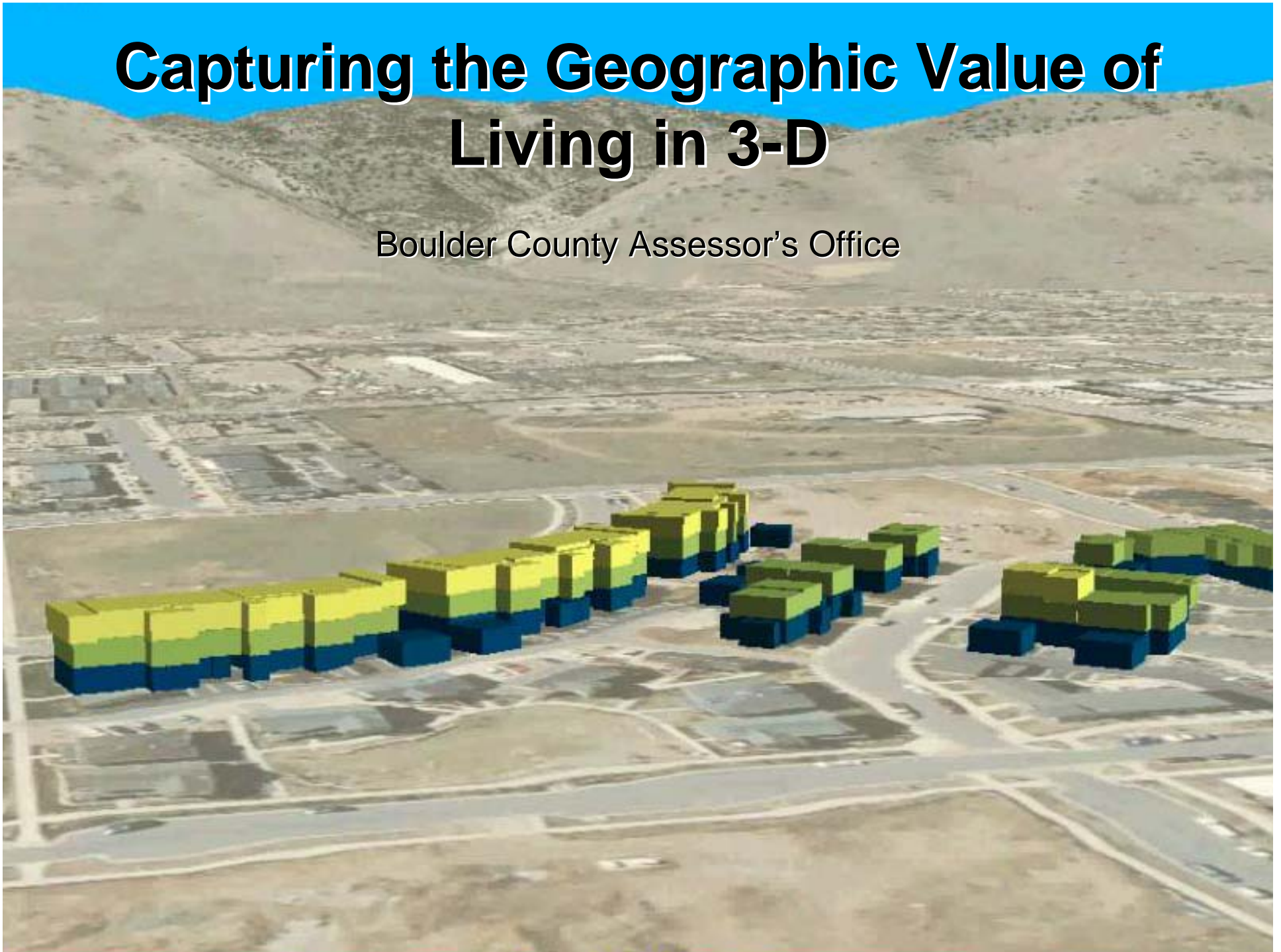
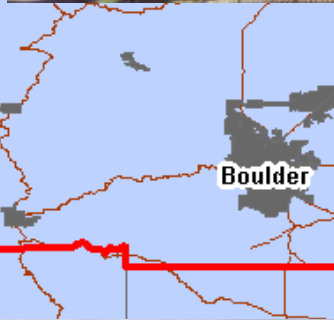


Capturing the Geographic Value of Living in 3-D

Boulder County Assessor's Office

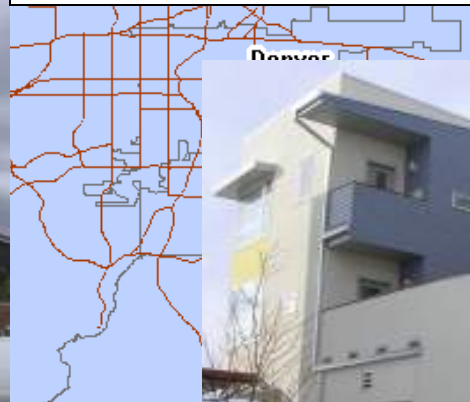




Longmont

Boulder

**In the city of Boulder,
25 of 37 plats in 2007
were for condos**



**Condominiums are popping up all
over Boulder County**

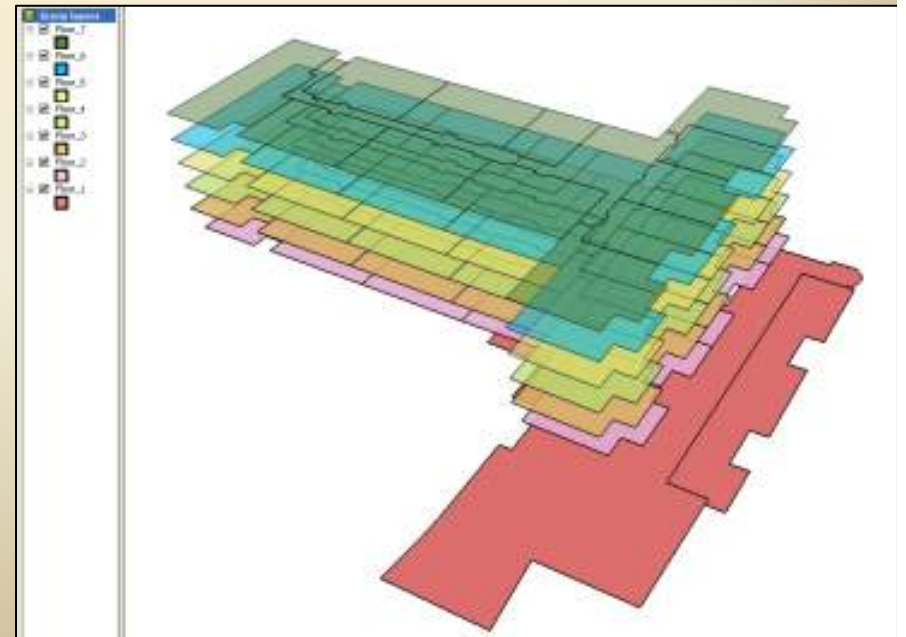


Introduction



Topics to be covered:

- Define condos and why it's difficult to represent them spatially
- History of mapping condos in Boulder County
- Current representation of condos (containers)
- Development/description of current data model
- Where are we going – future uses



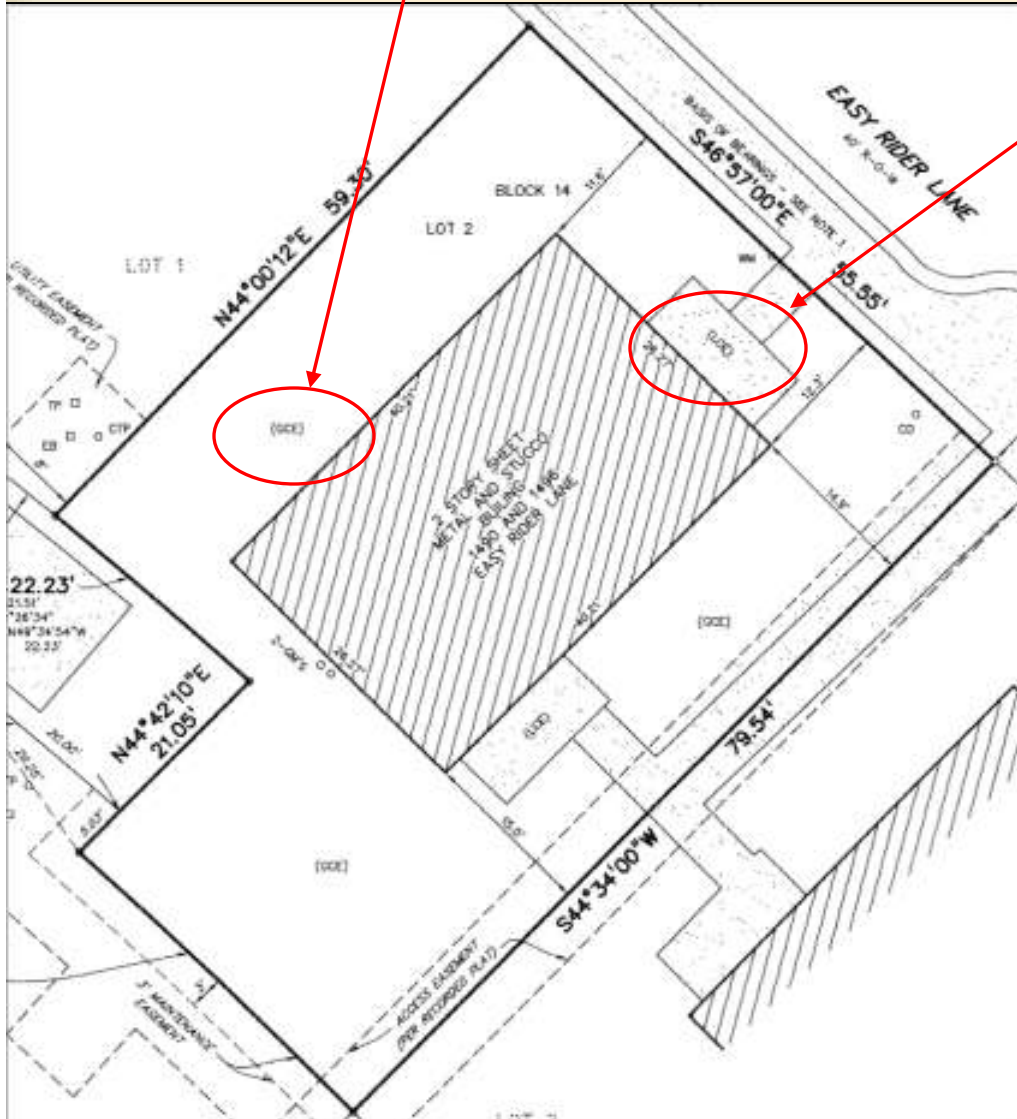
What is a condo?



- In Colorado, a condominium is a type of “common interest community” set up under the Common Interest Ownership Act. (C.R.S. 38-33.3)
- Unit owners own ‘walls-in’, but usually also an undivided interest in the common areas, including the land beneath their unit

What is a condo?

General Common Elements and Limited Common Elements



2862912
 Page 66 of 73
 261/10/2007 01:2:0
 Boulder County Clerk, CO 80502 DEC 8 2005 80 5 0 08

EXHIBIT B TO CONDOMINIUM DECLARATION OF PEARL STREET LOFTS

TABLE OF INTERESTS

Each Unit in the Condominium Community is hereby vested with an undivided Percentage Ownership Interest in the Common Elements, is subject to a Common Expense Assessment Liability and is allocated the number of Votes as set forth below.

73-68

Unit	Use	Percentage Share of Common Expense Assessment Liability	Percentage Ownership Interest in the Common Elements	Votes (except for electing directors-see Declaration)
A	Residential	12.5%	12.5%	1
B	Residential	12.5%	12.5%	1
C	Residential	12.5%	12.5%	1
D	Residential	12.5%	12.5%	1
E	Residential	12.5%	12.5%	1
F	Multi-Use	12.5%	12.5%	2
G	Commercial	12.5%	12.5%	2
H	Commercial	12.5%	12.5%	2

The Common Expense Assessment Liability, Percentage Ownership Interest in the Common Elements and Voting Rights have been allocated to each Unit by Declarant in accordance with Paragraphs 1.3 and 4.7 hereof.

Declarant makes no representation as to the square footage of the Units.

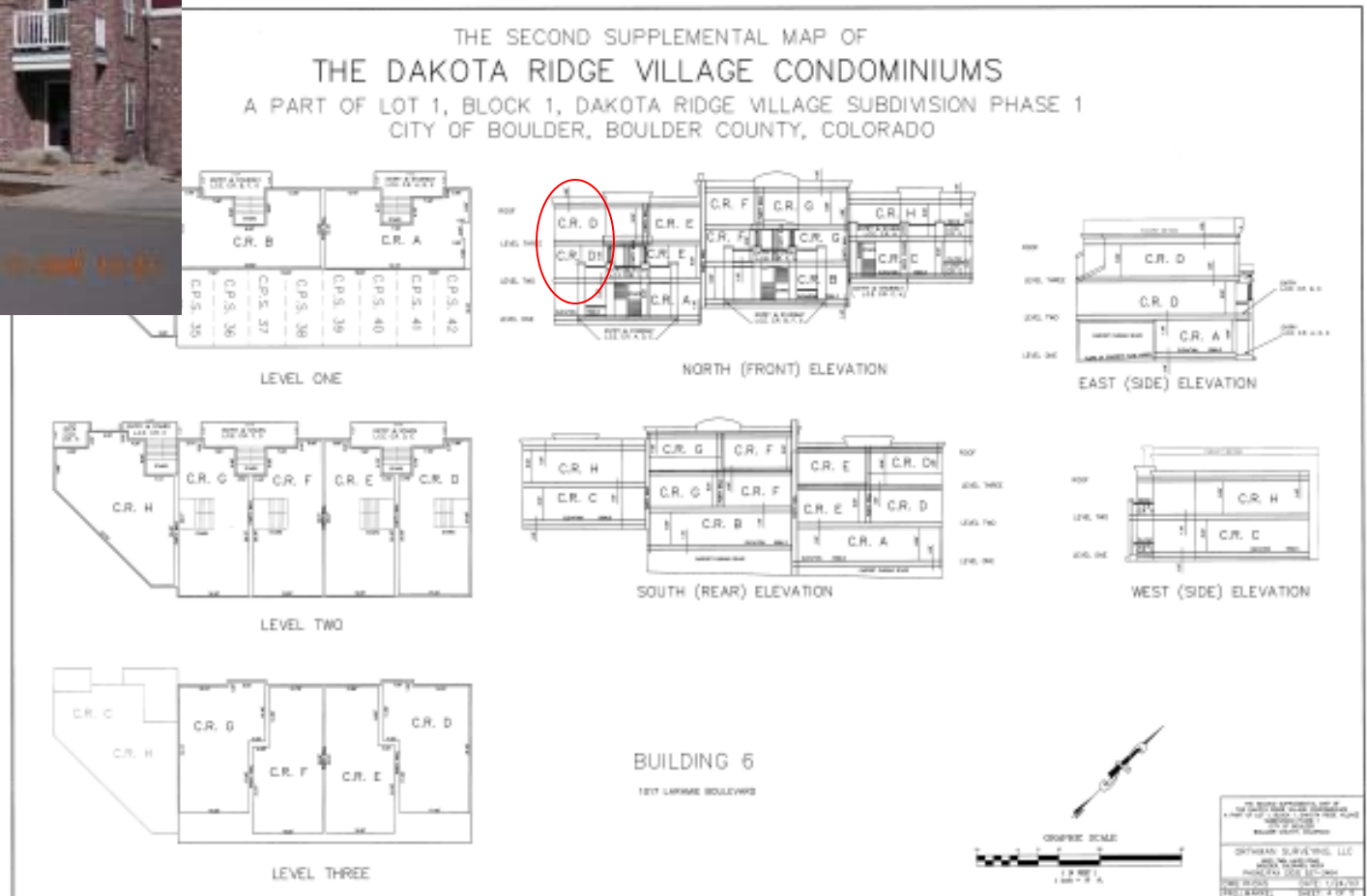
What is a condo?

Condos are different from townhouses, where the owner actually owns the land under their unit



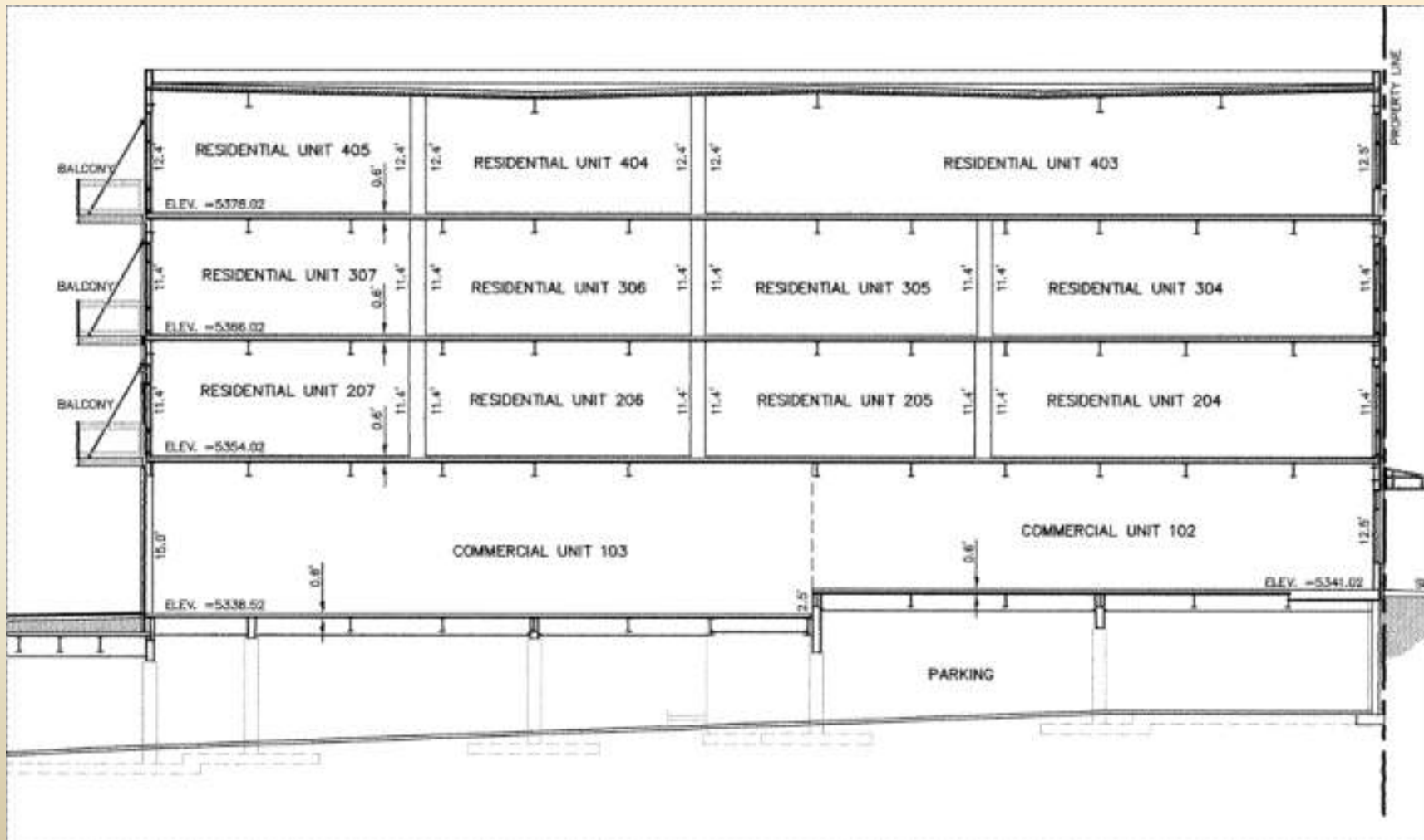
Condo Challenges

Condos can be multi-level = one unit has 2 floors (townhouse-style)



Condo Challenges

Or...condos can be stacked



Condo Challenges

Difficult to represent accurately in 2-D



Real World

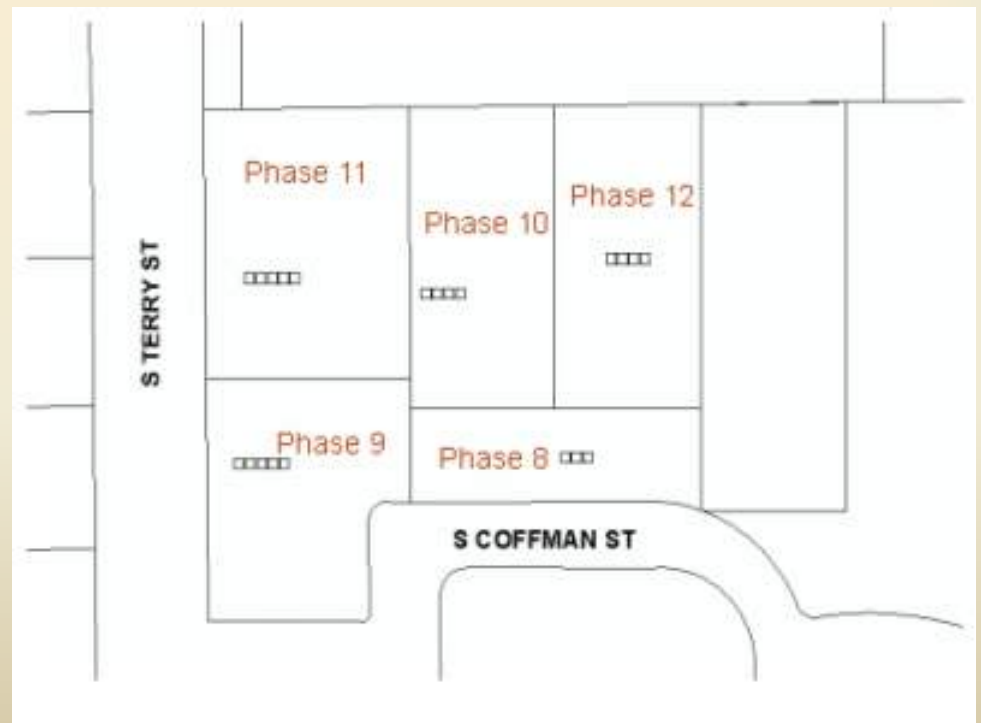


GIS

How we previously mapped condominiums

- In ArcInfo Workstation coverages, each unique condominium parcel number was represented by its own unique polygon
- Result: “Condo Boxes” were normally 5 foot by 5 foot polygons that ‘housed’ each unique parcel number/condo unit
- In each condo phase, one condo unit’s parcel number ‘housed’ the remainder geography

Poplar Grove Townhome Condos
Longmont, Colorado
Phases 8 through 12

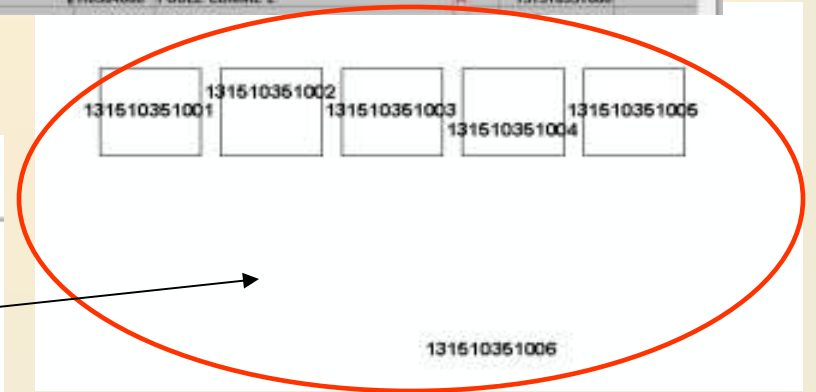
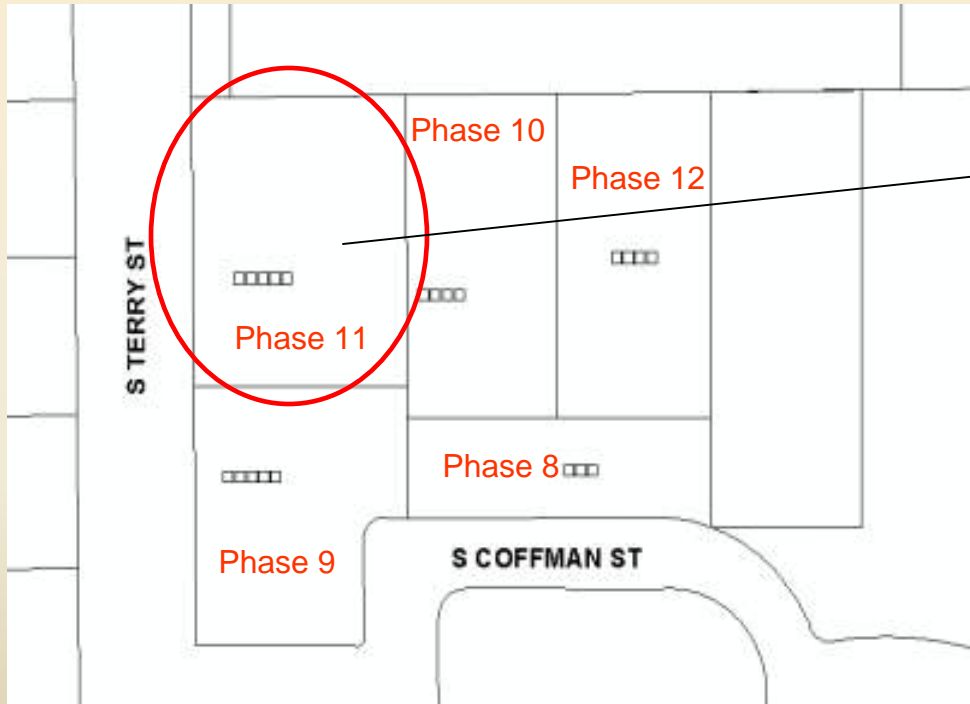


Condo Boxes: A Closer Look

Poplar Grove Townhome Condos
Longmont, Colorado
Phases 8 through 12

Condominium Query

Parcel Type	Condominium Code	Condominium Name	All	Active Only	Result Count
P	7222	POPLAR GROVE TOWNHOMES PH 11			6
Condo/Unit	Remark	Accession	Name	Status	Parcel No
91		R0504705	MILLER JOSHUA S	A	131510351001
92		R0504876	CLOUGH JOHN SCOTT	A	131510351002
93		R0504877	ORR ALVIN R	A	131510351003
94		R0504878	POIRY MICHAEL S & KATHLEEN HARTER PL	A	131510351004
95		R0504879	BLACK MARCUS EDWARD	A	131510351005
96		R0504880	POOLE CONNIE L	A	131510351006



- 5 of the 6 units in Phase 11 are represented by condo boxes
- 1 of the 6 units is the 'remainder' geography within Phase 11's general common elements
- Poor representation of condo units' relative location to each other

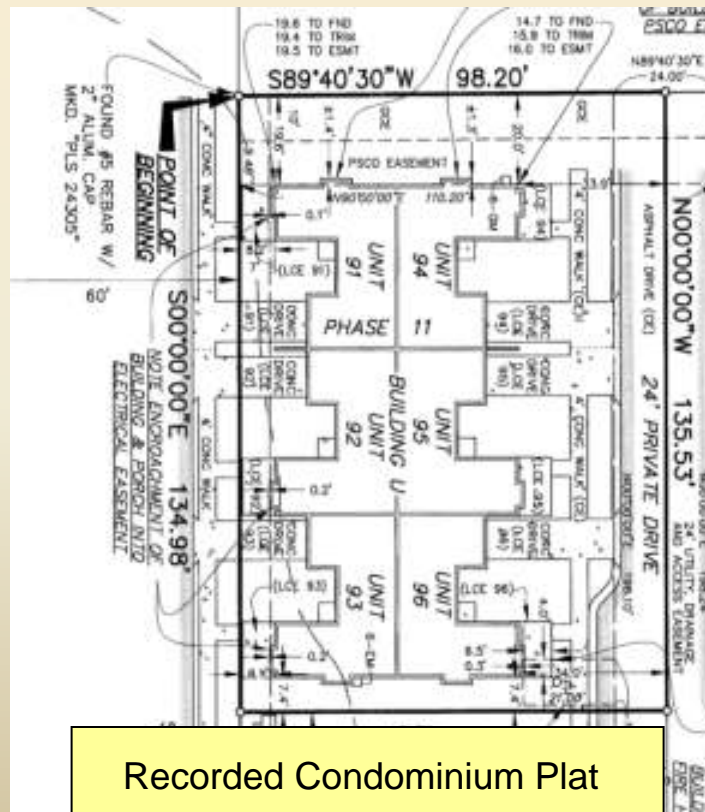
Condos in the Real World



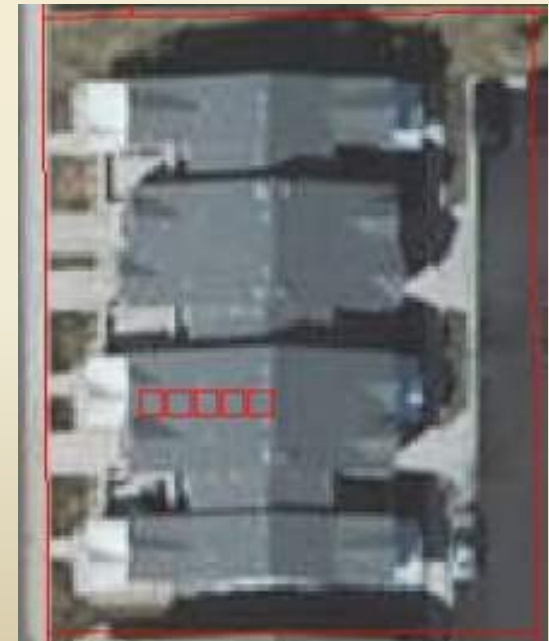
Photographs

Poplar Grove Townhome Condos
Longmont, Colorado
Phases 8 through 12

- Condo boxes are spatially inaccurate
- Derived x-y coordinates for modeling are arbitrary
- Limited ability to value condo units by location



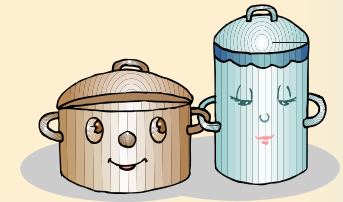
Recorded Condominium Plat



Aerial Photography



How we map condos now... with “Containers”



- A container illustrates an entire condo phase in the parcel layer
- Each unit owns a partial interest in the GCE
- This is a better representation than the condo box



How containers work

- Containers are created in ArcMap using a custom vendor editing extension
 - Records for each unit are copied to a separate table
 - The table records are linked to the polygon via a common “feature key”
 - One-to-many relationship

- Brand new condo containers can be created

- Existing condo boxes can be converted to containers

The screenshot illustrates the relationship between a parcel polygon and its container units. On the left, a parcel is highlighted in yellow on an aerial map. The 'Identify Results' window shows the following fields and values:

Field	Value
OBJECTID	117971
FIN	121014
FEATURE_KEY	121014
SUCCEEDED_BY	<null>
IS_CONTAINER	-1
STATUS	CONTAINER
ADDRESS	<null>
LDT_NUMBER	<null>
ACREAGE	<null>
Shape	Polygon
SHAPE.AREA	120309.216610
SHAPE.LEN	1633.823301

The 'Selected Attributes of IPM.F_NON_...' window shows a table with the following data:

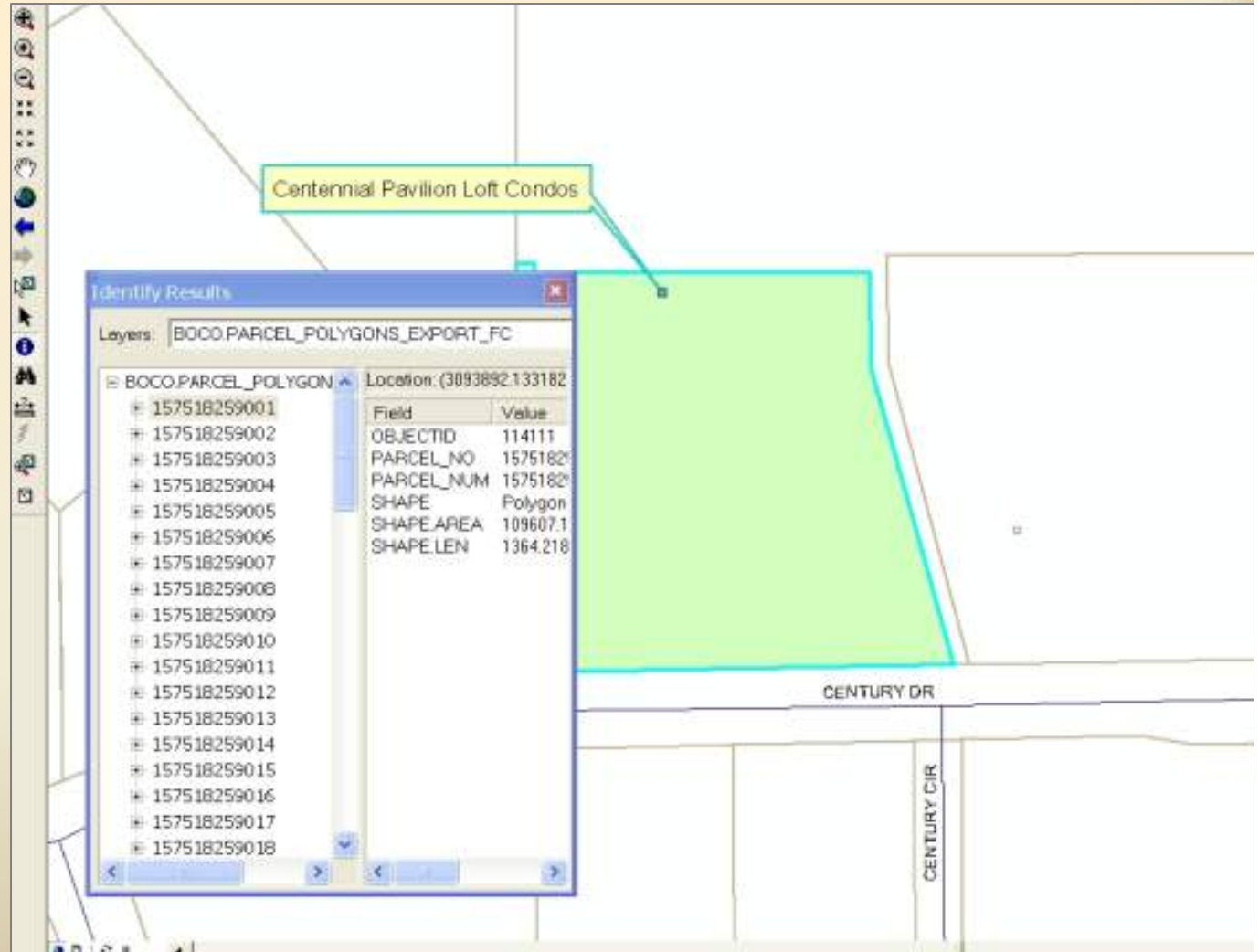
CONTAINER_FEATURE_KEY*	PARCEL_T
121014	146318320001
121014	146318320002
121014	146318320003
121014	146318320004
121014	146318320005
121014	146318320006
121014	146318320007
121014	146318320008
121014	146318320009
121014	146318320010
121014	146318320011
121014	146318320012
121014	146318320013
121014	146318320014

A red arrow points from the 'FEATURE_KEY' value '121014' in the Identify Results window to the 'CONTAINER_FEATURE_KEY*' column in the Selected Attributes window, highlighting the one-to-many relationship.

Use of Containers

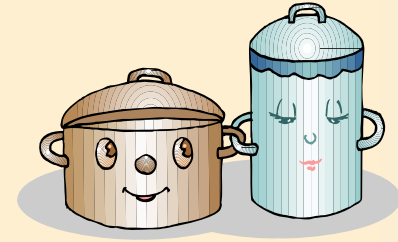
- An overnight SDE script builds stacked polygons from the non-mapped parcel table

- By using the identify tool in the parcel layer, all condo unit parcel numbers are revealed





Use of Containers Pros and Cons



- Pros

- Spatially a better representation than condo boxes
- Less confusing to the public when viewing parcel layer
- Much easier identifying units using a table



- Cons

- Does not accurately illustrate location of unit; x-y coordinates are generalized to container
- No help to the appraiser in valuation



How to make our condo data more useful and spatially accurate

- Digitize condo building footprints to a separate database
- Attribute individual features
 - Units, LCE, GCE
- Use a model that ensures uniformity
- Capture elevation for 3D modeling

Editor

Parcel Number

**E
l
e
v
a
t
i
o
n**

Unit #

X Y Coordinates

GCE

LCE

Original Condo Footprint Model

All levels contained in same shapefile:

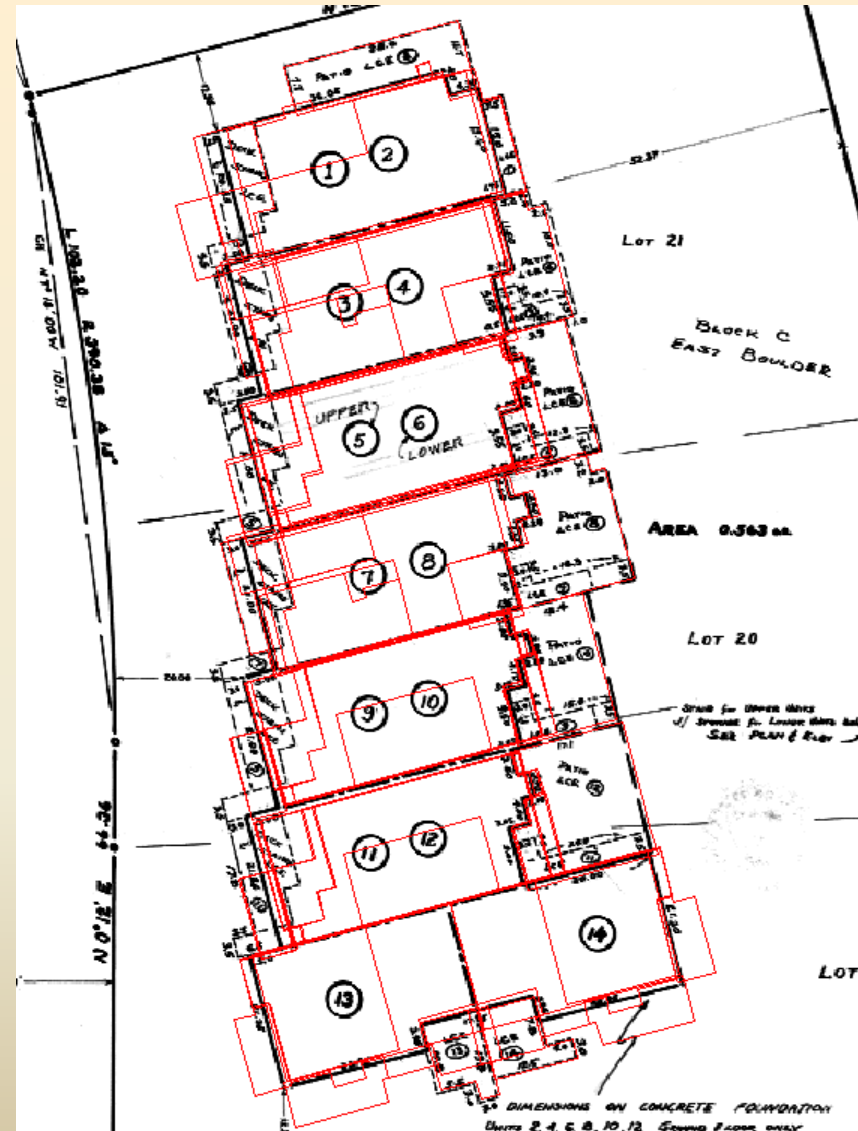
- Difficult to distinguish between floors
- This made for tough editing



Original Condo Footprint Model

Different floors were intentionally offset horizontally:

- Made editing between floors easier
- But...introduced greater spatial inaccuracy

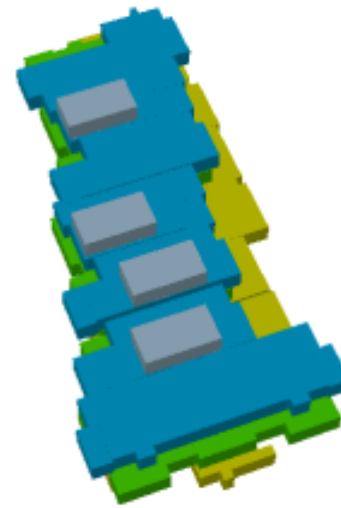


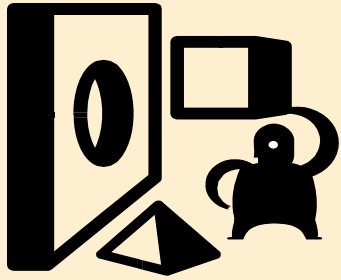
Original Condo Footprint Model

Offsets cause problems when the features are 3-D



Unregistered FrontCam





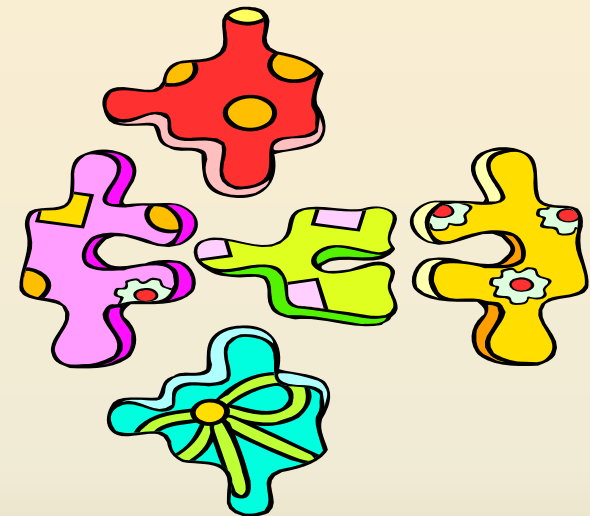
Original Condo Footprint Model

Attributes weren't standardized:

- Same kind of features were assigned different attributes
- Fields weren't required, leading to inconsistencies/data gaps

Consolidating shapefiles from various editors' work:

- Difficult!
- Good information lost because attributes had to be generalized



Re-designing the Condo Parcel Data Model



What needs to be captured...

For each Condo Unit, LCE and GCEs within the building:

- The footprints of each feature as polygons
- The attributes that allow 3-D display and analysis
 - Level/floor and elevation
- Other important attributes of each feature
 - Parcel number: links the GIS feature to the record in the Assessor's database
 - Condo unit number
 - Detailed classification of LCE or GCE
 - Primary polygon for each condo unit (X-Y)

Re-designing the Condo Parcel Data Model



In the Data Structure...

Fields and attributes should have:

- Rules for required fields
- Rules for types of data that can be entered
- Domains/pick-lists to eliminate arbitrary values

Digitizing and editing should be:

- Easier to work with and see
 - Levels/stories are discrete layers
- More efficient and less repetitive
 - Features and attributes can be copied from polygon to polygon and level to level

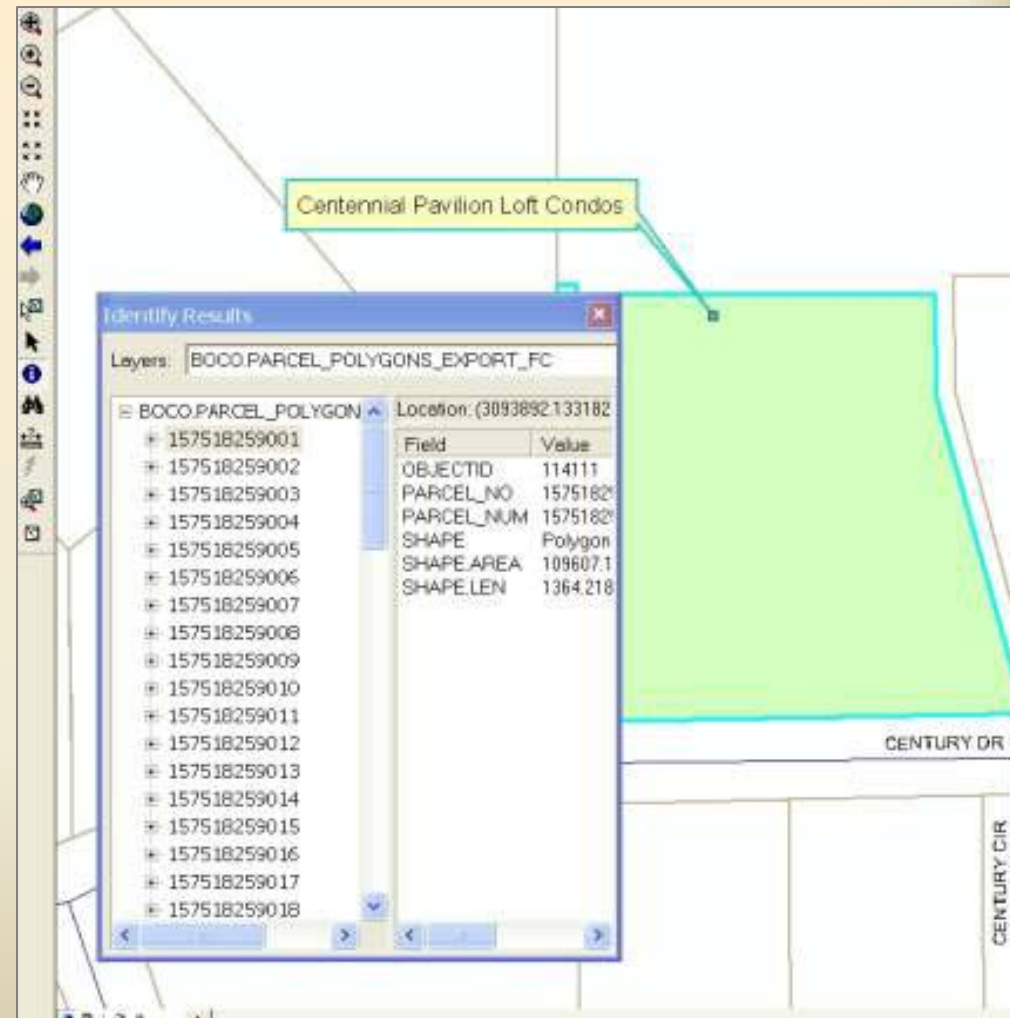
Re-designing the Condo Parcel Data Model

Data Consistency

- Makes consolidation easier
- Improves accuracy of final product

What we *didn't* need in this model:

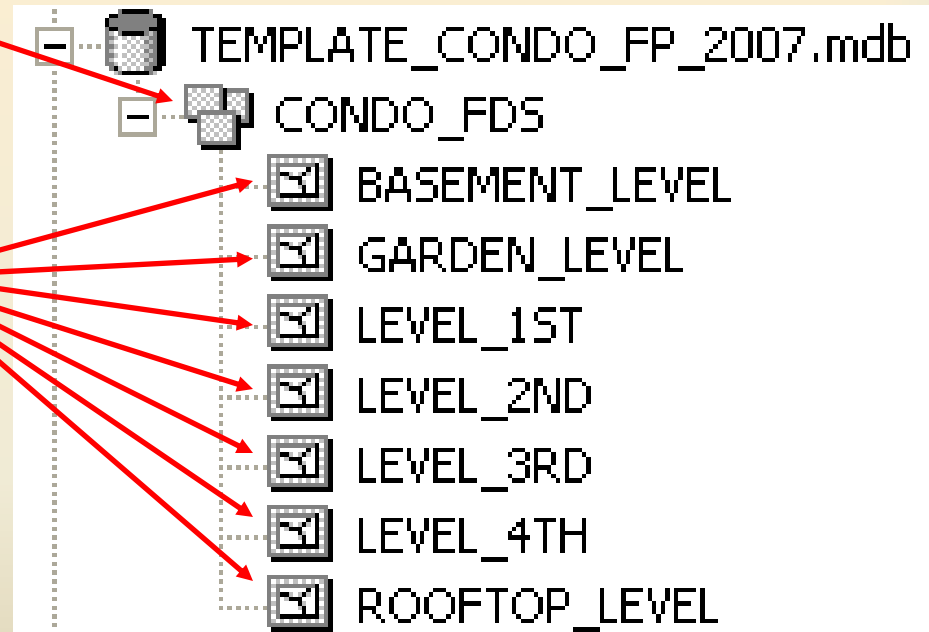
- The boundary of each condominium complex
- We already have container polygons in our parcel layer



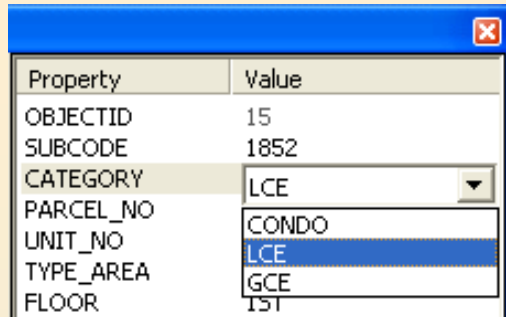
Current Condo Parcel Data Model

The Personal GeoDatabase (PGDB)
contains a **Feature Data Set (FDS)**

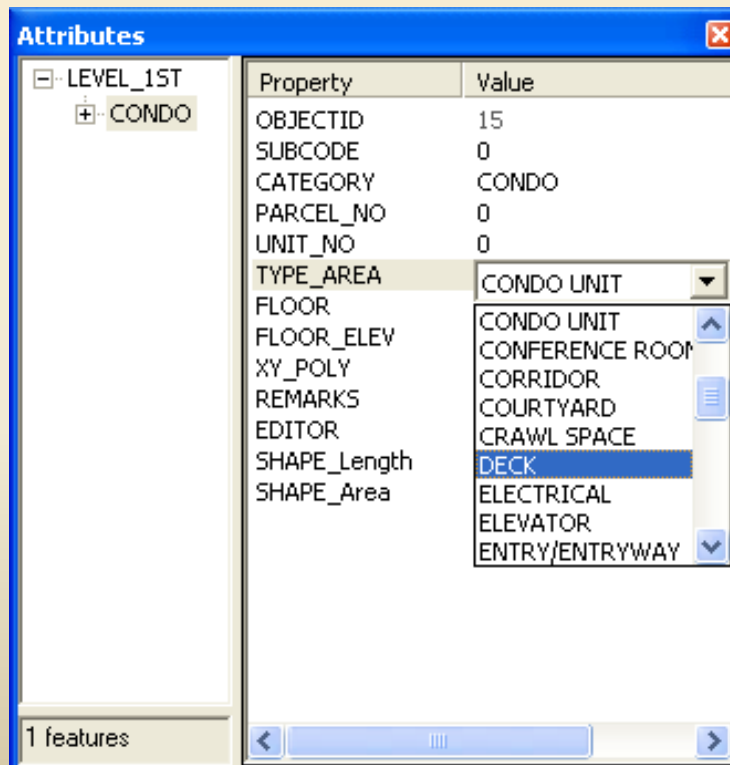
FDS contains seven
Feature Classes for
levels Basement
through 4th Floor, and
Rooftop



Current Condo Parcel Data Model



Property	Value
OBJECTID	15
SUBCODE	1852
CATEGORY	LCE
PARCEL_NO	CONDO
UNIT_NO	LCE
TYPE_AREA	GCE
FLOOR	1ST



Attributes

LEVEL_1ST
CONDO

Property	Value
OBJECTID	15
SUBCODE	0
CATEGORY	CONDO
PARCEL_NO	0
UNIT_NO	0
TYPE_AREA	CONDO UNIT
FLOOR	CONDO UNIT
FLOOR_ELEV	CONFERENCE ROOM
XY_POLY	CORRIDOR
REMARKS	COURTYARD
EDITOR	CRAWL SPACE
SHAPE_Length	DECK
SHAPE_Area	ELECTRICAL
	ELEVATOR
	ENTRY/ENTRYWAY

1 features

Each Feature Class:

- represents a level/story
- contains the same fields, domains and rules

Additional feature classes can be added to the PGDB for higher stories – 5th floor and above

Fields & Attributes

Required Fields:

- ✓ Subdivision Code
- ✓ Category
- ✓ Type of Area
- ✓ Floor Level
- ✓ Floor Elevation
- ✓ Editor

Conditional Fields:

- Parcel Number
- Unit Number
- Remarks

Exclusive: X-Y Polygon

Data Model – Fields & Attributes

- **Unit Number:**

1, 2, and 3

- **Category:**

CONDO

LCE

GCE

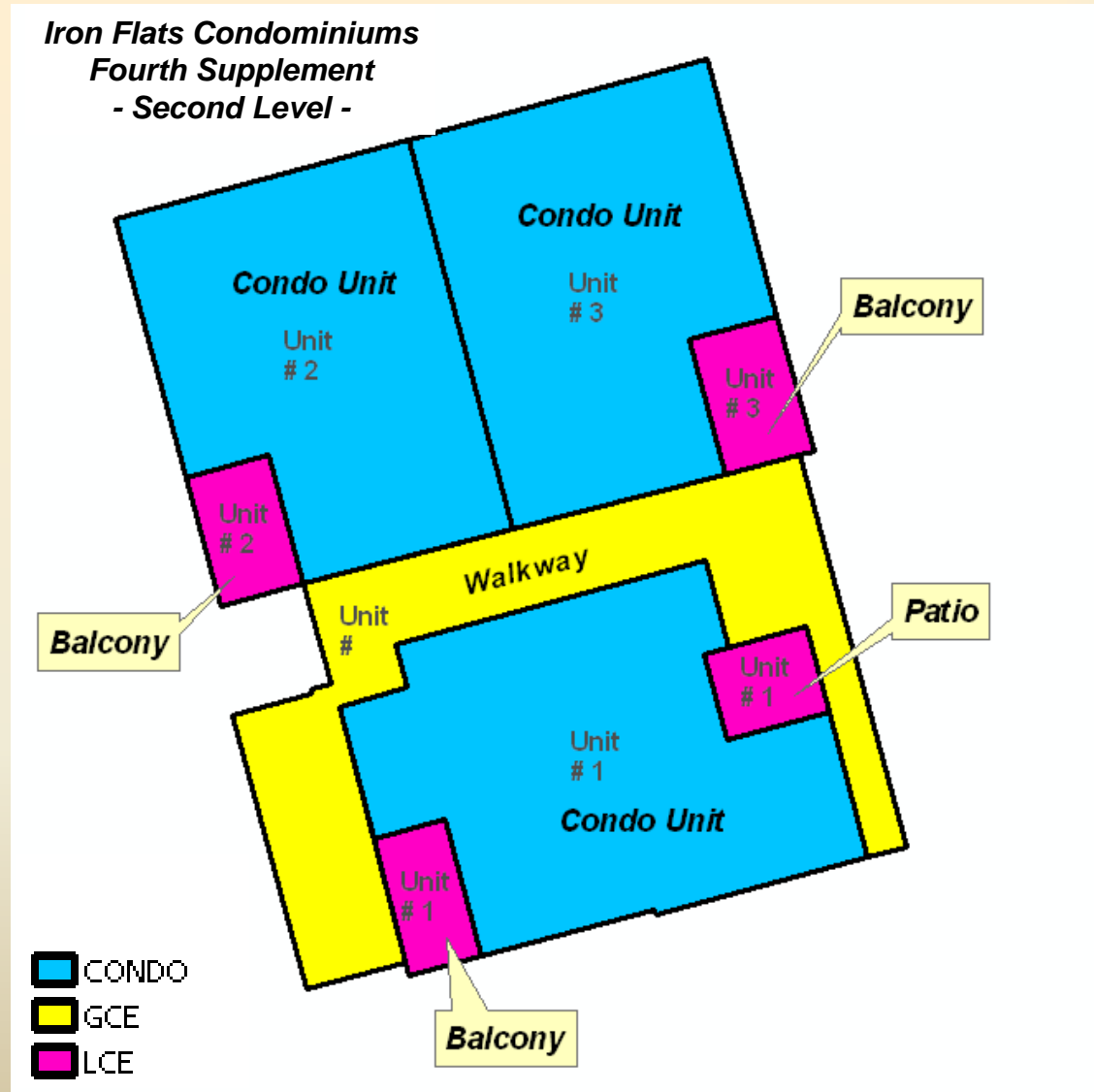
- **Type Area:**

Condo Unit

Balcony

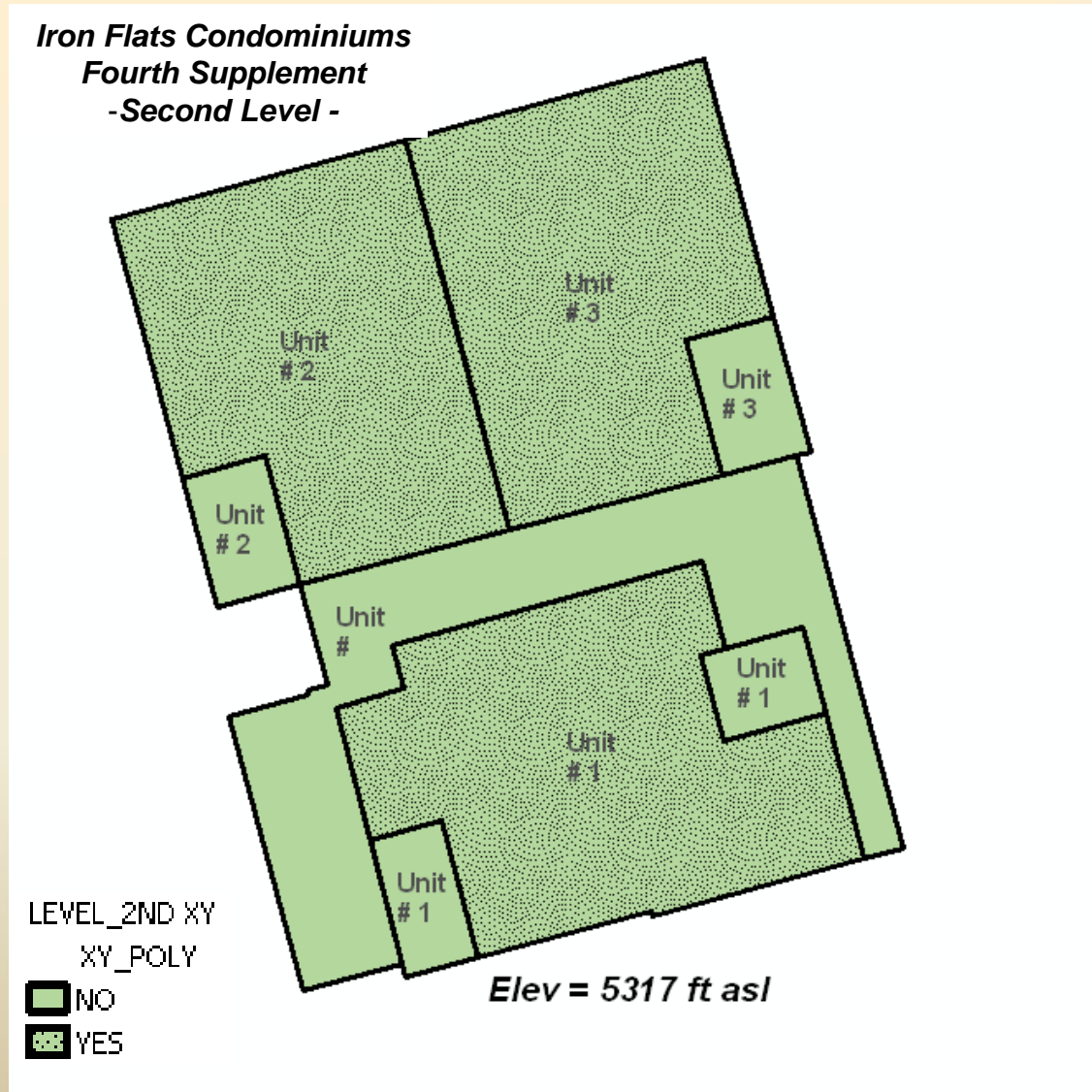
Patio

Walkway



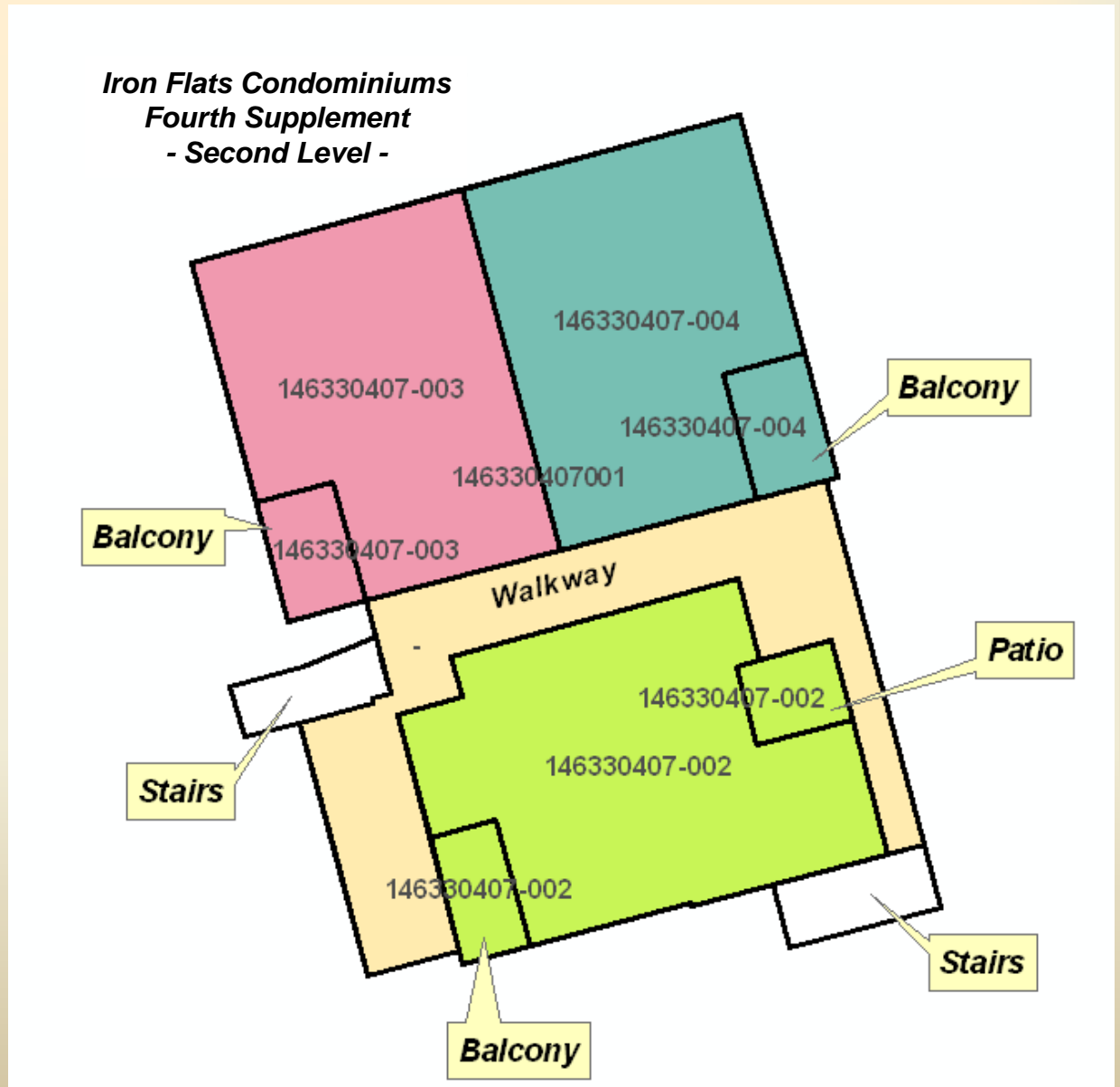
Data Model – Fields & Attributes

- **Floor:**
2nd
- **Elevation:**
5317 ft asl
- **X-Y Poly:**
NO
YES



Data Model – Fields & Attributes

- **Parcel Number (PIN):**
Usually unique for condo units
- **PIN** also may apply to LCEs:
When the LCE feature is associated with only one account
- **Remarks:**
 - Provides more specific details about a feature
 - Lists multiple unit numbers



Data Model – Fields & Attributes

- Subcodes:

637

8519

- Editors:

Lori

Rachel

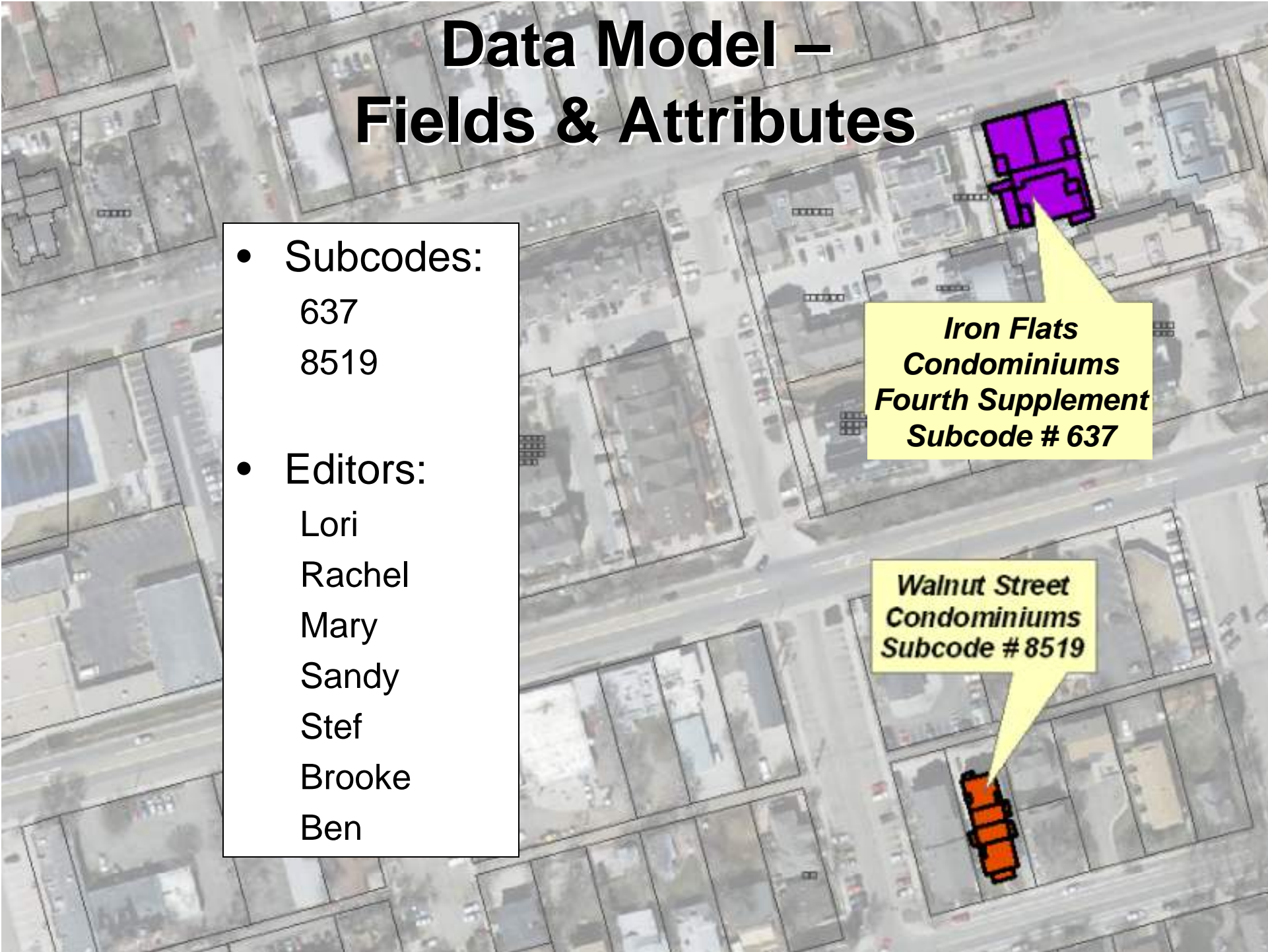
Mary

Sandy

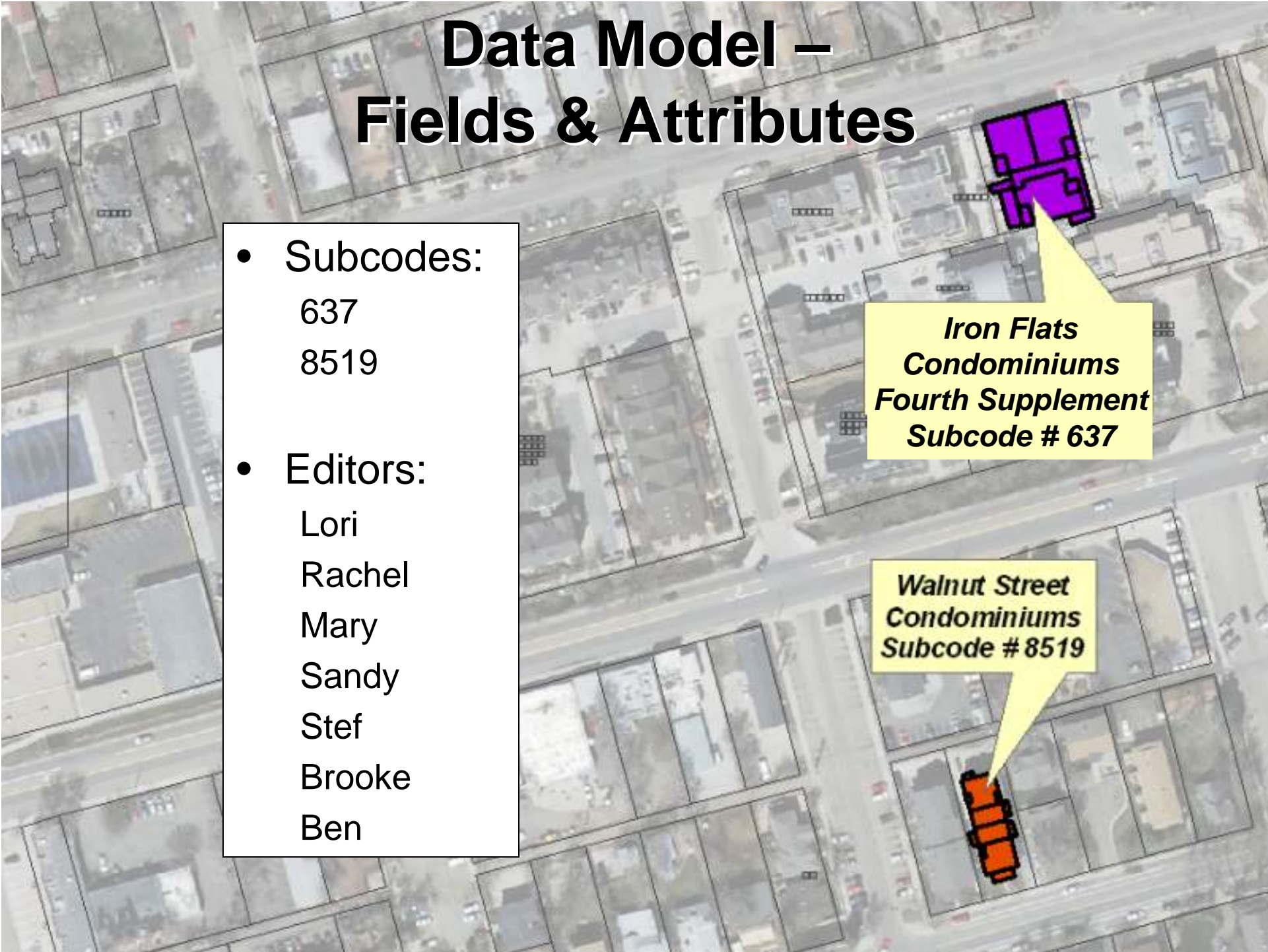
Stef

Brooke

Ben

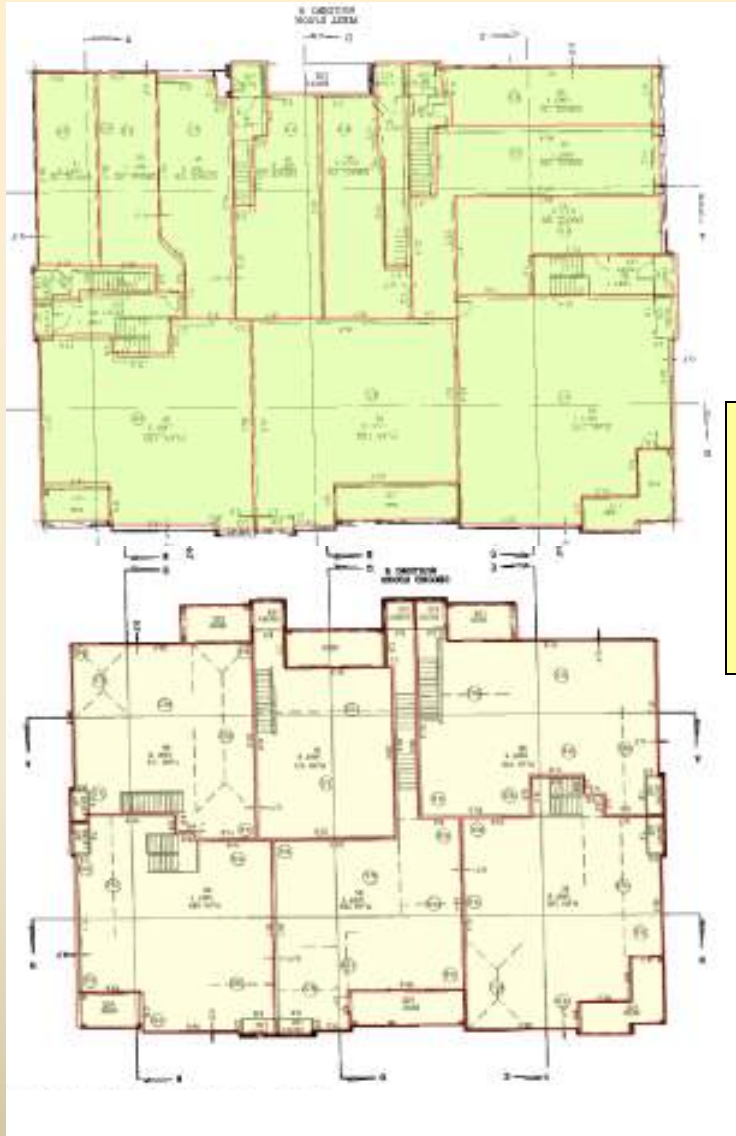


***Iron Flats
Condominiums
Fourth Supplement
Subcode # 637***



***Walnut Street
Condominiums
Subcode # 8519***

Georeferencing Plat Image and Other Tricks



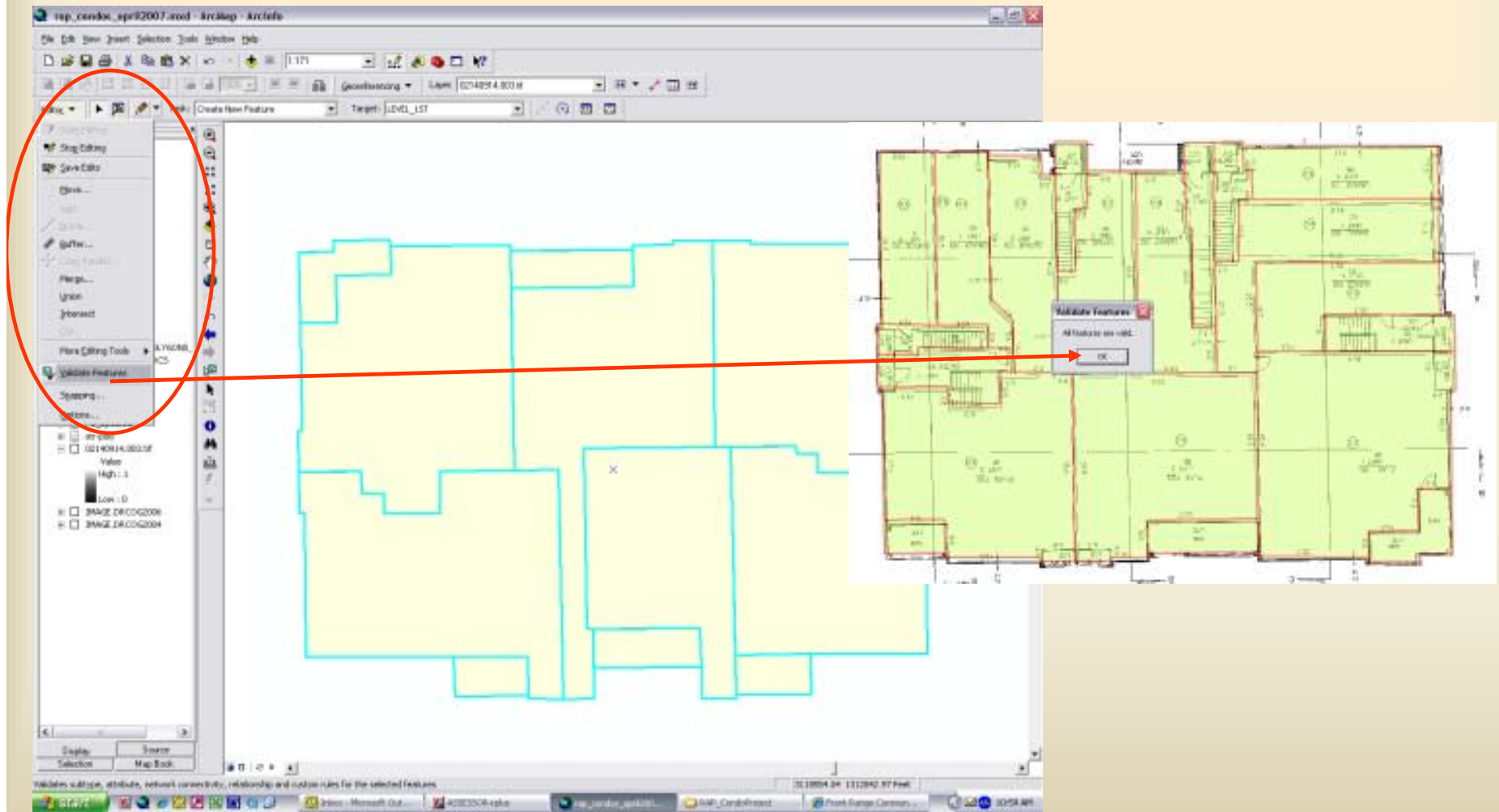
Villas at Ute Creek
Longmont, Colorado
Original filing & phases
1 through 5

Attribute Condo Units

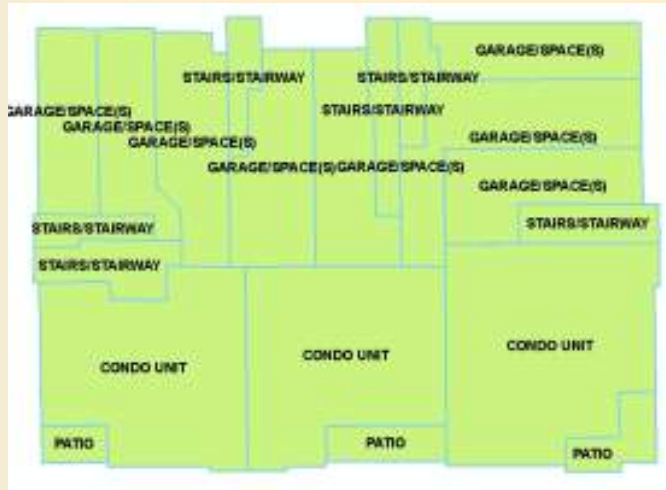
The screenshot shows the ArcMap interface with a floor plan of a building. The map is titled "6 SKIDDER BUILDING 9" and shows two floors: "FIRST FLOOR" and "SECOND FLOOR". A specific unit is highlighted in light green. The "Layers" panel on the left shows a list of layers, with "LEVEL_2ND" selected. The "Attributes" panel is open, displaying the following data:

Property	Value
OBJECTID	184
SUBCODE	8434
CATEGORY	
PARCEL_NO	<null>
UNIT_NO	<null>
TYPE_AREA	CONDO UNIT
FLOOR	1ST
FLOOR_ELEV	5016
XY_POLY	NO
REMARKS	<null>
EDITOR	Rachel Pominello
SHAPE_Length	60.240
SHAPE_Area	200.761

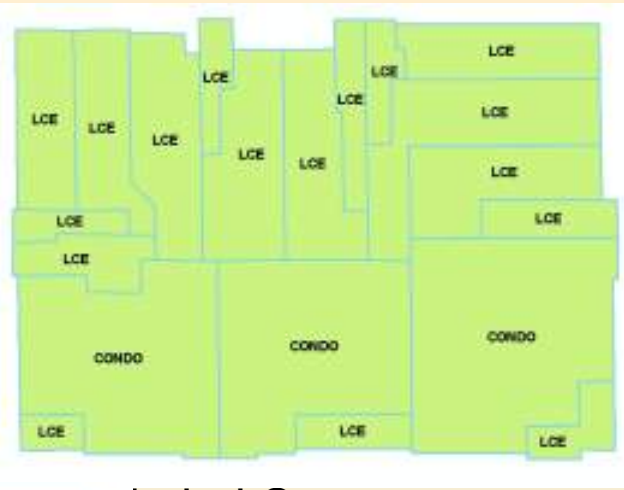
Quality Control and Edit Checks: Validate Features



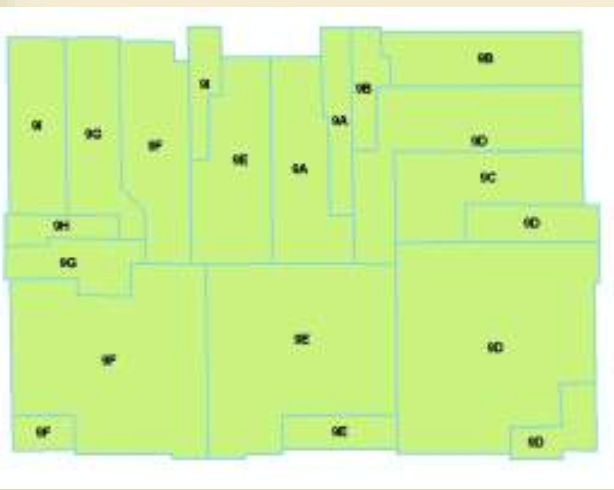
Quality Control and Edit Checks: Labeling Attributes



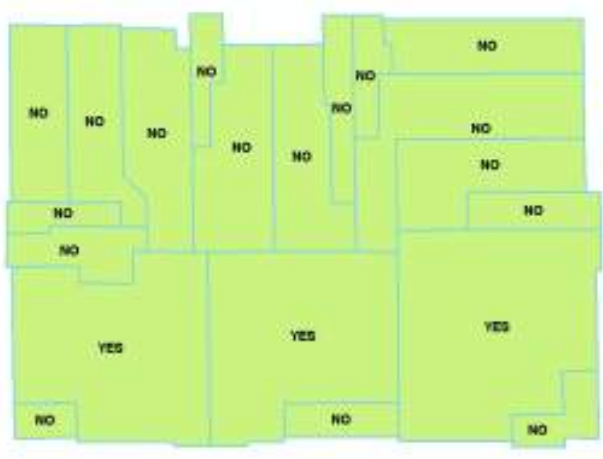
Area Type



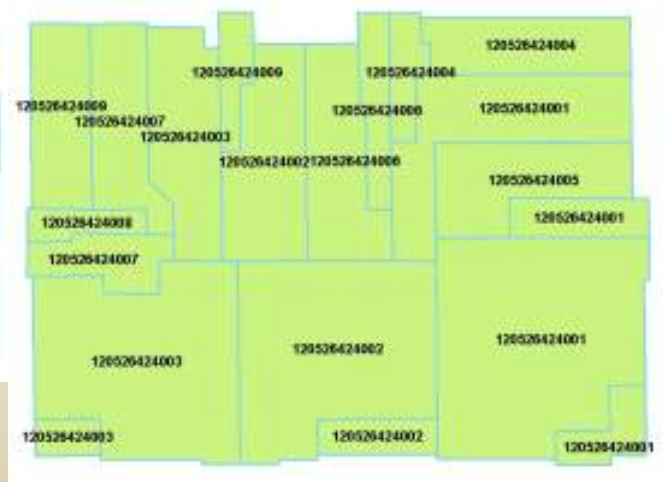
Label Category



Unit Number



X Y Polygon?



Parcel Number

The new condo model highlights

- Spatially accurate - but not survey quality
- Data structure promotes uniformity
- Consistency of GIS editing and data entry allows easier consolidation of multiple editors' work
- Provides more detail for each unit and its relative position within the condo complex, in both 2-D and 3-D views

Editor

Parcel Number

**E
l
e
v
a
t
i
o
n**

Unit #

X Y Coordinates

GCE

LCE

Ultimate Products / Future Uses

Publish condo footprints in online mapping application

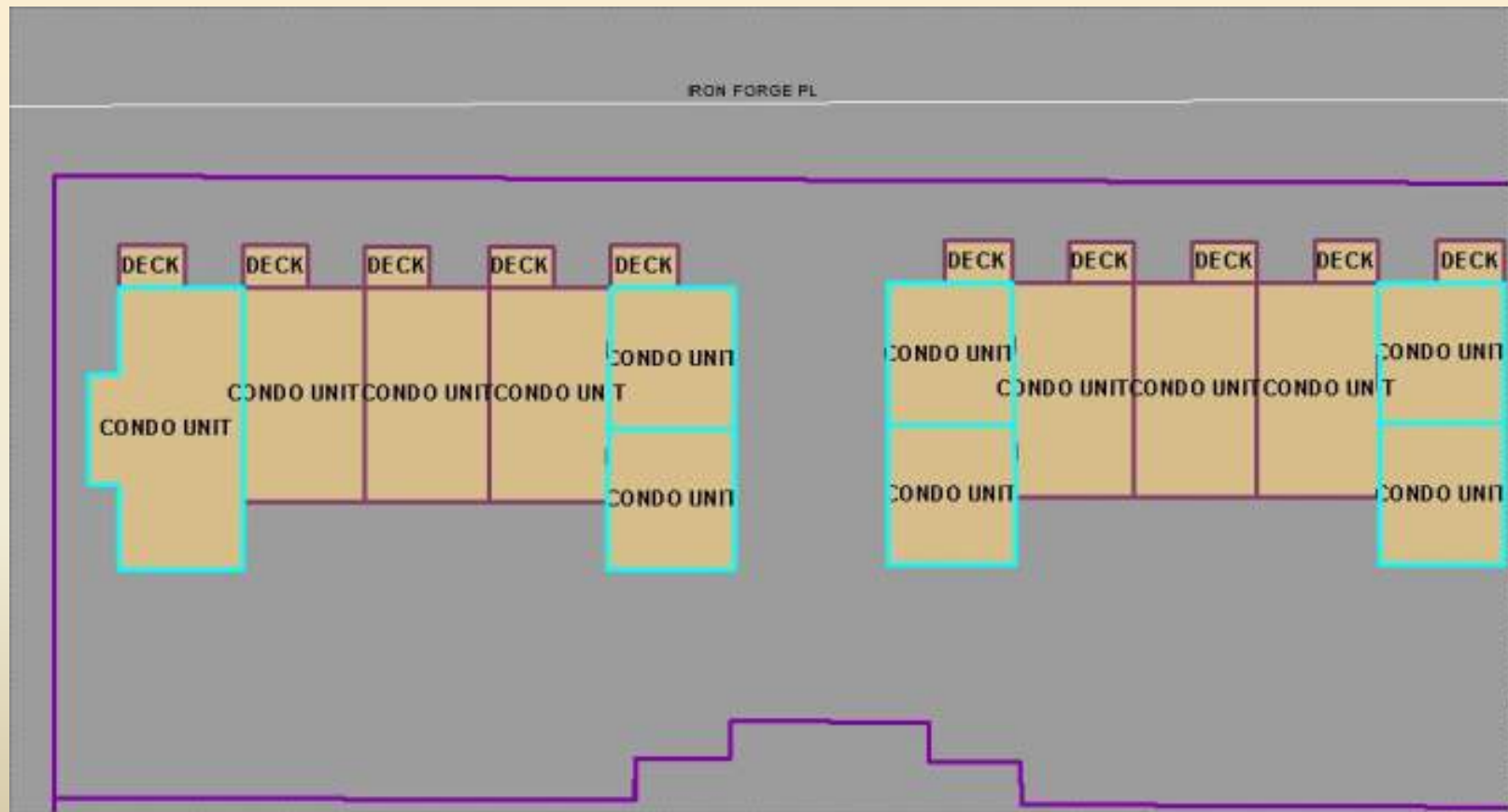
- Depicts the individual unit boundaries while retaining the boundary of the underlying land parcel of the condo complex



Ultimate Products / Future Uses

Capturing additional attributes for detailed property valuation:

- End units, west-facing units, 4th floor vs. 1st floor, etc



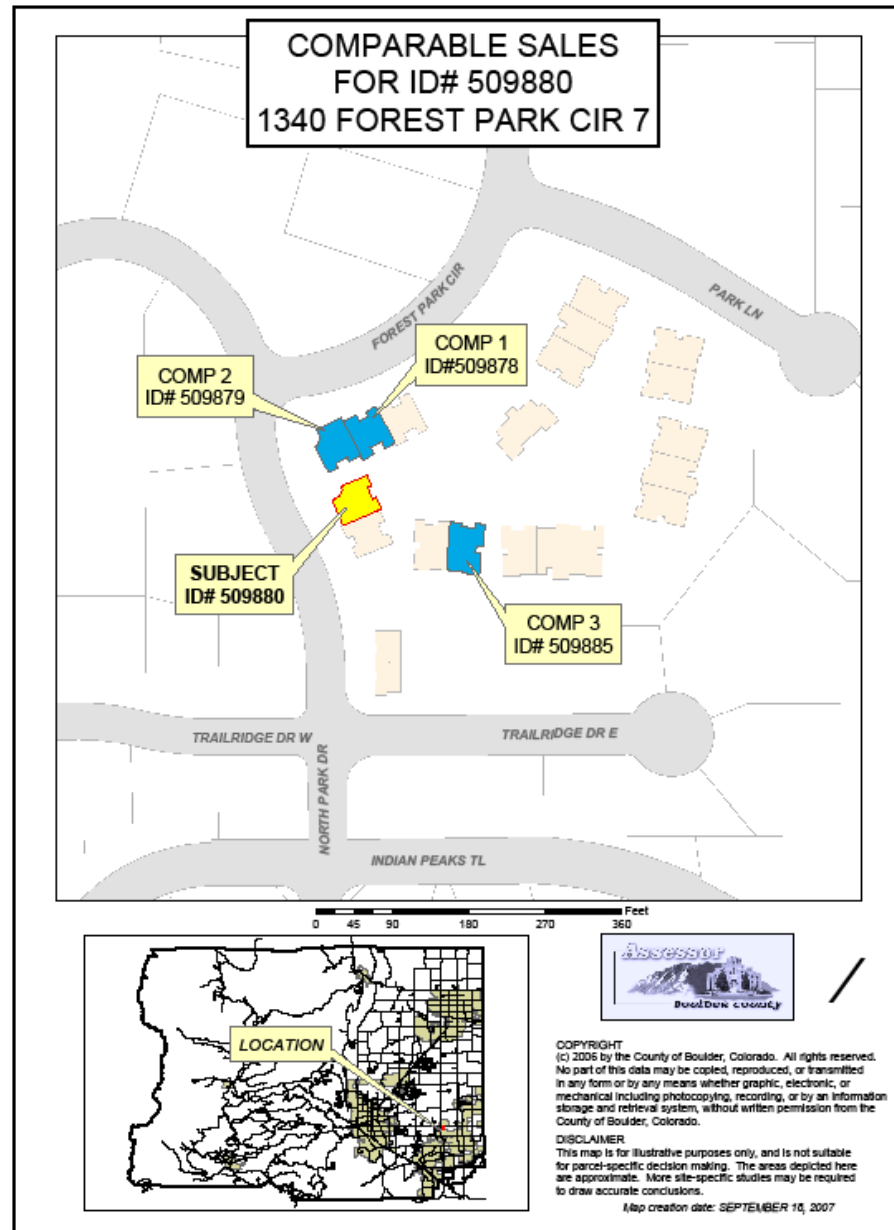
Ultimate Products / Future Uses

Appraisers can analyze properties in 3-D to assign attributes and determine which attributes affect value that we may not have realized before

- Floor level and view
- Relative location, traffic, and privacy
- Visual tool to help explain values to taxpayers



Comparable maps



- Traffic
- Golf Course

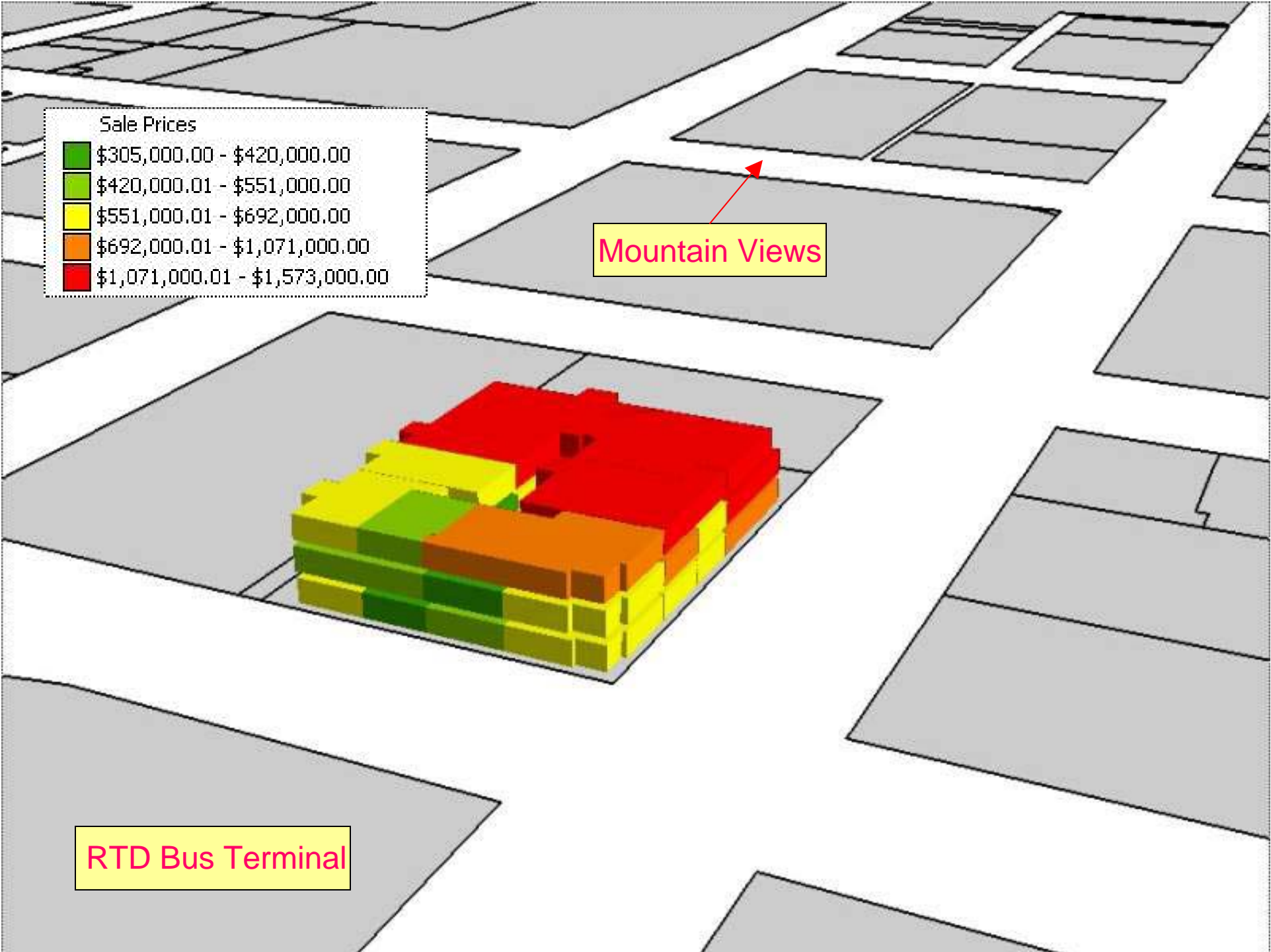


- Views
- Proximity to Open Space



- **Golf Course**





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