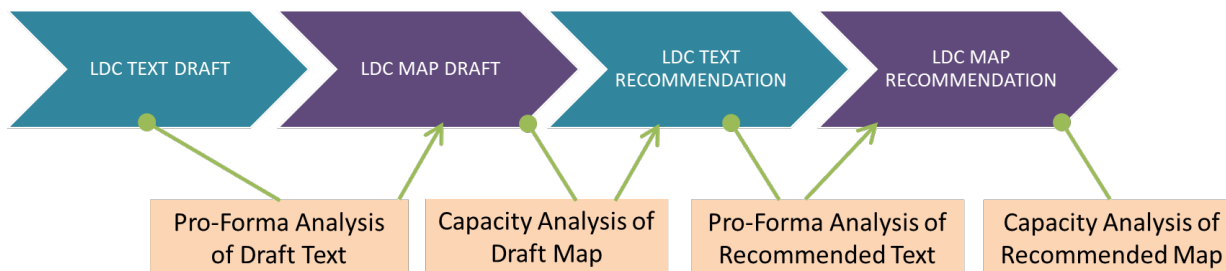


Date: October 30th, 2019
TO: City of Austin
FROM: Cascadia Partners
Re: Envision Tomorrow Modeling Assumptions for the Land Development Code Revision

The following memorandum summarizes the modeling approach and assumptions used in the housing capacity analysis of the City of Austin’s revised Land Development Code (LDC). This memorandum is a revision of the March 27th, 2018 memorandum produced by Fregonese Associates. Technical terms used in this document are defined in Appendix A: Glossary.

Background

As part of the LDC revision process, Cascadia Partners (CP) was tasked with providing City of Austin staff with feedback on proposed code text and map changes using the Envision Tomorrow model. Using Envision Tomorrow, CP performed a capacity analysis that estimated the number of base, market-rate bonus, and income-restricted bonus housing units that could feasibly be built under the City’s current zoning ordinance (Title 25) and under the staff recommended LDC revision within Austin’s city limits and limited-purpose extraterritorial jurisdiction (LTD ETJ). This iterative process involved staff-led production of text and map changes and consultant-led modeling of the impacts of those changes as shown below.



Capacity Analysis

The analysis to determine the total housing capacity of the proposed LDC and zoning map included four major steps:

1. **Development Feasibility.** Envision Tomorrow was used to estimate the number of parcels likely to develop or redevelop based on market conditions and zoning allowances. Only parcels identified in this step were included in capacity estimates.
2. **Base Build-Out Density Assumptions.** Base housing capacity was calculated per zone based on a mix of building types allowed in the zone and parcels identified in step 1.
3. **Estimated Bonus Production.** Bonus unit production was calculated per zone based on a density multiplier applied to base unit capacity.
4. **Estimated Income-Restricted Bonus Capacity.** Income-restricted capacity was estimated as a percentage of total bonus capacity.

Envision Tomorrow

Envision Tomorrow (ET) is an open-access scenario planning package that allows users to analyze how their community's current growth pattern and future decisions impacting growth will impact a range of measures from public health, fiscal resiliency and environmental sustainability. ET provides a quick, sketch-level glimpse of the possible impacts of policies, development decisions and current growth trajectories, and can be used by communities to develop a shared vision of a desirable and attainable future. It can be applied at scales from a single parcel to a metropolitan region.

As a scenario planning model, Envision Tomorrow is a tool for helping local jurisdictions test the impacts of changes to zoning. In Austin, different iterations of the LDC were treated as separate scenarios in order to measure the relative change between Austin's current LDC (Title 25) performance in the future and what an alternative code proposal like the LDC revision could deliver. Cascadia Partners used Envision Tomorrow to identify potential new development or redevelopment locations, feasible building types, and impacts of changes to zones and locations of zones.

Envision Tomorrow is currently being used by planning departments, regional governments, and universities across the country for research, planning and implementation projects. In addition to the City of Austin, users of Envision Tomorrow include:

- Wasatch Front Regional Council (WFRC)
- Metropolitan Area Planning Association (MAPA)
- City of Portland, Oregon
- Chicago Metropolitan Agency for Planning (CMAP)
- Mid America Regional Council (MARC)
- Cornell University
- University of Texas, Austin
- City of Oklahoma City, Oklahoma
- Portland Metro Regional Government (METRO)

Comparability of Assumptions to CodeNEXT Process

In September of 2017, capacity estimates were developed for existing Title 25, referred to as "Nearest Equivalency," and for proposed Title 23, referred to as "CodeNEXT Draft 3." In order to maintain comparability to those 2017 estimates, key assumptions in the Envision Tomorrow model were not varied for the LDC revision capacity estimate. This includes building prototype pro-formas, construction costs, and achievable market-rate rents, lease rates, and sales prices.

Step 1: Development Feasibility

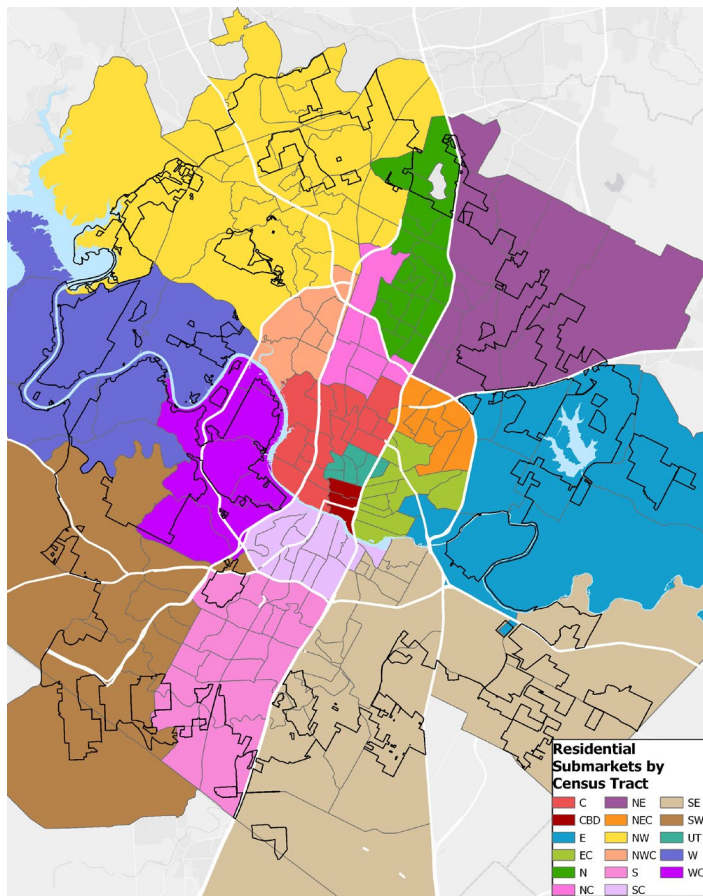
Envision Tomorrow assesses development feasibility of the proposed zoning map by performing a pro-forma feasibility test. This test is based on land values, local market conditions, and a single prototypical building pro-forma that varies by zone district. Land values came from 2016 Travis Central Appraisal District (TCAD) parcel data and market conditions were based on 95th percentile achievable rents by submarket from CoStar data acquired in 2017. Submarket sales and rental rate assumptions are included in table 1 on the following page.

Table 1: Achievable Rent / Sales Price Assumptions by Submarket

Submarket	Residential Sales Price / Sqft	Apartment Rents / Sqft
CENTRAL	\$392	\$2.00
CBD	\$487	\$2.49
EAST	\$173	\$1.42
EAST-CENTRAL	\$303	\$2.24
NORTH	\$186	\$1.44
NORTH-CENTRAL	\$274	\$1.66
NORTHEAST	\$156	\$1.60
NORTHEAST-CENTRAL	\$228	\$1.60
NORTHWEST	\$191	\$1.51
NORTHWEST-CENTRAL	\$305	\$1.54
SOUTH	\$193	\$1.61
SOUTH-CENTRAL	\$392	\$2.01
SOUTHEAST	\$189	\$1.54
SOUTHWEST	\$180	\$1.58
UNIVERSITY OF TEXAS	\$532	\$2.13
WEST	\$258	\$1.65
WEST-CENTRAL	\$380	\$2.01

Submarket source: ApartmentTrends.com. Data source: ECONorthwest, 2017

Figure 1: Residential Submarkets

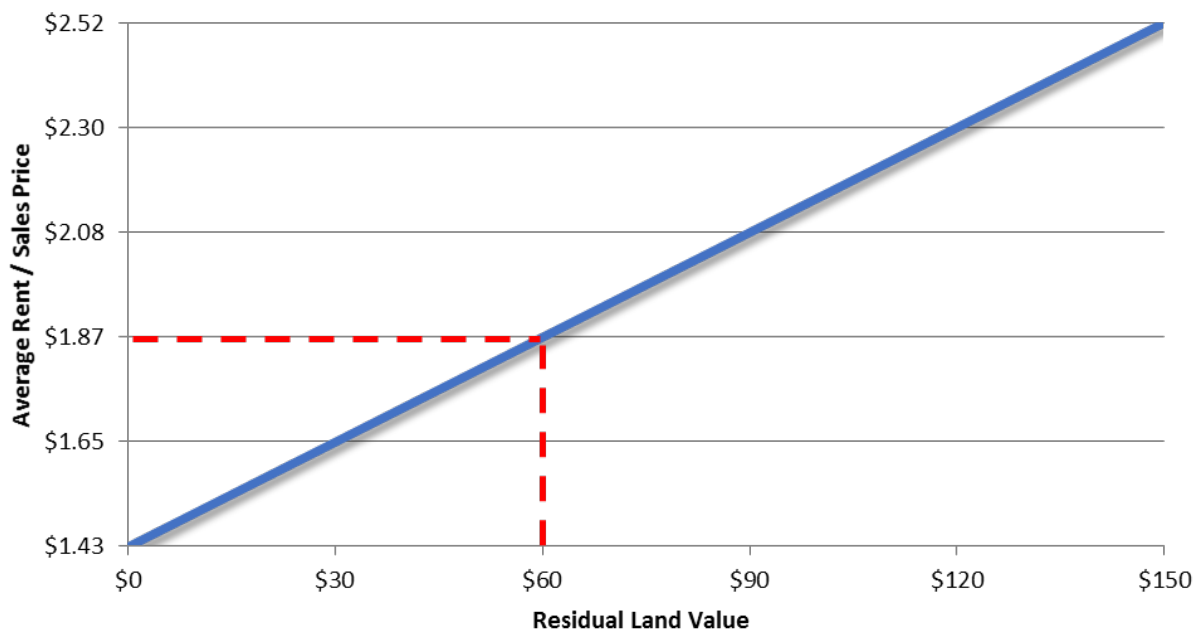


Left: Residential submarket geographies.

Source: ApartmentTrends.com (2017)

To test feasibility of proposed zoning, Cascadia Partners developed a series of highest and best use “prototype buildings” using the Envision Tomorrow Prototype Builder. The Envision Tomorrow Prototype Builder is a building pro-forma tool that allows the Envision Tomorrow model to test feasibility across large geographies. The library of building types created for this step in the process is called the “RLV Test” library and is comprised of 16 building representing housing and construction typologies generally permitted across the range of LDC zones. They were modeled with locally sourced construction cost, property tax, and impact fee assumptions and sub-market specific rents/sales prices as of 2017. The purpose of developing this library was to perform a residual land value (RLV) analysis for all parcels within the City of Austin, based on their assigned zone. A residual land value analysis fixes costs for construction and revenues from rent based on local conditions and uses them to solve for the maximum land cost a development can bear in a specific location.

Figure 2: Residual Land Value Curve



Above: Given local market rents at \$1.87 per foot, we assume that residual land value for a given building type is \$60/foot. Source: Fregonese Associates

For each zone district in the revised LDC, Cascadia Partners worked with City of Austin staff to identify an appropriate building prototype to use as a test case for redevelopment. Table 2 lists the building prototype selected to test feasibility for each zone. It is important to note that densities associated with these prototype buildings are not the build-out densities assumed within the model. Rather, build out densities for each zone are defined by a mix of building types described in more detail in “step 2” of this memorandum. Also note that Table 2 includes a column titled “vacant land only” which indicates whether the feasibility test includes or excludes developed land. For some lower intensity zones, it is assumed that development would only occur in instances where no existing use occupies a parcel. The pro-formas associated with the building types listed in Table 2 are included with this document in a zipped directory titled “RLVTest_PrototypeLibrary.zip”.

Table 2: Prototype Buildings by Zone

Revised LDC Zone	Feasibility Test Building	Vacant Land Only
CC120	High Rise	No
CC40	Mid-Rise	No
CC60	Mid-Rise	No
CC80	High Rise	No
DC	High Rise	No
LA	House Large	No
MS2A	Mid-Rise Mixed Use	No
MS2B	Mid-Rise Mixed Use	No
MS3	Mid-Rise Mixed Use	No
MU1	Cottage Apartments	No
MU2	Rowhouse Medium	No
MU3	Low-Rise Mixed Use	No
MU4	Low-Rise Mixed Use	No
MU5A	Mid-Rise Mixed Use	No
MU5B	Mid-Rise Mixed Use	No
R1	House Small	Yes
R2A	Duplex	Yes
R2B	Duplex	Yes
R2C	Duplex	Yes
R3	Cottage Apartments	Yes
R4	Multiplex Large	No
RM1	Rowhouse Medium	No
RM2	Rowhouse Medium	No
RM3	Low-Rise	No
RM4	Mid-Rise	No
RM5	Mid-Rise	No
RR	House Large	Yes
UC	High Rise	No
UC120	High Rise	No
UC80	High Rise	No

Envision Tomorrow used the selected pro-forma iteratively across all submarkets to identify the residual land value for each zone within each submarket. For parcels within a given zone, those parcels with land values equal to or less than the residual land value of their prototype building were assumed developable or able to redevelop. For instance, if a building prototype in a given submarket had a residual land value of \$50/foot, it could be applied to all parcels with a given zone type with a total value of \$50/foot or less.

Step 2: Base Build-Out Density Assumptions

Once redevelopment locations were identified in step 1, build-out density assumptions for base capacity were made using the Envision Tomorrow Scenario Builder tool. The Scenario Builder is a tool within the Envision Tomorrow suite that allows for mixes of prototype buildings, called “development types,” to be “painted” onto a scenario “canvas” that represents the present condition. Each development type contains detailed assumptions about density, use mix, and numerous other built environment attributes that are used to estimate base housing unit capacity as well as a range of additional performance metrics.

Prototype buildings are the building blocks of Envision Tomorrow scenarios and represent a range of existing and aspirational building types allowable within current code and the staff recommended LDC revision. Prototype buildings were developed in 2017 using an open-source building pro-forma tool called the Envision Tomorrow ROI Model. For more information about the ROI model, visit: <http://envisiontomorrow.org/building-prototypes>. The structure of each building model is identical, save for varying assumptions for physical building characteristics (height, use, parking, landscaping, etc.) and construction costs. In both CodeNEXT and the LDC revision project, two separate prototype libraries were developed: the “RLV Test” prototype library, used for feasibility testing, and the “Build-Out Capacity” prototype, explained in greater detail below.

Build-Out Capacity Library

The “Build-Out Capacity” library includes 25 building prototypes modeled to be buildable within both the LDC revision standards. These building prototypes were combined in various configurations to create zone development types to match the assumed build-out densities allowed in revised LDC zones. The outcome of these configurations (mix of buildings) is a blended average housing unit density assumption. This density is what drives the model’s assumption for base unit production on parcels deemed feasible for development within each zone. It is important to note that the build-out densities assumed in the Envision Tomorrow model do not simply assume the maximum allowed density would be achieved in each zone. Rather, robust site-specific case studies of building massing were undertaken to establish likely achievable densities within each zone given requirements for parking, setbacks, and other site-specific attributes that drive achievable densities. Table 3 below provides a full list of revised LDC zones with their associated Envision Tomorrow “build-out” densities vs maximum densities set within code text.

Note that the “percent of maximum density” column shows how the Envision Tomorrow model does not assume maximum density allowed in the revised LDC would be achievable on most lots. For example, though the MS3 zone allows a maximum base unit density of 54 units per acre, pro-forma testing of typical lot conditions implied that a lower density of 37 units per acre was more likely to be achievable. Thus, Envision Tomorrow assumed a build-out density that was only 68% of what the maximum density of that zone would allow.

Table 3: Assumed Build-Out Density by Zone

Revised LDC Zone	Envision Tomorrow Base Build-Out Density (Units per Acre)*	Revised LDC Max Density (Units per Acre, where applicable)	Percent of Maximum Density Assumed in Build-Out
CC120	176	NA	NA
CC40	40	NA	NA
CC60	40	NA	NA
DC	216	NA	NA
MS2A	60	NA	NA
MS2B	45	NA	NA
MS3	37	54	68%
MU1	13	18	73%
MU2	21	24	87%
MU3	11	24	46%
MU4	23	36	64%
MU5A	19	48	39%
MU5B	14	48	29%
R1	9	17	54%
R2A	11	17	62%
R2B	13	17	76%
R2C	14	25	56%
R3	20	26	76%
R4	18	35	52%
RM1	20	52	38%
RM2	24	24	99%
RM3	35	36	98%
RM4	35	48	73%
RM5	40	54	74%
RR	2	2	95%
UC	187	NA	NA
UC120	187	NA	NA
UC80	80	NA	NA

**Note: Net density assumed for house scale zones. For non-house scale zones, gross density is reported.*

Step 3: Estimating Bonus Production

As mentioned previously, estimates of bonus production happen as a post-process outside of the core Envision Tomorrow modeling process. Bonuses in the LDC can take the form of increased height, FAR, or unit per acre allowances. In order to normalize the impact on capacity of these various bonus types, we normalize them using a simple density multiplier. We arrive at the density multiplier by performing simple building envelope calculations of bonuses

using the Envision Tomorrow ROI Model. Based on these tests, each zone with a bonus is assigned a bonus multiplier which we then multiply against base units to estimate bonus capacity. For instance, if a zone has a bonus with a multiplier of 1.25 and it produced 1,000 units of base capacity, then the number of additional bonus units is $(1,000 * 1.25) - 1,000 = 250$.

Two caveats in relation to the above calculation should be noted. First, bonus multipliers are the result of pro-forma testing and achievable density and are not solely based on numerical increases in density allowed by the bonus. For instance, if a bonus allows a large FAR increase, but parking or other site considerations make achieving the maximum FAR difficult, a lesser bonus multiplier is assumed. The second caveat is that for zones with a -A variant, we assume that no units would have been produced as base capacity and rather all units are considered bonus. Assumptions related to bonus multipliers by zone for the revised LDC are documented in table 4 below.

Table 4: Revised LDC Bonus Assumptions

REVISED LDC ZONE	BONUS TYPE	MULTIPLIER
MS2A	Height	1.4
MS2B	Height	1.4
MS3	Height / Units per Acre	1.3
MU1	Units per Acre / FAR	2.0
MU2	Units per Acre / FAR	2.0
MU3	Units per Acre / FAR / Height	2.0
MU4	Units per Acre / FAR	1.7
MU5A	Units per Acre / FAR / Height	1.9
MU5B	Units per Acre / FAR / Height	1.9
R4	Units per Lot / FAR / Height	1.5
RM1	Units per Lot / FAR	1.1
RM2	Units per Acre / FAR / Height	2.5
RM3	Units per Acre / FAR	2.0
RM4	Units per Acre / Height	3.0
RM5	Units per Acre / Height	2.8
CC40	Height/FAR	1.6
CC60	Height/FAR	1.4
CC85	Height/FAR	1.9
CC120	Height/FAR	1.7
UC80	Height	1.9
UC120	Height	1.7
DC	FAR	2.5

Step 4: Income-Restricted Affordable Housing Production

Like the estimation of bonus production, the affordable housing production estimates are the product of a post-processing step. The estimates rely on the outputs of bonus program calibration performed by ECONorthwest (ECONW). The work done by ECONW's provided Cascadia Partners with estimates, by zone and census tract, of the feasible affordable unit set-aside as a percentage of total bonus unit capacity.

ECONW produced estimates for both “for sale” and “for rent” product. These set-aside percentages were blended by weighting “for sale” and “for rent” production using Envision Tomorrow’s estimate of renter and owner percentage by zone. For instance, if a given zone is assumed to be comprised of 25% renter product and 75% owner product, these factors were applied to the “for rent” and “for sale” set-aside percentages to arrive at a blended rate for that zone.

As part of CP’s post processing work, these blended percentages were multiplied against bonus units produced within each unique zone-census tract combination. For instance, if zoned parcels within a particular census tract produced 300 units, and the set-aside percentage for that zone-tract combination was 5%, we assume that the 300 bonus units include 15 income-restricted affordable units.

Housing Capacity Reporting

Total housing capacity estimated for the Revised LDC and the “Nearest Equivalency” to title 25 are summarized in table 5 below for the City of Austin and its LTD ETJ.

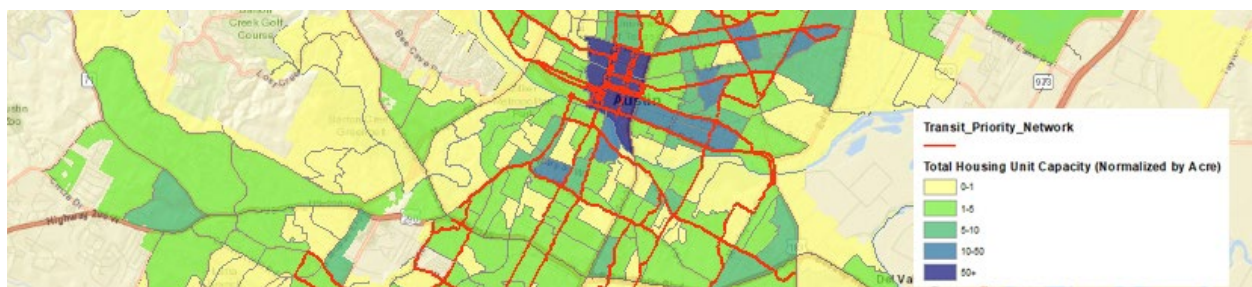
Table 5: Housing Capacity

Housing Capacity for City of Austin and LTD ETJ	Nearest Equivalency	Revised LDC
Base	140,040	209,940
Bonus	5,174	187,457
<i>Income-Restricted Affordable</i>	<i>1,500</i>	<i>8,891</i>
Total	145,215	397,396

Two additional datasets have been produced to provide more a granular and zone-by-zone reporting of capacity. The first, titled “RevisedLDC_Capacity_Zone_Dist_102919.xlsx” provides a Microsoft Excel workbook with a break-down of base, bonus, and income-restricted affordable bonus capacity by zone and council district.

The second dataset includes a Microsoft Excel workbook and a GIS shapefile. The workbook, titled “RevisedLDC Capacity Zone BlockGroup 102319.xlsx” provides a summary, by zone, of total capacity produced at a Census Block Group scale. The shapefile contains the same data summarized in the workbook, joined to 2010 Census Block Group boundaries. For those interested in learning more about where in the City additional capacity would exist under the Revised LDC, this dataset can be used to visualize capacity by zone at a sub-council district scale as shown in figure 3 below.

Figure 3: Example of Block Group Visualization



Appendix A: Glossary

Housing Capacity – Estimate of the number of housing units that could feasibly be built based on the Land Development Code, current market conditions, and available land.

Base Capacity – Portion of housing capacity allowed without requirements for affordable housing or fees in-lieu.

Bonus Capacity (Market Rate) – Portion of housing capacity allowed in addition to base capacity and only if income restricted affordable housing or fees in lieu are provided.

Bonus Capacity (Income Restricted) – Amount of affordable housing capacity produced and subsidized by market-rate bonus units or fees in lieu.

Envision Tomorrow – Suite of open-access scenario planning tools developed by Fregonese Associates.

Envision Tomorrow Prototype Builder – Spreadsheet tool that is used to test the physical and financial performance of proposed development and to better understand the impacts of local development regulations on development outcomes.

Envision Tomorrow Scenario Builder – Plug-in for ArcGIS that connects to Envision Tomorrow Prototype Builder to calculate a range of planning indicators across a corridor, district, city, or region.

“Nearest Equivalency” Land Development Code – A modeled approximation of the current Land Development Code (Title 25).

Revised Land Development Code – A modeled approximation of the Land Development Code revision currently being considered.

Real Estate Pro-Forma – A set of calculations that projects the financial performance of an investment, such as a real estate project.

Travis Central Appraisal District (TCAD) – entity responsible for fairly determining the value of all real and business personal property within Travis County, Texas. Provider of parcel boundaries and valuation estimates used in capacity analysis.

Development Feasibility – A concept that considers the financial viability of a real estate project in a specific location. A project is considered feasible if the net present value of the project meets or exceeds profit requirement and all costs associated with the project.

Residual Land Value (RLV) Analysis – Method for calculating the feasible development locations for a real estate project. Involves subtracting from total value of an assumed development, all costs associated with the development, except the cost of land. The remainder is the maximum cost of land for the given project. Using this value, it is possible to identify properties where development of a certain type could feasibly occur.

CoStar – Provider of property-level data including vacancy, rents, sales for multifamily, office, industrial, and retail property. Used to estimate achievable rents, lease rates, and sales prices for the residual land value analysis.