A Report on New York City's Present and Possible Urban Tree Canopy

Prepared for:

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SUMMARY

On April 12th, 2006, the New York City Department of Parks & Recreation requested that the U.S. Forest Service conduct an analysis of existing urban forest data for the City of New York. The analysis also considered issues associated with the possibility of achieving a goal of 30% Urban Tree Canopy (UTC) cover by 2030: "30 by 30." This goal is based upon Lulely and Bond's (2002) analysis and recommendation that New York City increase UTC by 10% (a 30% UTC goal) in order to significantly mitigate ozone related air quality in the City.

The assignment was to:

1. Use high resolution biophysical and social GIS data.
2. Characterize Existing and Possible UTC at a parcel level.
3. Summarize Existing and Possible UTC at several geographies: city, borough, community district, neighborhood, and by land use type.
4. Produce a written Report that includes methods, results, discussion, and recommendations.

The USDA Forest Service's Northern Research Station conducted this analysis in partnership with the Spatial Analysis Laboratory of the University of Vermont's Rubenstein School of the Environment and Natural Resources. Data were received on May 1st, 2006 and analyses were complete by May 29th, 2006 (four weeks). The final UTC GIS data layer that was used to derive the metrics contained over 9 million polygons.

Presently, New York City has 44,509 acres of UTC (termed Existing UTC), comprising 24% of the City's total land area. 42% of the City's land (79,203 acres) could possibly be covered by UTC (termed Possible UTC), that is, there are no roads or buildings.

UTC increases can be most efficiently realized by maximizing protection and maintenance in combination with new plantings and natural regeneration. If these trees are managed so that their anticipated mature crown projections are realized, significant UTC increases will occur in concert with planting efforts. Therefore, the number of new trees needed to achieve a UTC goal in NYC will depend upon mortality and growth rates of existing trees and new trees.

An additional consideration is that the addition of new trees can occur through a combination of planting and regeneration. Currently, rates of tree regeneration, growth, and mortality are not known for NYC in general and for different land use types in particular.

The impacts of setting a UTC goal will likely include focusing or reallocating public agency resources (funds, staff, etc.) to enhance UTC on PROW (public rights of way) and Open Space and Outdoor Recreation lands. On private lands, a combination of education and outreach, landowner and redevelopment incentives, and refocusing of regulatory mechanisms to specifically achieve the objectives of the UTC goal will likely be required.

Our analysis confirms that a UTC goal of 30% by 2030 is an ambitious and achievable goal, requiring 12,000 acres of additional tree canopy. This goal corresponds to the goal scenario

identified by Lulely and Bond (2002). Our analysis also indicates that this goal is achievable through incremental and strategic increases with specific targets for certain land use types.

We recommend that progress in attaining this goal be monitored and evaluated with a remote sensing assessment (multi-spectral, color infrared (CIR) overhead imagery and LIDAR) at 5-year intervals.

We recommend that the USDA Forest Service, Northern Research Station's NYC Urban Ecology Field Station work with the City to:

1. Develop an implementation plan that considers Potential and Preferable options to realize the UTC Goal: 30% by 2030.
2. Conduct studies in NYC to better understand rates of tree regeneration, growth, and mortality for different land use types.
3. Conduct a market assessment of different land ownership types, stewardship regimes, and appropriate combinations of incentives and regulatory mechanisms.
4. Develop a comprehensive urban forest management plan, including strategies for reducing tree mortality rates, increasing planting and natural regeneration rates, a market assessment (above), and education and outreach.
5. Develop an urban forestry economic model to assess:
    a. Where and how urban forestry contributes to neighborhood desirability and property values?, and
    b. How can citywide policy scenarios (incentives and regulatory mechanisms) be used to promote urban tree canopy, neighborhood desirability, and economic development?
6. Link UTC goals to other city goals: for instance, increasing community health, neighborhood quality of life and desirability, environmental literacy, and sustainability.
7. Monitor and assess the social and ecological benefits provided by changes in the City's UTC.

TABLE OF CONTENTS

FIGURES

TABLES

ASSIGNMENT

On April 12th, 2006, the New York City Department of Parks & Recreation requested that the U.S. Forest Service conduct an analysis of existing urban forest data for New York City[1]. The analysis also considered issues associated with the possibility of achieving a goal of 30% Urban Tree Canopy (UTC) cover by 2030: "30 by 30." This goal is based upon Lulely and Bond's (2002) analysis and recommendation that New York City increase UTC by 10% (a 30% UTC goal) in order to significantly mitigate ozone related air quality in the City.

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The assignment addressed only the first "P" of a "3 P" planning process: Possible, Potential, and Preferable (Raciti et al. 2006). In this case, Possible UTC asks the question, "Where is it biophysically *feasible* to plant trees?" This is the first step in the assessment process. It is not concerned with costs, logistics, or land use. For the New York City UTC assessment, all lands that were not covered by water, roads, or buildings were considered "possible" planting locations. Potential and Preferable UTC will eventually need to be addressed, where Potential UTC asks, "Where is it economically *likely* to plant trees?" For instance, which areas have regulatory mechanisms that conserve tree cover or have incentive supports for adding tree cover? Which areas are most cost-effective for achieving air quality or other goals? And Preferable UTC asks, "Where is it socially *desirable* to plant trees?" For example, where will tree cover make neighborhoods more attractive? Where are there active stewardship groups that will help maintain healthy trees? Where will tree cover address other issues such as cooling the air, reducing noise, or improving the water?

METHODS

Estimating Existing and Possible UTC

Existing UTC and Possible UTC values were derived by applying the UTC model in the USDA Forest Service's FOS (Forest Opportunity Spectrum[2]) Toolbox (http://www.unri.org/fos) to

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[2] FOS is a framework for organizing data, as well as for asking and answering urban forestry related questions. It can be used to assist decision-makers as they decide what their tree canopy goal will be and what actions they can take to achieve that goal. FOS allows forest opportunity types to be user defined. For example, the major FOS types usually

existing and derived geospatial data layers for New York City. The UTC model was customized to account for the uniqueness of NYC's data layers, but retained its overall structure. This enabled the UTC model to compute metrics that are meaningful for NYC, yet comparable to other cities where the UTC model has been applied. In short, the UTC model overlays the geospatial data layers, then calculates a series of statistics. These statistics are then imported into a spreadsheet to generate the UTC metrics or joined back to the original data layers to aid in cartographic representation.

A simplified version of the UTC model is presented in Figure 2. The model inputs consisted of *geographic boundaries* (boroughs, community districts, and neighborhoods), *parcels* (PLUTO), public rights-of-way (*PROW*), *land cover*, *roads*, and *buildings*. Of these, PROW was the only layer that had to be derived. The PROW layer was generated through an overlay process that created polygons where the parcels layer differed from the borough boundaries (the absence of parcels), followed by manual corrections using high-resolution imagery as the base map. The overlay of the six layers in the UTC model yielded a *combined overlay* layer in which each resulting polygon had the attributes of the input polygons. In some cases these attributes were mutually exclusive (i.e. a polygon could be a building, but not a road), in other cases they were overlapping (i.e. a building could have tree canopy [overhanging], and be part of a parcel).

A series of queries was then run on the *combined overlay* layer to generate UTC statistics at the borough, community district, neighborhood, and parcel level. Existing UTC was calculated by simply identifying current canopy. Possible UTC was determined by identifying land where canopy could possibly exist. The query for possible UTC identified all land that was not existing canopy, not water, not a building, and not a road. The query used to estimate possible UTC is liberal from a bottom-up perspective and conservative from a top-down perspective; land that could possibly support tree canopy is included (primarily non-road and non-building impervious surfaces, bare soil, and grass), but estimates are not made for features (primarily buildings and roads) that could support overhanging canopy.

At the borough level the UTC statistics were most detailed from an attribute perspective as Existing UTC and Possible UTC were summarized by parcel land use type. At the community district, neighborhood, and parcel level the spatial detail was emphasized, with each unique geographic element (community district, neighborhood, or parcel) containing values for Existing and Possible UTC. The summary statistics tables were then joined to the community districts and neighborhoods to create a series of maps displaying the relative Existing and Possible UTC. A table containing similar information at the parcel level has been provided to the New York City Department of Parks & Recreation to support further detailed UTC analysis.

UTC Calculator to Model UTC Scenarios

A UTC calculator was developed to enable users to model UTC outcomes by changing increases in UTC for specific land uses. For example, the user can change the percent tree canopy cover increase in land use types such as PROW, Open Space and Outdoor Recreation, and Vacant Land to see its effects on overall UTC for the City. The model was developed in Excel.

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include: regional forestry, riparian forests, large parks, abandoned industrial areas, neighborhood areas, and roads (which includes street trees).

RESULTS

Land use

Land use types in acres and as a percentage of the total City land area are summarized in Table 1. Water features are excluded from the metrics presented in this table. More than 60% of land in the City consists of PROW (26%), One and Two Family Buildings (22%), and Open Space and Outdoor Recreation (15%).

Land cover

Land cover—Existing UTC, Possible UTC, and Not Suitable for UTC—is depicted as a percentage of the total City land area in Figure 3. Land "not suitable for UTC" consists of roads and buildings.

Existing UTC

Existing UTC by land use type in acres and as a percentage of the total City land area is summarized in Table 2. Currently, UTC covers 44,509 acres or 24% of the City. Of the total land area, most UTC occurs on Parcel lands (18%) in contrast to PROW (6%). The three land use types with the most Existing UTC, as a percentage of total land area, are PROW (6%), Open Space and Outdoor Recreation (6%), and One and Two Family Buildings (5%).

Possible UTC

Possible UTC by land use type in acres and as a percentage of the total City land area is summarized in Table 3. The five land use types with the largest possibility for increasing canopy cover are One and Two Family Buildings (10%), PROW (9%), Open Space and Outdoor Recreation (7%), Transportation and Utility (4%), and Vacant Land (2%). Of these five land use types, PROW, One and Two Family Buildings, Open Space and Outdoor Recreation, and Vacant Lands already have the highest levels of existing canopy cover. However, Public Facilities and Institutions and Transportation and Utility have similar amounts of Existing UTC.

Existing and Possible UTC are summarized by PROW / Parcel for the City (Figure 4), by Borough (Figure 5, Figure 6, Table 4), by Community District (Figure 7 and Table 5), and by Neighborhood (Figure 8, Table 6).

It is important to note that the accuracy of estimating Existing and Possible UTC is most directly influenced by the land cover layer used in the model. The land cover data used in the model were derived from 3ft resolution color-infrared aerial imagery acquired in 2001 and 2002, and consisted of the following classes: tree canopy, grass, impervious, and water. The overall accuracy of the land cover layer was 86%. The producer's accuracy for mapping tree canopy cover was 84% and the user's accuracy was 80%. Producer's accuracy is a measure of errors of omission, while user's accuracy is a measure of errors of commission. Thus, tree canopy was mapped correctly 84% of the time while an individual tree canopy pixel stood an 80% chance of actually being tree canopy. The main source of confusion with tree canopy was grass. Of the 464 tree canopy sample sites visited, 46 were grass. Of the 225 grass sample sites visited, 74 were canopy. Based on the accuracy assessment conducted, it is likely that the Existing UTC estimates presented in this report are slightly conservative.

DISCUSSION

The land area in the City is comprised of parcel land (73%) and PROW (26%) (Figure 4). In terms of lands that are possible for increasing UTC (possible), the greatest opportunities for UTC increases exist on One and Two Family Buildings (10%), PROW (9%), and Open Space and Outdoor Recreation (7%). A mix of public and private lands from the following classes: Vacant Lands, Transportation and Utility, and Public Facilities and Institutions, would account for an additional margin of opportunities (8%). Determining which, how much, and where these lands are most likely (potential) and desirable (preferable) for increasing UTC needs to be examined further.

Existing UTC (44,509 acres) covers 24% of the total area of the City. The maximum Possible UTC is 79,203 acres or 42% of City land area, a 178% increase. However, the probability and/or preferability of such an increase is unlikely. A 30% canopy cover goal would require a 6% increase from Existing UTC, or an increase of 11,836 acres. As a public initiative on public lands only, sizable canopy goal increases are achievable through PROW plantings alone. For example, roadside areas in the PROW are currently 28% canopied (6,539 acres). An increase to 76% canopy (an increase of 11,238 acres) in these roadside areas would achieve an overall UTC of 30%.

A more balanced approach among land use types would involve other land use types and owners as policy makers, planners, and managers considered the probability and preferability of different options.

Using the UTC Calculator, for instance, the following scenario for achieving the 30% UTC goal is possible with incremental and strategic increases in the following land use types, where *UTC Increase* is the number of additional acres needed to achieve the 30% UTC goal and *Resulting UTC* is the net total acres (Existing + Increase) for the 30% UTC goal in terms of acres and percent:

Category (parcel land use)	Existing UTC (percent)	UTC Increase (acres)	Resulting UTC (acres)	Resulting UTC (percent)
PROW	5.7%	4,816	15,485	8.2%
One and Two Family Buildings	4.9%	1,817	11,000	5.9%
Open Space and Outdoor Recreation	6.5%	3,139	15,347	8.2%
Transportation and Utility	0.9%	1,059	2,723	1.4%
Vacant Lands	1.9%	704	4,286	2.3%
Public Facilities and Institution	1.2%	461	2,684	1.4%
Parking Facilities	0.1%	118	306	0.2%

While we may not think of trees in cities as a typical "forest," these trees provide valued services to our daily lives. These benefits include: lowering city temperatures, improving water quality, saving energy, reducing air and noise pollution, increasing neighborhood desirability and quality of life, enhancing property values, providing wildlife habitat, facilitating social and educational opportunities, and providing aesthetic benefits. Scientists now have the ability to qualify and quantify the benefits of UTC. An increase in UTC brings an associated increase in the UTC benefits listed above (Galvin et al. 2006).

As trees and tree crowns take time to grow, UTC planning has a temporal as well as a quantitative element. More than twenty years' time will be needed to achieve a significant increase in UTC.

While it is easy to think of UTC increases in terms of planting and natural regeneration of trees, it is critical that UTC increases include a combination of tree protection, tree maintenance, and tree planting in order to be fully realized and efficiently implemented. Lulely and Bond (2002) offered the following conceptual analysis for increasing UTC: **CT = CB + CN + CG – CM**

Where:
CT = total UTC in the modeling domain over time (realization of UTC goal);
CB = the Existing UTC;
CN = UTC increase from new trees (planting);
CG = the growth of Existing UTC (protection and maintenance); and,
CM = UTC mortality or loss due to natural and man-induced causes.

It is critical to recognize that *UTC increases can be most efficiently realized by maximizing protection and maintenance in combination with new plantings and natural regeneratio*n. If trees are managed so that their anticipated mature crown projections are realized, significant UTC increases will occur in concert with planting efforts. Therefore, the number of new trees needed to achieve a UTC goal in NYC will depend upon mortality and growth rates of existing trees and new trees.

An additional consideration is that the addition of new trees can occur through a combination of planting and regeneration. Currently, rates of tree regeneration, growth, and mortality are not known for NYC in general and for different land use types in particular.

The impacts of setting a UTC goal will likely include focusing or reallocating public agency resources (funds, staff, etc.) to enhance UTC on PROW and Open Space and Outdoor Recreation lands. On private lands, a combination of education and outreach, landowner and redevelopment incentives, and refocusing of regulatory mechanisms to specifically achieve the objectives of the UTC goal will likely be required.

RECOMMENDATIONS

Our analysis confirms that a UTC goal of 30% by 2030 is an ambitious and achievable goal, requiring 12,000 acres of additional tree canopy. This goal corresponds to the goal scenario identified by Lulely and Bond (2002). Our analysis also indicates that this goal is achievable through incremental and strategic increases with specific targets for certain land use types.

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6. Link UTC goals to other city goals: for instance, increasing community health, neighborhood quality of life and desirability, environmental literacy, and sustainability.
7. Monitor and assess the social and ecological benefits provided by changes in the City's UTC.

GLOSSARY

Existing UTC - Any piece of land in the city that was covered by UTC at the time of satellite data acquisition.

Forest Opportunity Spectrum (FOS) - The Forest Opportunity Spectrum provides a framework for organizing data, as well as for asking and answering urban forestry related questions. This framework may assist decision-makers as they decide what their tree canopy goal will be and what actions they can take to achieve that goal. FOS allows forest opportunity types to be user defined. For example, the major FOS types usually include: regional forestry, riparian forests, large parks, abandoned industrial areas, neighborhood areas, and roads (which includes street trees).

GIS - Acronym for *geographic information system*. An integrated collection of computer software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes. A GIS provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analyzed. (ESRI GIS Dictionary, http://support.esri.com)

Geoprocessing - A GIS operation used to manipulate GIS data. A typical geoprocessing operation takes an input dataset, performs an operation on that dataset, and returns the result of the operation as an output dataset. Common geoprocessing operations include geographic feature overlay, feature selection and analysis, topology processing, raster processing, and data conversion. Geoprocessing allows for definition, management, and analysis of information used to form decisions. (ESRI GIS Dictionary, http://support.esri.com)

i-Tree - The i-Tree suite of software tools was developed to help users—regardless of community size or technical capacity—identify and manage the structure, function, and value of urban tree populations. i-Tree allows you to promote effective urban forest management and sound arboricultural practices by providing information for advocacy & planning, baseline data for making informed decisions, and standardization for comparisons with other communities. Better understanding of benefits and services provided by trees increases investment in stewardship, operations, and maintenance (http://www.itreetools.org/).

LIDAR - LIght Detection And Ranging sensors are active sensors that collect extremely detailed elevation data by way of a laser. By emitting pulses from the laser, then sensing the time it takes for the pulse to return, the height of objects on the ground can be inferred. A relative surface DEM generated from LIDAR data can greatly complement imagery when performing a UTC assessment as it allows for features that have similar spectral and textural properties, to be differentiated based on height. LIDAR can be particularly useful in separating trees from shrubs and buildings from parking lots.

Multispectral Data - Data that span several parts of the electromagnetic spectrum are referred to as multispectral data. Color infrared (CIR) imagery is an example of multispectral data. It displays light from part of the visible spectrum as well as near infrared (NIR).

Near Infrared (NIR) - Having a NIR (near infrared) band can assist in distinguishing tree and vegetation types (broadleaf vs. conifer vs. grass), impervious surface types (concrete vs. asphalt), and other features (forests vs. forested wetlands). NIR can also be used to assess vegetation condition. This makes NIR data invaluable for natural resource management.

Parcel – Tax lot level data from the City's PLUTO™ layer. Parcels typically have a single owner, and have attributes such as land use associated with them.

Possible UTC - Where is it biophysically *feasible* to plant trees? This is the first step in the assessment process. It is not concerned with costs, logistics or the fact that tree planting may not be appropriate or desirable in some locations. For the New York City UTC assessment, all land that was not covered by water, a road, or a building was considered a "possible" planting location.

Potential UTC - Where is it economically *likely* to plant trees? Which areas have regulatory constraints that conserve tree cover or have incentive supports for adding tree cover? Which areas are most cost-effective for achieving air and water quality improvements and other goals?

Preferable UTC - Where is it socially *desirable* to plant trees? Where will tree cover make neighborhoods more attractive? Where will tree cover address other issues such as cooling and cleaning the air? And where we will tree planting be undesirable, including recreational areas such as playing fields?

PROW (Public Right Of Way) – Land that is not part of the City's PLUTO™ layer. This typically includes sidewalks, planting strips, alleys, and streets. The term includes any strip of land over which public facilities such as highways, railroads, or power lines are built.

Riparian Zone – This is the area of vegetation around streams. In less urbanized systems, the riparian zone is extremely important for water quality. This area of vegetation captures and processes pollutants before they can make it into surface waters. In urban areas, however, riparian zones are often less effective at removing pollutants. One reason is that urban streams tend to be deeply incised, causing the riparian zone to be disconnected from the stream below. Secondly, the streams in many urban areas have been functionally replaced with storm sewers and are now best understood as "sewersheds" in contrast to watersheds.

Three Ps - When moving from a canopy assessment to an implementation plan, it is useful to separate the process into a sequence of steps. This allows the task to be broken into manageable components and prevents each step from being bogged-down by details that belong in later stages of the process. The Three Ps: Possible, Potential, and Preferable, provide a useful sequence for structuring the goal setting and implementation process. (See Possible, Potential, and Preferable for more information).

Urban Forests - Urban forests include the trees in our yards, parks, public spaces, and along our streets. Though we don't often think of them as forests, they provide many forest benefits, such as cleaner air and water. In addition to environmental benefits, urban forests increase property values, reduce home energy costs, block UV radiation, buffer wind and noise, provide shade and beautify our neighborhoods.

UFORE - the **U**rban **For**est **E**ffects model can be used for detailed, statistically based sampling and data collection protocols. These protocols allow for estimation of total and variation related to urban forest structure and population effects. After tree data are collected and entered into the UFORE database (either by uploading from PDAs or by doing manual entry), they are merged with local hourly weather and air pollution concentration data. These data make it possible to calculate structural and functional information using a series of scientific equations or algorithms. If a complete inventory is conducted (i.e., all trees are measured; a 100% sample), then UFORE calculates values for each tree and for the total population. If only a sample is examined (i.e., plots are randomly located within the area of analysis), then UFORE calculates estimates for the total population along with estimate error (http://www.itreetools.org/ufore.html).

Urparian - Urparian describes the vegetated and non-vegetated areas around roads and sidewalks. The term comes from combining urban and riparian to form a single word. In less urbanized systems, the corridor around streams (the riparian zone) is extremely important for water quality. This area of vegetation captures and processes pollutants before they can make it into surface waters. In urban areas, however, riparian zones are often less effective at removing pollutants. One reason is that urban streams tend to be deeply incised, causing the riparian zone to be disconnected from the stream below. Secondly, the streams in many urban areas have been functionally replaced with storm sewers. In this context, the soil and vegetation around roads and sidewalks is the new riparian zone. By increasing tree canopy in the urparian zone, we can return some of the environmental benefits of riparian areas to urban systems.

Urban Tree Canopy (UTC) - Urban tree canopy (UTC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above.

FIGURES

Figure 1. Fine scale analysis used in this report

Figure 2. UTC model schematic for New York City

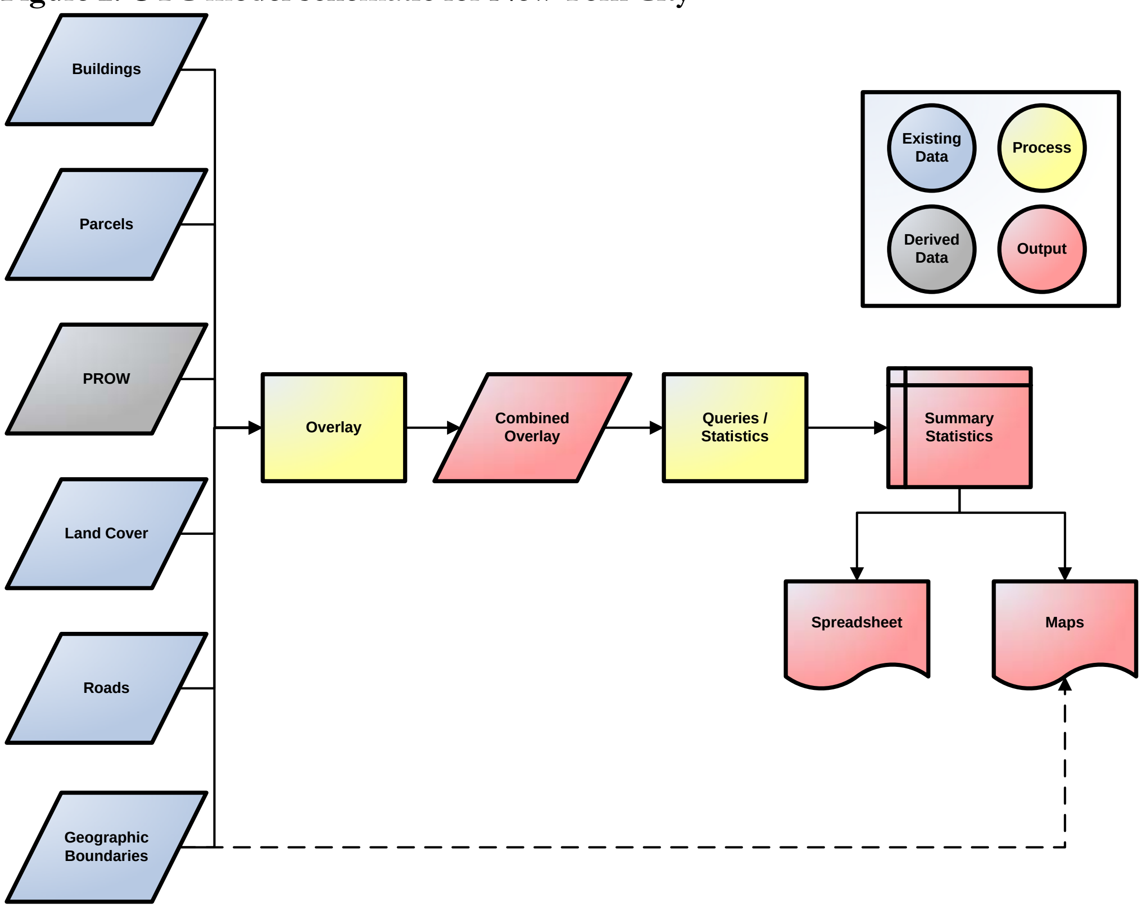


Figure 3. Existing and Possible UTC in New York City

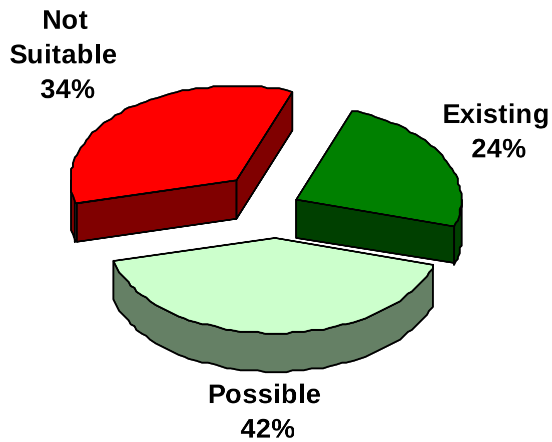


Figure 4. Existing and Possible UTC on Parcel Lands and PROW

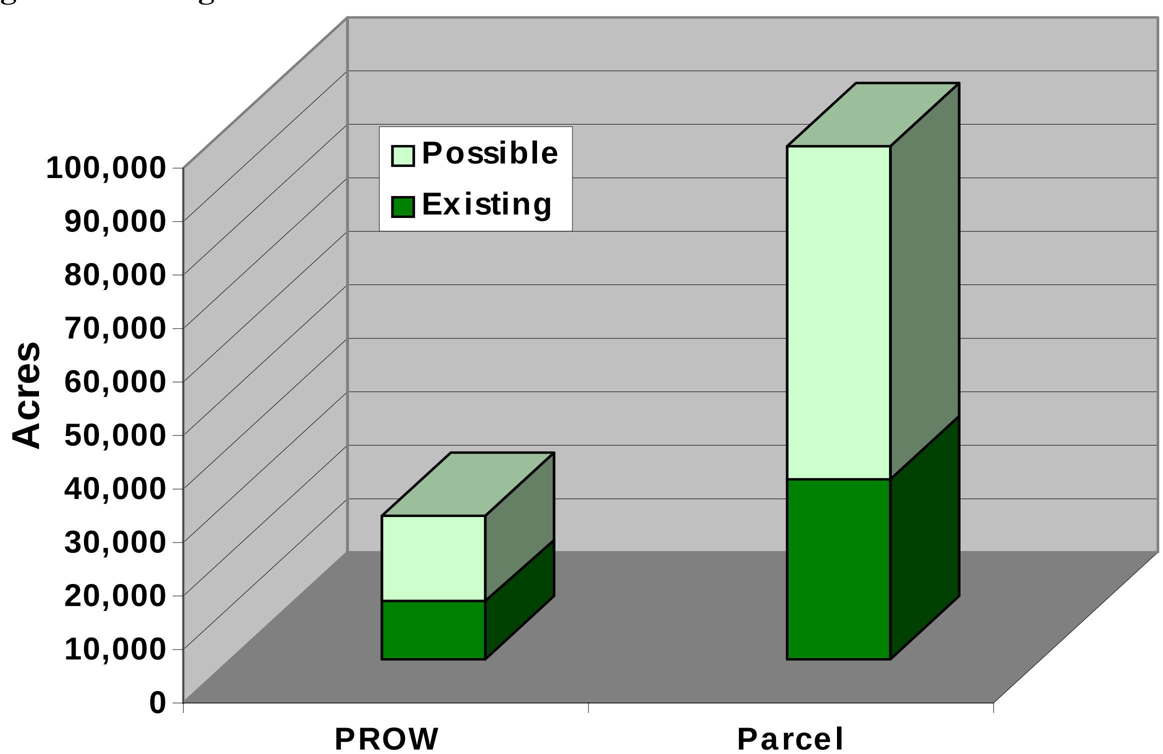


Figure 5. UTC by Land Use

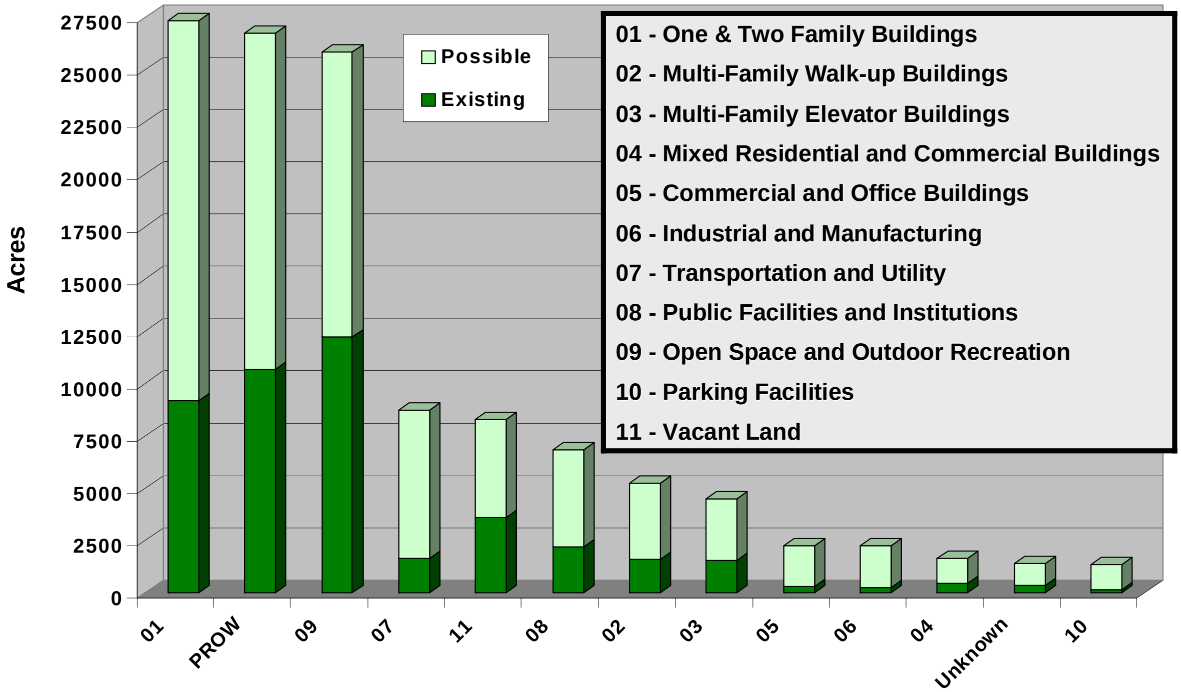


Figure 6. Total Existing and Possible UTC by Borough

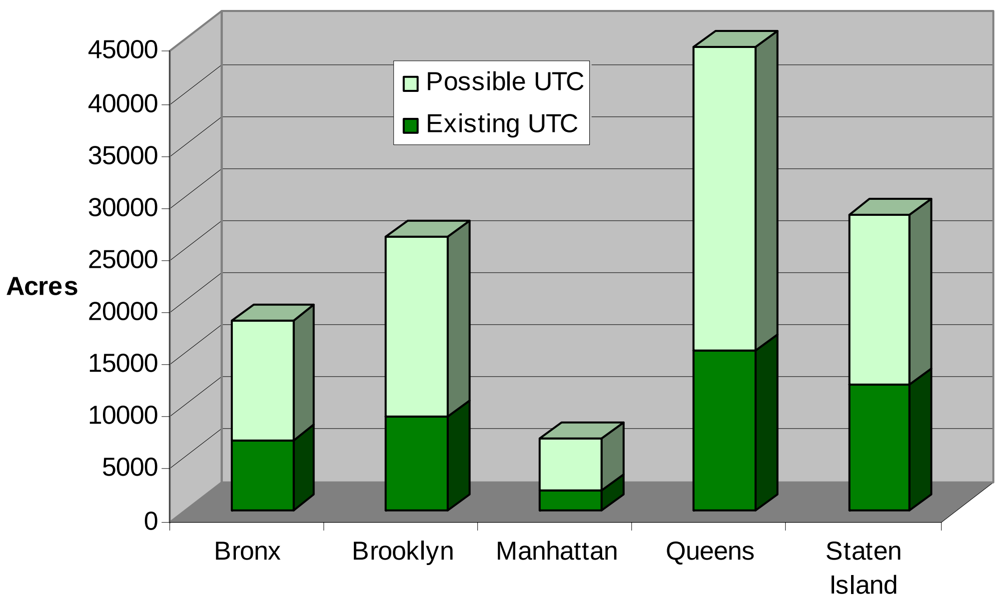
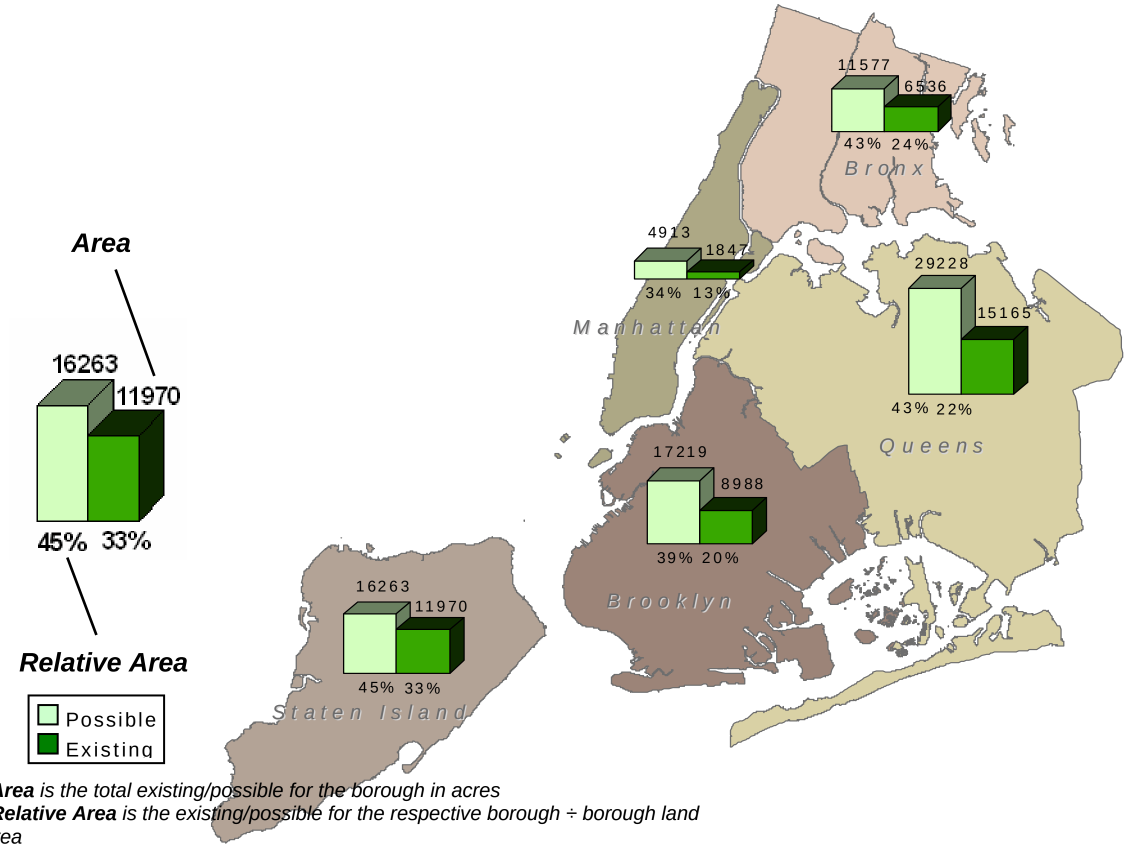


Figure 7. Total and Relative Existing and Possible UTC by Borough



**Area* is the total existing/possible for the borough in acres
**Relative Area* is the existing/possible for the respective borough ÷ borough land area

Figure 8. Existing and Possible UTC by Community District

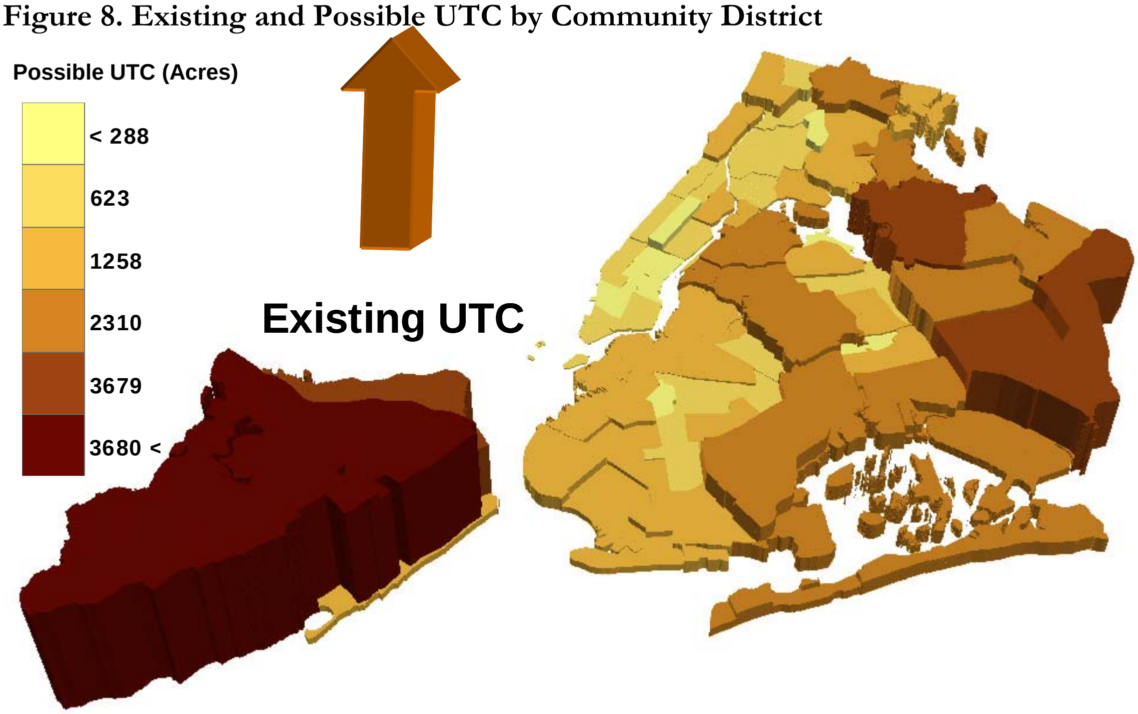
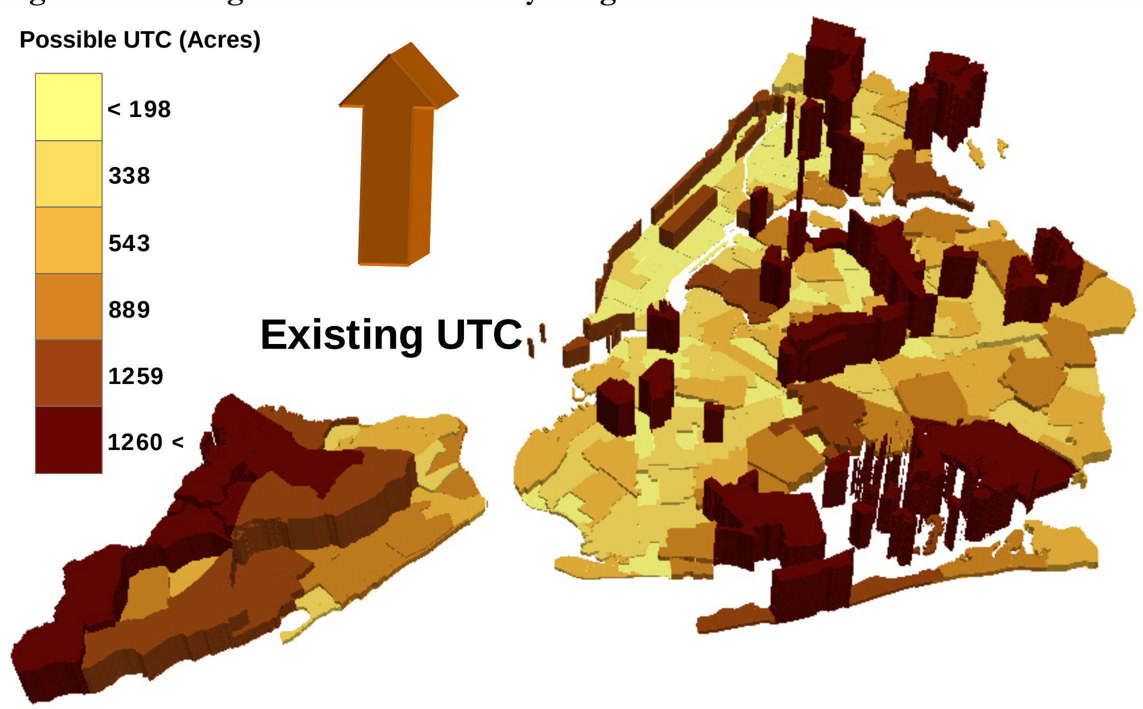


Figure 9. Existing and Possible UTC by Neighborhood



TABLES

Table 1. Land use types in acres and as a percentage of the total City land area

PROW	**49,239**	**26%**
Parcel	**137,307**	**73%**
Unknown	1,758	1%
01 - One & Two Family Buildings	41,181	22%
02 - Multi-Family Walk-up Buildings	10,302	5%
03 - Multi-Family Elevator Buildings	7,526	4%
04 - Mixed Residential and Commercial Buildings	4,242	2%
05 - Commercial and Office Buildings	5,615	3%
06 - Industrial and Manufacturing	5,678	3%
07 - Transportation and Utility	12,735	7%
08 - Public Facilities and Institutions	10,351	6%
09 - Open Space and Outdoor Recreation	27,276	15%
10 - Parking Facilities	1,937	1%
11 - Vacant Land	8,703	5%

Table 2. Existing UTC by land use type and in acres and as a percentage of the total City land area

PROW	**10,668**	**6%**
Parcel	**33,664**	**18%**
Unknown	354	0%
01 - One & Two Family Buildings	9,182	5%
02 - Multi-Family Walk22!@-up Buildings	1,598	1%
03 - Multi-Family Elevator Buildings	1,582	1%
04 - Mixed Residential and Commercial Buildings	472	0%
05 - Commercial and Office Buildings	331	0%
06 - Industrial and Manufacturing	278	0%
07 - Transportation and Utility	1,664	1%
08 - Public Facilities and Institutions	2,223	1%
09 - Open Space and Outdoor Recreation	12,207	6%
10 - Parking Facilities	188	0%
11 - Vacant Land	3,581	2%

Table 3. Possible UTC by land use type in acres and as a percentage of total City land area

PROW	**16,054**	**9%**
Parcel	**62,098**	**33%**
Unknown	1039	1%
01 - One & Two Family Buildings	18,174	10%
02 - Multi-Family Walk-up Buildings	3,641	2%
03 - Multi-Family Elevator Buildings	2,936	2%
04 - Mixed Residential and Commercial Buildings	1,200	1%
05 - Commercial and Office Buildings	1,940	1%
06 - Industrial and Manufacturing	1,970	1%
07 - Transportation and Utility	7,058	4%
08 - Public Facilities and Institutions	4,611	2%
09 - Open Space and Outdoor Recreation	13,649	7%
10 - Parking Facilities	1,182	1%
11 - Vacant Land	4,694	2%

Table 4. Existing, Possible, and Relative UTC by Borough

	Existing UTC	***Possible UTC***	***Relative Area Existing UTC***	***Relative Area Possible UTC***
Bronx	6,536	11,578	24%	43%
Brooklyn	8,989	17,220	21%	39%
Manhattan	1,848	4,914	13%	35%
Queens	4,256	9,150	20%	43%
Staten Island	11,971	16,263	34%	46%

Table 5. Existing, Possible, and Relative UTC by Community District

Borough	*Community District*	*Possible UTC*	*Existing UTC*	*Relative Area Existing UTC*	*Relative Area Possible UTC*
	101	378	58	6%	39%
	102	203	56	6%	24%
	103	387	133	12%	36%
	104	316	53	5%	29%
	105	206	19	2%	20%
	106	270	70	8%	30%
Manhattan	107	446	114	9%	37%
	108	385	98	8%	30%
	109	351	146	15%	37%
	110	339	102	11%	38%
	111	724	214	14%	48%
	112	690	387	22%	39%
	164	288	413	54%	38%
	201	623	147	11%	45%
	202	660	127	9%	47%
	203	437	185	18%	43%
	204	501	186	15%	40%
	205	342	101	11%	39%
	206	410	110	11%	43%
	207	482	183	15%	39%
Bronx	208	731	800	38%	35%
	209	1,172	482	18%	45%
	210	2,093	576	15%	54%
	211	970	445	19%	42%
	212	1,421	949	27%	40%
	226	334	755	66%	29%
	227	178	473	66%	25%
	228	933	1044	51%	45%

Brooklyn	301	1,258	206	7%	42%
	302	702	255	14%	39%
	303	700	299	16%	38%
	304	523	204	16%	40%
	305	1,589	658	18%	44%
	306	741	309	16%	38%
	307	769	677	28%	32%
	308	336	220	21%	32%
	309	324	222	21%	31%
	310	919	643	25%	36%
	311	953	282	12%	40%
	312	769	460	20%	34%
	313	912	319	17%	49%
	314	558	529	28%	30%
	315	1,172	578	19%	39%
	316	508	175	15%	43%
	317	712	467	22%	33%
	318	2,310	1449	26%	42%
	355	90	425	77%	16%
	356	1,690	711	26%	62%
Queens	401	1,753	514	13%	45%
	402	1,451	375	12%	45%
	403	750	355	18%	38%
	404	565	210	14%	37%
	405	2,183	925	19%	45%
	406	649	493	26%	34%
	407	3,297	1771	24%	44%
	408	1,832	1565	33%	38%
	409	999	435	18%	41%
	410	1,757	831	21%	45%
	411	2,295	1936	33%	39%
	412	2,542	1462	24%	42%
	413	3,286	2325	29%	41%
	414	2,235	656	16%	55%
	480	227	45	6%	31%
	481	486	222	24%	53%
	482	136	402	71%	24%
	483	1,882	370	8%	42%
	484	1,458	390	20%	75%
Staten Island	501	3,679	2651	31%	43%
	502	5,936	4337	34%	47%
	503	6,040	4698	35%	45%
	595	659	296	28%	63%

Table 6. Existing, Possible, and Relative UTC by Neighborhood (ordered, high to low, by Relative Existing UTC)

Neighborhood	*Possible UTC*	*Existing UTC*	*Relative Area Existing UTC*	*Relative Area Possible UTC*
parks/cemeteries-bx	1,870	2,719	56%	38%
Todt-Emersonl-HeartlaVill	1,210	1,869	51%	33%
Riverdale-Fieldston	335	575	51%	30%
GrymesHill-Clifto-FoxHills	303	365	43%	36%
Rosedale	499	550	42%	38%
Annad-Hugue- Prin-Elting	1,259	1,296	41%	40%
Starrett City	92	105	41%	36%
Jamaica Estates-Holliswood	337	388	39%	34%
parks/cemeteries-bk	2,257	1,783	39%	49%
Westerleigh	494	538	38%	35%
Charlest-Richm-Tottenville	2,241	1,639	37%	51%
New Brighton - Silver Lake	417	376	36%	40%
parks/cemeteries-qn	3,400	2,188	35%	55%
Rossville - Woodrow	608	522	35%	41%
W NewBri-NewBri-StGeorg	416	389	35%	37%
Arden Heights	435	402	35%	38%
parks/cemeteries-si	307	173	35%	62%
DouglasMan-Douglast-L Neck	630	509	34%	42%
parks/cemeteries-mn	1,193	869	34%	46%
Springfield Gardens North	251	216	33%	39%
Fresh Meadows - Utopia	236	208	32%	37%
Dyker Beach Park	279	165	32%	54%
NewSpring-Bloom-Chels-Trav	3,138	1,849	32%	53%
Baisley Park	364	304	32%	38%
Laurelton	427	326	31%	41%
Murray Hill	422	374	31%	35%
Oakland Gardens	417	339	31%	38%
SpringfieldGrdns S-Brookvi	311	262	30%	35%
Flatbush	290	306	29%	28%
Kew Gardens Hills	307	253	29%	36%
Kew Gardens	179	133	29%	39%
Bayside - Bayside Hills	696	522	29%	39%
East Flushing	276	196	29%	41%
Canarsie	697	526	28%	37%
Parkchester	63	60	28%	30%
Midwood	250	230	28%	30%
Far Rockaway - Bayswater	490	333	28%	41%
Bellerose	543	359	28%	42%
GlenOaks-FlorlPk-NewHydePk	460	297	28%	43%
Spuyten Duy - Kingsbridge	202	148	28%	38%
Forest Hills	453	353	27%	34%
Fort Hamilton	104	60	27%	46%

MarinePk-Georgetown-Bergen	666	397	26%	44%
Eastchest-Edenwald-Bayches	369	240	26%	40%
St. Albans	753	460	26%	42%
Great Kills	1,051	572	26%	47%
Pomonok-FlushngHts-Hillcre	355	229	26%	40%
Auburndale	305	197	26%	40%
Queensboro Hill	256	152	26%	43%
MarinersHa-Arling-Granitev	1,043	494	25%	53%
Grasmere - Arrochar	408	233	25%	44%
Port Richmond	323	200	25%	41%
Oakwood - Oakwood Beach	562	307	25%	46%
Ocean Parkway South	147	102	25%	36%
Whitestone	692	396	25%	44%
Bay Ridge	413	329	25%	31%
Middle Village	604	328	24%	45%
Lindenwood - Howard Beach	658	344	24%	47%
Hollis	221	123	23%	42%
Briarwood - Jamaica Hill	255	154	23%	39%
Pelham Parkway	205	122	23%	39%
West Brighton	85	42	23%	46%
Windsor Terrace	100	72	23%	32%
Queens Village	680	363	22%	42%
Rego Park	177	114	22%	35%
Prospect-LeffertsGrdn-Wing	234	162	22%	32%
East Flatbush - Farragut	258	169	22%	34%
Clearview-BayTerr-FortTott	510	226	22%	49%
South Jamaica	397	201	22%	43%
South Ozone Park	889	449	22%	43%
Flatlands	457	271	21%	36%
Norwood	116	75	21%	32%
Cambria Heights	338	156	21%	45%
Madison	219	130	21%	35%
East Elmhurst	160	85	21%	39%
Crown Heights North	400	243	21%	34%
Kensington - Ocean Parkway	121	74	20%	33%
Stapleton - Rosebank	602	247	20%	49%
Fort Greene	147	76	20%	39%
Allerton - Pelham Gardens	305	146	20%	42%
Old Town - Dongan Hills -	763	276	20%	55%
East New York (part A)	1,228	515	20%	47%
Woodlawn - Wakefield	380	179	20%	41%
Washington Heights North	142	84	19%	32%
SheepshdBy-ManhBch-Gerrit	603	281	19%	41%
Soundview-CastleHill-Claso	505	202	19%	48%
Gravesend	259	109	19%	45%
Clinton Hill	163	88	19%	35%
Park Slope - Gowanus	289	180	19%	30%

Prospect Heights	77	44	19%	32%
Homecrest	241	129	19%	35%
Bronxdale	128	65	19%	37%
Borough Park	408	230	19%	33%
Stuyvesant Heights	265	132	18%	37%
Dyker Heights	257	125	18%	37%
Co-Op City	424	153	18%	50%
Elmhurst - Maspeth	183	90	18%	37%
Highbridge	104	50	18%	37%
Williamsbridge - Olinville	329	147	18%	39%
Stuyvesant Town - Cooper V	55	21	18%	46%
Crown Heights South	111	64	18%	30%
New Dorp - Midland Beach	685	224	17%	53%
Jackson Heights	407	186	17%	38%
Sunset Park East	216	106	17%	35%
Soundview - Bruckner	148	61	17%	40%
Morrisania - Melrose	155	64	17%	40%
Erasmus	109	54	16%	33%
VanNest-MorrisPk-WstcstrSq	370	134	16%	45%
Van Cortlandt Village	271	91	16%	48%
Ozone Park	265	92	16%	46%
Woodhaven	330	134	16%	39%
Hammels-Arverne-Edgemere	790	202	16%	61%
Brownsville	311	115	16%	42%
Rugby - Remsen Village	264	117	16%	35%
Morris Heights	192	72	16%	42%
College Point	617	177	16%	54%
Cypress Hills - City Line	245	96	15%	39%
Schylrvill-ThrogsNeck-Edge	1,185	324	15%	56%
North Corona	156	62	15%	39%
Flushing	319	131	15%	37%
Carroll Gardens - Red Hook	407	144	15%	43%
Richmond Hill	501	177	15%	42%
Brighton Beach	145	57	15%	38%
Belmont	124	45	15%	40%
Woodside	242	94	14%	37%
Glendale	252	94	14%	39%
Elmhurst	255	102	14%	35%
Lower East Side	230	75	14%	44%
Bedford	296	106	14%	40%
Ridgewood	478	161	14%	41%
West Farms - Bronx River	132	47	14%	38%
Ocean Hill	194	62	14%	42%
Seagate - Coney Island	383	96	13%	54%
Steinway	581	168	13%	46%
PelhamBy-CntryClub-CityIs	470	118	13%	53%
Bushwick	373	122	13%	40%

East Harlem South	148	50	13%	39%
Harlem River shore	108	25	13%	56%
Melrose Sth-Mott Haven Nth	169	51	13%	43%
East Village	65	32	13%	26%
Central Harlem N - PoloGrd	224	75	13%	38%
East Harlem North	236	71	13%	42%
Bath Beach	165	52	13%	40%
Astoria	326	111	12%	36%
Morningside Heights	124	43	12%	35%
Kingsbridge Heights	137	36	12%	47%
Maspeth	322	99	12%	40%
Manhattanville	88	27	12%	39%
Mott Haven - Port Morris	274	86	12%	38%
Old Astoria	146	43	12%	41%
Brooklyn Heights - Cobble	112	34	12%	40%
Bedford Pk - Fordham North	114	41	12%	33%
West Concourse	150	47	12%	37%
Corona	183	52	12%	41%
Bensonhurst West	403	122	12%	39%
Bathgate - Claremont	164	44	12%	44%
Yorkville	89	36	12%	29%
Crotona Park East	170	42	12%	47%
Bensonhurst East	310	88	11%	40%
Westchester - Unionport	243	63	11%	43%
Queensbr-Ravensw-Long IslC	220	61	11%	40%
East New York (part B)	198	50	11%	43%
Williamsburg	86	29	11%	32%
Sunset Park West	441	122	11%	39%
DUMBO-Vineg-Dwntwn-Boerum	226	70	11%	35%
Bushwick North	193	62	11%	34%
East Tremont	196	43	10%	45%
Hamilton Heights	99	28	10%	35%
Jamaica	482	102	10%	45%
Marble Hill - Inwood	141	31	9%	42%
EastConcours-ConcoursVill	172	39	9%	41%
Breezy-BelleH-Rockaw-BChan	1,076	153	9%	62%
West Village	122	46	9%	23%
Lenox Hill - Roosevelt Isl	178	40	8%	36%
JFK International Airport	2,044	408	8%	40%
Chinatown	102	27	8%	31%
Hunts Point	674	102	8%	51%
Gramercy	39	13	8%	23%
Riker's Island	352	29	8%	92%
Mount Hope	120	26	8%	36%
Longwood	105	19	8%	43%
HuntePt-Sunnyside-W Maspe	1,107	178	8%	47%

Central Harlem South	120	24	7%	36%
Washington Heights South	138	30	7%	33%
East Williamsburg	421	58	6%	47%
Greenpoint	300	47	6%	41%
Upper West Side	206	41	6%	32%
Lincoln Square	129	23	6%	36%
Murray Hill - Kips Bay	101	22	6%	29%
Flatiron-Union Sq-Chelsea	213	44	6%	27%
Fordham South	51	8	5%	35%
North Side - South Side	302	39	5%	41%
Carnegie Hill-Upper E Side	116	22	5%	25%
Clinton	104	17	5%	28%
Turtle Bay - East Midtown	104	17	4%	27%
Battery Pk City-Lower Manh	133	13	4%	36%
SoHo-Tribeca-Little Italy	133	19	3%	24%
Midtown - Midtown South	141	8	1%	20%

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