and polygons are the only required feature types in the cadastral standard. Though we are specifying ESRI based GIS formats in the highest level of the standard, other valid GIS formats exist.

Attributes are the information about each feature, both the GIS features and assessor database. This standard specifically addresses the GIS feature(s) attributes and the attribute(s) in the assessor database that will allow the joining and relating of the parcels to the assessor property records.

Spatial accuracy is a metric that can only be legally determined by a licensed Connecticut Surveyor. Since most GIS practitioners are not surveyors, these standards utilize a simple method of comparing the parcel boundaries with other elements in "Framework" GIS datasets to infer spatial accuracy. These elements typically are lines of occupation observable in orthoimagery or other basemapping. Utilizing generally accepted GIS editing practices with survey sources, accurate parcel boundaries can be achieved. It is not necessary to certify all features within a town-wide parcel dataset, but rather infer the spatial accuracy of the whole dataset from the sum of the sources of the parcel boundaries.

The official State of Connecticut **horizontal coordinate system and datum** is the Connecticut State Plane System North American Datum of 1983. The standard requires this to be implemented at the highest levels and a compatible system implemented at level I.

Quality assurance and quality control are steps taken to attain a certain level of information accuracy. There are a number of steps and actions that identify errors such as omissions, commissions and erroneous data entries. In order to achieve the objectives of the standard, QA/QC procedures must be implemented.

FGDC compliant metadata is required for all federal GIS standards, see www.fgdc.gov/metadata for more details. Metadata provides the necessary background information for sharing GIS datasets.

2.1 Level I

Boundary Compilation Methods and Sources

The least expensive and least accurate method of creating a parcel dataset is the digitization of the assessor/tax maps. This method starts out with either tablet digitizing of a hardcopy map or heads up digitizing of a scanned map. Next, the digitized parcels are essentially rubbersheeted to fit a known geographic base, such as the 2004 State of Connecticut orthoimagery.

Assessor/tax maps will be the primary source of parcel boundaries at Level I. It is assumed that this source for compiling parcel boundaries will produce the least spatially accurate parcel dataset.

Features and Format

Parcel polygons are the only required geographic feature of Level I. Any ESRI ArcGIS compatible vector GIS format will be acceptable at this Level such as geodatabase feature classes, shapefiles, and coverages. See Appendix D for full list of ESRI supported formats.

Attribution

A field used to join to the assessor database is the only required attribute of Level I. The name of the field should be a text field named GISID or GPIN. The formatting of the values at the record level should be the same as it is stored in the assessor CAMA database so that a majority of the records match between the two datasets. In Connecticut assessor records, a consistent parcel identification scheme does not exist. Many employ a map block lot, map lot or street number street code system of labeling property records plus a host of other identification schemes. At Level I, the match rate should be at least 75%. It is expected that properties like condominiums will not be accommodated properly at Level I and these records will account for most of the mismatches.

Spatial Accuracy

There is not spatial accuracy requirement for Level I parcel dataset. When a parcel dataset at Level I is displayed with a quality orthoimagery product such as the 2004 State of Connecticut orthophotos, it is expected that many of the property lines that are supposed to align with obvious lines of occupation will not. It is also expected that property lines will appear to go through houses and other buildings when in reality do not. This is the most limiting aspect of the Level I parcel dataset. Issues like these affect usage of the product such as town staff not printing maps for the public or causing considerable confusion when evaluating a property in the decision making process.

Horizontal Coordinate System and Datum

Connecticut State Plane North American Datum of 1983 US Feet (CT NAD 83) or Connecticut State Plane North American Datum of 1927 US Feet (CT NAD 27). Existing parcel datasets should be either compatible or in the same coordinate system as the official state coordinate system and datum (CT NAD83). See the Connecticut State Statutes Chapter 241 Sec. 13a-255. (Establishment of a Connecticut coordinate system), for more details.

Quality Assurance and Quality Control

Minimal QA/QC steps are required for Level I. A check for required features, format, attributes, and horizontal coordinate system and datum is the first step. The second step is to ensure the minimum match rate is achieved. At level I, a 75% match rate is required. This means that 75% of the records in the GIS parcel polygon feature class must match the CAMA database. The opposite must also be true whereby 75% of the CAMA database records must have a corresponding match in the GIS parcel polygon feature class. A listing of the QA/QC steps for each level is included in Appendix C.

FGDC Compliant Metadata

Not required for Level I.

2.2 Level II

Boundary Compilation Methods and Sources

The majority (51%) of the parcels at Level II will be generated from tax maps and similar to Level I, these will be created through heads up digitizing. In addition to parcels derived from tax maps, the remainder of the parcels will have a land record source such as a subdivision map or deed. A parcel dataset at this level will either have started out as a level I dataset that has been updated with land record sources or shall have been created from land record sources to begin with. More details about boundary compilation methods are in Appendix A.

Sources will include tax maps, subdivision maps, DOT ROW maps, RR valuation maps, and other surveys. It is recommended that Coordinate Geometry (COGO) methods be utilized to enter the survey metes and bounds information.

Features and Format

The Level II dataset will contain both lines and polygons and can be in a number of ESRI compatible formats.

Attribution

At Level II, the match rate between the parcel and CAMA datasets should be above 90%. This will be accomplished by creating an attribute that bridges the parcels and the CAMA database in such a way that properties like condominiums can be matched between the parcel and the CAMA records. There are two options for creating the bridge between the parcel and CAMA databases. ADD DIAGRAM. The first bridge, hence referred to as

Intersection Table, is a table that stores the GISID and the corresponding CAMA database IDs. The CAMA table is joined to the Intersection Table via the CAMA ID which then can be related to the parcel feature class. In this arrangement, a condominium property can be selected and all of the individual units of the condominium can be selected through the Intersection Table. The second option adds the GISID into the CAMA database directly. The bridge is an important component of quality control as well as supporting the functional requirements of most parcel dataset users.

At Level II, additional attributes will be required for the parcel polygons, though populating values will be optional. These attributes outline when the parcel was created or edited, who performed the edits, the methodologies that were used, and the resources consulted by the editor. In this sense, these are termed Feature Level Metadata, data about the data and are defined as Parcel Type, Parcel Name, Owner Type, Date, Editor, Source Type, Source and Method. The list of the Feature Level metadata attributes is in Appendix B. Below is an example of feature level metadata.

Parcel Type	Parcel Name	Owner Type	Date	Editor	Source Type	Source	Method
Fee Simple		State	5/1/2008	MRG	Deed	304/123	COGO
Fee Simple		Private	2/1/2001	MRG	Subdivision	Ab1234	Digitize
Condominium	Hill Condos	Private	1/3/2001	MRG	Survey	Ab1201	COGO
Water	Park Pond	Municipal	1/3/2001	MRG	Tax Map	TM100	Digitize
Municipal ROW	North St	Municipal	1/3/2001	MRG	Tax Map	TM100	COGO

In order to combine municipal parcels into a statewide dataset and have a unique ID attribute values, the municipal three digit code needs to be appended to the municipal parcel ID in both the assessor database and GIS parcel dataset.

For the parcel lines, the line type will be the only attribute required. The specifics of the line types are included in Appendix B. Examples of the line types are right-of-way, property, water, town and state. This is important information for cartographic and analytical purposes.

Spatial Accuracy

The parcels created from land record or other surveyed sources should reasonably align with obvious lines of occupation on a quality orthoimagery product or other basemapping. Using surveyed sources to produce a parcel dataset will create a much more accurate parcel dataset than using the assess/tax maps as a source. It is expected that a Level II parcel dataset will be reliable in the areas with survey sources but will have the same issues as a Level I parcel dataset in the other areas.

Horizontal Coordinate System and Datum

Connecticut State Plane North American Datum of 1983 (US Feet).

Quality Assurance and Quality Control

The QA/QC for Level II is more rigorous than Level I. In addition to the checks for Level I the relationship of the parcels in GIS to the assessors CAMA database is examined more closely at Level II. Since condominiums are expected to be accommodated at this level, a higher match rate is expected (90%). Other QA/QC steps include: visual analysis of the Map Block Lot or Street Number Street Code system employed by the assessor should be examined for outliers and typos, examination of duplicate (Map Block Lot, GPIN) attribute values, and check for missing (Null) values. A full listing of the QA/QC steps for each level is included in Appendix C.

FGDC Compliant Metadata

Full FGDC compliant metadata is not required for Level II. A minimum level of metadata, though, is required. See Appendix G for details.

2.2 Level III

Boundary Compilation Methods and Sources

The majority of parcels within a Level III will be compiled utilizing sources and methods that can produce a high quality parcel dataset. Sources such as deeds, subdivisions and surveys will provide the highest quality results. At least 75% of the parcels with such a source shall be compiled from the available source. The goal is to compile as many property boundaries with a surveyed source as feasible. This will be achieved using DOT right-of-way maps, railroad valuation maps, subdivision and other survey maps as well as deed only survey information. Remaining properties not generated from survey sources will come from tax maps or interpretation of lines of occupation from aerial orthophotography or planimetric base data.

A significant component of the parcel dataset is the right-of-way. Traditional GIS development practices have created a single town-wide right-of-way feature. This single feature is typically half the size of the GIS file on disk. In an ESRI geodatabase, the single ROW feature contains more vertices than most computers can process efficiently or at all depending on the GIS process employed (such as validate topology and some geoprocessing tasks). In Level III, the right-of-way will be split at logical intersections and there is a hierarchy of which segments are continuous along the length of a right-of-way. State ROWs have the highest priority, followed by town ROWs, railroad ROWs and lastly private ROWs. Breaking up the ROW in this manner will not only make parcel datasets more manageable from a file size perspective, but will also improve processing efficiency and improve ROW management.

In order to support the use of coordinate geometry attributes, lines and arcs must be constructed with a start and end point only (called two point lines).

Features and Format

At Level III, the only accepted format will be an ESRI Geodatabase. The features within the geodatabase are identified in Appendix E – Connecticut Cadastral Data Model (ADD MODEL).

Attribution

The same attributes at Level II are required at Level III. At Level III, the feature level metadata attributes will be required to be filled out. Another difference for the parcel polygon feature is that instead of the Intersection Table, a direct CAMA integration is required. This will entail adding the linking field directly into the CAMA database.

The boundary lines will need to include the standard ESRI based COGO fields. The list of COGO fields is located in Appendix B. If the boundary lines are added utilizing the ESRI COGO Inverse tool, the fields will be automatically populated. As stated in the boundary compilation methods and sources, the COGO tools will create two point lines or arcs. If the lines are entered utilizing other means, these could be calculated only if two point lines are utilized.

Spatial Accuracy

The parcels created from land record or other surveyed sources should reasonably align with obvious lines of occupation on a quality orthoimagery product or other basemapping. Using surveyed sources to produce a parcel dataset will create a much more accurate parcel dataset than using the assess/tax maps as a source. With a high rate of parcel with survey sources, it is expected that a parcel dataset in the Level III category will be highly reliable and will not limit the uses of the data.

Horizontal Coordinate System and Datum

Connecticut State Plane North American Datum of 1983 US Feet.

Quality Assurance and Quality Control

The same attribute QA/QC steps identified in Level II are to be performed for Level III cadastral datasets. The mechanisms might be slightly different due to the Intersection Table rather than the direct integration, but the report formats will be the same. The match rate is also higher at Level III, 98% vs 90%.

Level III incorporates geodatabase topology. Topology is a rigorous check of geometric integrity of the feature classes in the cadastral dataset. It is essential to a high quality end product. Topology is implemented first by listing the features to participate in the topology, then adding specific rules that identify geometric rules that should be adhered to. The rules can be implemented on a single feature class on itself, such as No Dangles. The rules can also be implemented on a feature class or subtype against another feature class or subtype, such as parcel polygon boundaries must be covered by parcel lines.

Within ArcMap, there are tools (ArcEditor and ArcInfo only) that allow the editor to view and resolve topology errors. Not only can the editor resolve individual errors automatically, the editor can also resolve multiple errors at the same time as long as the errors are based on the same rule.

For a full listing of the topology rules see Appendix E (Geodatabase Model) and descriptions see Appendix F (FURTHER CLARIFY IN APPENDIX).

FGDC Compliant Metadata

Level III cadastral data requires full FGDC compliant metadata.

3. Publication Cadastral Standard Overview

The Publication Standard Parcel Dataset is meant for the statewide parcel dataset. The statewide parcel dataset will be created on a set interval to coincide with the assessors grand list, October 1st, though not generally certified until the following January or February. There is a process that creates this dataset which essentially merges a subset of the assessor CAMA database into the GIS parcel polygon feature class. As part of the process, several attributes are added to indicate the date of the GIS and assessor data and the Production Standard Level of the GIS data.

Features and Format

There is only one feature type specified for the publication parcel dataset, the polygon.

Attribution

Spatial Accuracy

Horizontal Coordinate System and Datum

Quality Assurance and Quality Control

FGDC Compliant Metadata

4. DEFINITIONS

The following definitions will aid in understanding the terms, acronyms and concepts presented in this standard.

Cadastre or Cadastral: 1. Tax inventory and assessment of real property. (Black's Law Dictionary, 5th ed.) 2. An official register of the quality, value and ownership of real estate, used in appropriating taxes. (Definitions of Surveying and Associated Terms, American Congress on Surveying and Mapping, 1941).

CAMA: Computer Aided Mass Appraisal. A software application and database utilized in the assessment of real property.

Coordinate Geometry: A method of defining geometric features through the input of bearing and distance measurements. Coordinate Geometry (COGO) functions are typically used by land surveyors to enter traverses around spatial features such as parcels, to calculate precise locations and boundaries using distances and bearings from reference points, and to define curves using a point location, radius, arc-length, tangent and other curve measures.

Topology: The properties of data adjacency and connectivity that define spatial relationships. Specific to GIS software, the arrangement that constrains how point, line and polygon features share geometry

Feature Level Metadata: Information that relates to the creation or edit of a digital record. Includes Edit Date, Edit Method, Editor, and Edit Source.

Domain: The range of valid values for a data element. In a geodatabase, domains are a mechanism for enforcing data integrity. Attribute domains define what values are allowed in a field in a feature class or nonspatial attribute table. If the features or nonspatial objects have been grouped into subtypes, different attribute domains can be assigned to each of the subtypes.

Subtype: In geodatabases, a subset of features in a feature class or objects in a table that share the same attributes.

Georeference:

5. REFERENCES

MassGIS Parcel Standard
http://www.mass.gov/mgis/standards.htm#Parstandard

CTGIS User to User Outline
http://ctgis.uconn.edu/committees/standards.htm

FGDC Cadastral Subcommittee
www.nationalcad.org

State of Connecticut
Application Development domain Technical Architecture
http://www.ct.gov/doit/lib/doit/Application_Architecture_5-8-2003_ver_2-5.pdf
http://www.ct.gov/doit/lib/doit/downloads/Addendum_B.pdf

6. APPENDICES

A Boundary Compilation Methods
B Attributes and Feature Level Metadata
C Quality Control and Quality Assurance tests

Appendix A – Boundary Compilation Methods

The boundary compilations specified below are means by which property boundaries are compiled and entered into a cadastral dataset. Site and source specific factors help direct the editor to choose the appropriate method. It is expected that a town-wide cadastral dataset would be compiled by several of the methods listed below.

Coordinate Geometry (COGO) – Surveyor information inputted directly as formatted on survey. Metes and bounds are entered sequentially.

Scan, georeference and digitize tax maps – Tax maps are scanned, georeferenced to know points, then the property lines are digitized by tracing the boundaries of the georeferenced parcels. The tax map may be georeferenced a number of times to get blocks or small areas on the map to fit correctly. Utilizing a whole georeferenced tax map is a rare occurrence.

Scan, digitize and rubbersheet tax maps – Tax maps are scanned, the property maps are digitize then the digitized tax map is rubbersheeted to fit existing GIS data. This method is not recommended for any level of this standard. Considerable spatial inaccuracies are introduced utilizing this method.

Scan, georeference and digitize subdivisions and other surveys. Survey maps are scanned, georeferenced to know points, then the property lines are digitized by tracing the boundaries of the georeferenced parcels. An alternative to COGO entry, scanning, georeferencing and digitizing surveys is less time consuming that COGO entry though not as accurate.

CAD submission import – Care needs to be taken when loading CAD submission files into a GIS. In many cases the CAD file cannot be used directly, but rather, some clean-up steps must be performed prior to loading into the cadastral GIS dataset.

Centerline offsets - When starting a parcel project from scratch, it is often helpful to begin by offsetting a street centerline GIS file by the appropriate street right-of-way widths. This only generates the right-of-way lines. Parcel lines would need to be created using other methods.

Utilize Existing GIS features – Many communities have GIS layers such as water featuers, fences, walls, buildings and other planimetric

Triangulation Means

Appendix B – Attributes and Feature Level Metadata

The following tables define the Level III feature level metadata domains. Though the domains are not required for Level II, the content within the tables are.

Parcel Polygon Feature Level Metadata

Field Name:	fmSourceType	
Field Alias:	Source Type	
Code		**Description**
1		Tax Map
2		Deed
3		Subdivision
4		Town Clerk Map
5		Asbuilt
6		DOT ROW Mapping
7		RR Valuation Map
8		Lines of Occupation
9		Wetland Application Map

Field Name:	fmMethod	
Field Alias:	Method	
Code		**Description**
1		Heads Up Digitizing
2		COGO
3		Non-Coordinated COGO
4		Coordinated CADD
5		Non-Coordinated CADD
6		RTK GPS
7		GIS Grade GPS

Field Name:	fmPropertyType	
Field Alias:	Property Type	
Code		**Description**
1		Fee Simple
2		Condominium
3		State ROW
4		Municipal ROW
5		Railroad ROW
7		Private ROW
8		Water Feature
9		Paper Street

Field Name:	fmOwnership	
Field Alias:	Property Ownership	
Code		**Description**
1		Private
2		Municipal
3		State
4		State DEP
5		State DOT
6		State DPW
7		Railroad
8		Unknown
9		Federal
10		Tribal
11		Non-Profit

Parcel Line Feature Level Metadata

Field Name:	fmLineType	
Field Alias:	Property Line Type	
Code		**Description**
1		Property
2		ROW
3		Town
4		County
5		State
6		Water Feature
7		ROW Break Line (for Topology)

COGO Fields – Obtained from ESRI online help page:
http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Adding_COGO_fields_to_a_feature_class

Field name	Description	Field alias	Format
Direction (or Angle)	If the feature is straight, this is the direction of the line. If the feature is a circular arc, this is the direction of the chord line. The field is named either Angle (to be compatible with ARC/INFO coverages) or Direction (if you use the Create COGO Fields command).	COGO Direction	Text Length=12
Distance	If the feature is straight, this is the distance between the end points. If the feature is a circular arc, this is the distance along the chord line.	COGO Distance	Text Length=10
Radius	The length from the center point to the curve.	COGO Radius	Text Length=10

Tangent	The distance between the end point and the point of tangency. The point of tangency is determined by intersecting a perpendicular line from each of the endpoints of the curve.	COGO Tangent	Text Length=10
ArcLength	The length along the curve. When editing in ArcMap, this is typically referred to as Arc.	COGO ArcLength	Text Length=10
Side	The side on which the center point of the circular arc is located.	COGO Side	Text Length=1

Appendix C – Quality Assurance and Quality Control

Level	Steps	Description
Level I		
	Check for Format	Verify Parcel Polygons exist
	Check Coordinate System and Datum	Verify CT NAD 83
	Check for Features	
	Check Definition of Attributes	
	Mismatch Report – 75%	Check for the number of unmatched records between the GIS and CAMA and visa versa.
Level II		
	Mismatch Report – 90%	Check for the number of unmatched records between the GIS and CAMA and visa versa.
	Duplicate Attribute Report	Find duplicates where duplicates are not expected.
	Check for Coding Problems	Visually inspect parcels by Map, Block, … codes
	Verify some metadata exists	
Level III		
	Mismatch Report – 98%	Check for the number of unmatched records between the GIS and CAMA and visa versa.
	Check for Null Values	
	Compare GIS length to Dimension Length (if Dimensions exist)	Find discrepancies between line length and reported dimension length (if dimensions exist as a feature class)
	Verify Topology	
	Compare GIS acreage vs CAMA acreage	
	Verify ROW width	
	Verify metadata is FGDC compliant	

Appendix D - Data formats supported in ArcGIS

http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Data_formats_supported_in_ArcGIS

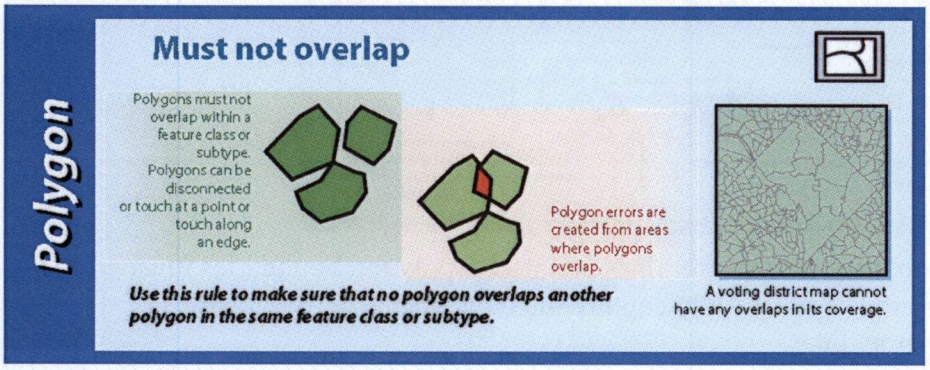
ArcInfo coverages
DGN (5.x to 8)
DWG (Release 12 to AutoCAD 2006)
DXF (Release 12 to AutoCAD 2006)
Geodatabases
PC ArcInfo coverages
SDE layers
Shapefiles
MAP INFO

Appendix E – Connecticut Cadastral Data Model

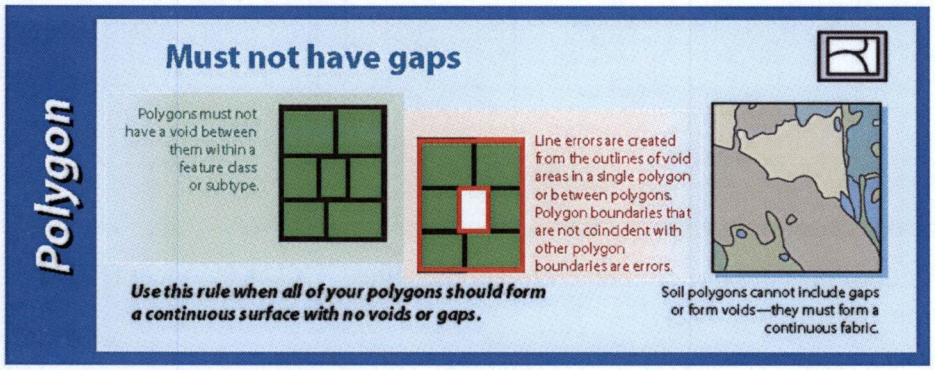
To be added.

Appendix F – Topology Rules and Descriptions

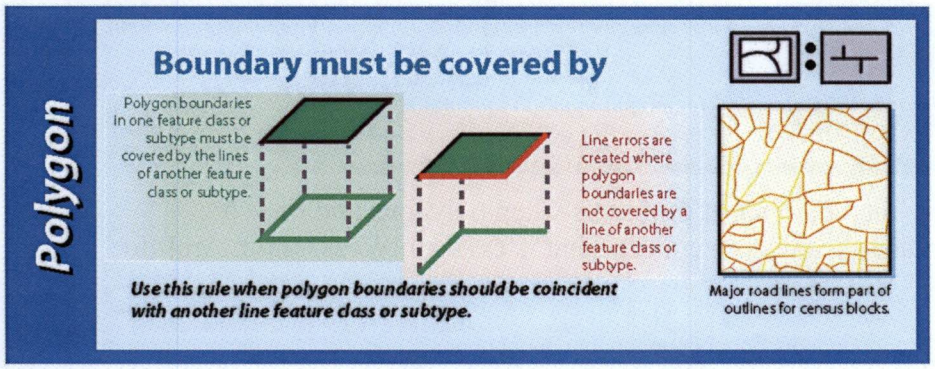
Topology is a critical element in the production of quality GIS products, especially when creating polygon features. Geodatabase Topology identifies errors based on the specific topology rules implemented.



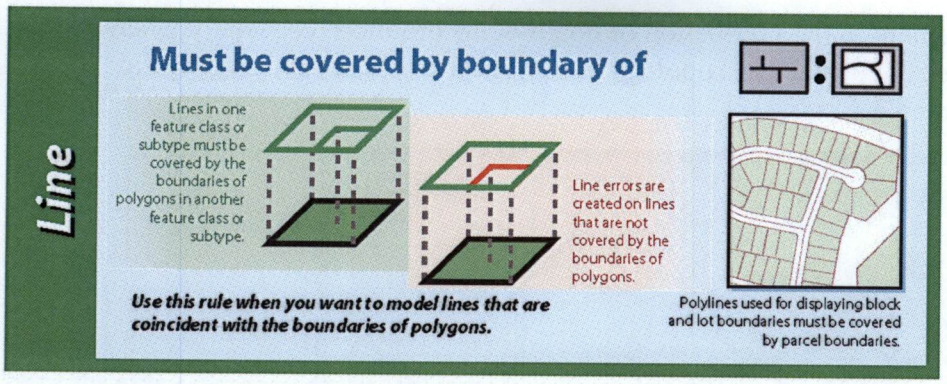
The entire town parcel feature class must not have polygons which overlap. There cannot be any exceptions to this rule.



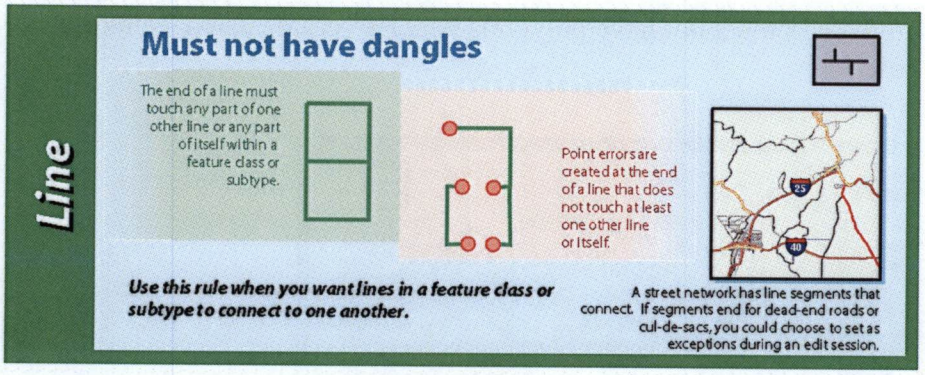
The entire town parcel feature class must be continuous within the town boundary. The only exception to this rule is the area outside the town boundary. This area is referred to as the universal polygon.



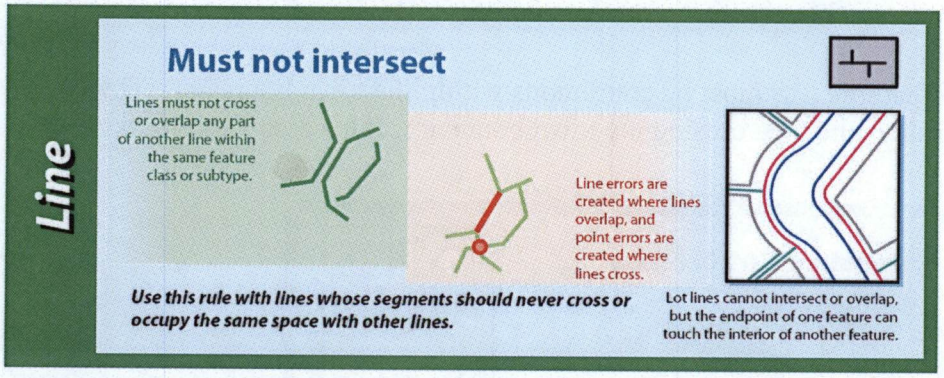
Coincident parcel polygon boundaries and parcel lines are critical to data integrity and quality. The parcel polygon boundary must share the same geometry as the property lines.



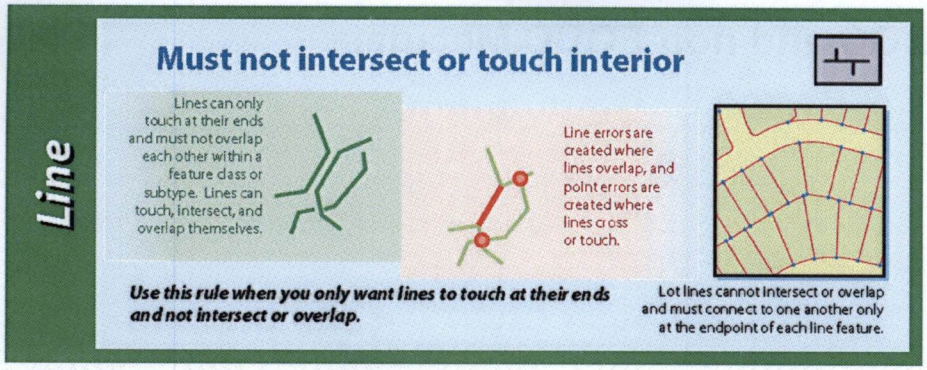
Similar to the previous Topology rule, parcel lines and parcel polygon boundaries must be coincident. Both rules are needed to fully capture the coincidence between parcel polygon boundaries and parcel lines.



Dangles are lines whose endpoint(s) are not connected to another line. This is a concept that is exists in Workstation ArcInfo topology.



Intersecting lines may present a number of problems when polygons and lines are integrated within a geodatabase. This is a concept that is exists in Workstation ArcInfo topology.



This rule should be used to identify parcel lines whose endpoints are not coincident with other parcel line endpoints. Even though there is a component for identifying line intersections and overlaps, it is easier to resolve en mass intersecting parcel lines with the Must not Intersect topology rule utilizing the Topology Error Inspector.

Appendix G – FDGC and non-FGDC Metadata

To be added.