THE EVALUATION OF THE IMACT OF FORM-BASED CODE AND CONVENTIONAL ZONING ON FORT MCPHERSON REDEVELOPMENT

A Thesis
Presented to
The Academic Faculty

By

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In Partial Fulfillment
of the Requirements for the Degree
Master of Science in the
School of City and Regional Planning

Georgia Institute of Technology

May, 2010

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ACKNOWLEDGEMENTS

I wish to thank Professor Michael Dobbins, Professor Richard Dagenhart, and Professor Perry Yang for your sincere help and dedication to finishing my master thesis. Without your help and advice, it was impossible for me to finish this thesis. Particularly, thank you to Professor Michael Dobbins for affording me the opportunity to pursue this research for one year. Your guidance has been always a great help, and you consideration of my school life also made me stay on the right track.

Additionally, a special debt of gratitude is owed to Haeyeon and Reggie who patiently helped to assist my graphic works and some detail tasks for my thesis. Your effort on my thesis also made me finish my thesis.

Finally, I wish to thank my parents who have been always taken care of me and my love Eunsook Kim who always makes me happy. You all always encourage me to study and live my life.

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SUMMARY

The form-based code has been widely used as an innovative design reform since it was suggested in the early 1980s. As a prescriptive design tool for creating the predictable result of the built environment, the form-based code has shown advantages throughout urban design projects and the plan-making process. However, it is also the case that most descriptions of the advantages of form-based codes are only statements without actual proof.

The goal of this thesis is to develop evaluation criteria for and identify the impact of form-based codes on community revitalization through comparison with conventional zoning. As evaluation criteria, four general categories – sustainability, connectivity, diversity, and design optimization and compactness – will be suggested. As a target site, the Fort McPherson Redevelopment in Atlanta will be selected, and the two physical alternative models based on the conventional zoning and the form-based codes will be made for comparison. To make clearer analyses of the two models, each general category will contain several quantitative and qualitative evaluation indicators.

In the analyses of the two physical alternative models, several implications are drawn. First, in terms of sustainability, form-based codes provide slightly more green space(s) within the residential lots for more amenities and create more spaces for environment-friendly living places. Second, in terms of connectivity, form-based codes can provide wider street standards, which creates more intersections and more blocks for street safety and vigorous street activities for the residents. Third, in terms of diversity, form-based codes do not provide variation in lot sizes under the maximized development

conditions, but instead provide more uniform building frontage and a sense of spaciousness by creating solid building walls along the street. Finally, in terms of design optimization and compactness, form-based codes allow more dwelling units per acre to be built and encourage more mixed-use development while providing enough public spaces for the public good.

Despite these analytic results and the hypothetical advantages of form-based codes over the conventional zoning, the important point is that form-based codes cannot be simply a replacement for, but a supplement to conventional zoning. To harmonize form-based codes with conventional zoning, physical components used in the form-based codes should be included in the conventional zoning, and ways should be found to absorb form-based codes to make them compatible with the conventional zoning and city comprehensive plans, for example, by using similar terms and content.

CHAPTER 1

INTRODUCTION

As an innovative zoning and design reform, form-based codes have increasingly gained in popularity and proven their effectiveness in many US cities and communities since the early 1980s. Many cities and communities in the US are considering form-based codes as a supplemental tool or as a replacement for their conventional zoning which has traditionally focused on the segregation of land uses to protect the public safety, health, and welfare through some numeric measurements and dimensions – for example, separating residential land use districts from industrial or commercial uses to reduce any negative impact on the living environment. Deriving from New Urbanism and responding to the problems of urban sprawl and urban decline, form-based codes are defined as a method, or a new urban design tool, that suggests the most desirable urban form and its components, which include building forms and uses, streets, open spaces, and landscaping to create more mixed-use, compact, and pedestrian-friendly communities in order to improve the environmental quality by creating more open spaces and making a more spatially networked system in the development area, and to create a continuous urban image harmonized with the other surrounding urban areas in the long term.

By putting great emphasis on mixed use and relationships between the physical forms and the surroundings, form-based codes have as their ultimate goal the creation of an attractive "Public Realm," which can be achieved by arranging building facades, walls, doors, and windows on streets and blocks that function together to create continuous images. Initially, form-based codes were developed to provide developers with sets of

instructions to develop Greenfield sites, but they have recently begun to being used in redevelopment and revitalization projects. Thus, form-based codes have a lot of potential as a future urban design tool, and their utilization will expand from neighborhood and community level to regional and national level because form-based codes at the regional and national level can be also considered as accumulation and networking of community and neighborhoods level.

For the last two decades, planners have begun to recognize that form-based codes have more advantages than conventional zoning in that they can encourage public participation, achieve more predictable results of the physical environment based on detailed components of form-base codes, and save time and money for a vision and administration. Although some planners argue that form-based codes also have the weaknesses of being relatively high cost and unpredictable with regard to their ultimate success with projects, form-based codes help planners and others recognize what the development area will look like in the future and what kinds of physical elements will be created to make a community more revitalized and livable in the future. To present predictable results of the physical environment, the development of form-based codes starts with the identification of the existing framework such as the existing buildings, streets, open spaces and parking lots, and then envisions the future framework based on existing physical data at both the macro and micro levels, categorizing their own land and building uses and setting up design standards, ending up with documentation of the form-based codes.

Therefore, it might be difficult to say which regulation system will be more desirable and help to create the better built environment and urban form, conventional

zoning or form-based codes. For this reason, some planners and communities choose the "hybrid code" which involves the combination of conventional zoning codes with graphic urban design standards because it helps urban planners and designers to easily understand the context of form-based codes within the existing zoning ordinances and the comprehensive plans. Nevertheless, it would be a good opportunity for planners to prove which regulation systems have more positive impacts on the future change of the built environment, what kinds of negative impacts conventional zoning and form-based codes would have in the development projects, and whether there are any ways to improve form-based codes so that it can be successfully compatible with existing comprehensive plans or zoning ordinance.

In this thesis, I will do a thorough analysis of both conventional zoning and form-based codes to determine whether and how form-base codes help to create a better physical environment than conventional zoning. I have chosen as a target area for this analysis Fort McPherson, which is located in the south of Atlanta close to East Point, because its blueprint plan is now being developed through public participation and because the zoning ordinance for Fort McPherson has many features of both conventional zoning and form-based codes. Also, Fort McPherson will serve as a catalyst for community revitalization and economic growth in south Atlanta. The quantitative analysis will be explained in terms of four categories which are drawn from Smart Scorecard by Fleissig, from case studies of form-based codes and zoning ordinances, and from other resources of evaluation indicators for neighborhood development. Each of the generalized categories will be divided into several quantitative and qualitative evaluation indicators.

CHAPTER 2
SETTING UP THE THESIS FRAMEWORK

2. 1 Questions and Issues in the Thesis

As an attempt to find a quantitative and qualitative approach to analyze the impact and effectiveness of conventional zoning and form-based codes, this thesis will focus on both conventional zoning and form-based codes. Ever since form-based codes were first suggested, planners have identified and described many unique characteristics of form-based codes. However, there have been very few attempts by planners to clearly prove how much better form-based codes are than conventional zoning by defining quantitative or qualitative evaluation criteria of land use patterns and urban forms.

Questions in this thesis can be provided as follows: Is it possible for planners to prove that form-based codes have more positive influence on the future community than conventional zoning codes through a quantitative or qualitative analytical approach? If so, how do form-based codes obtain more advantages over conventional zoning in terms of providing a better physical environment? What is the difference between conventional zoning and form-based codes in defining the area and setting up design standards or regulations? What negative impacts of conventional zoning on community revitalization can be expected and how can form-based codes suggest a solution to that problem? How can planners prove that form-based codes can create a better physical environment than conventional zoning?

To answer these questions, it is very important to compare conventional zoning

codes with form-based codes[1] to prove the effectiveness and impact of form-based codes on the Ft. McPherson BRAC redevelopment plan. This thesis will examine the built environment changes based on the components that are suggested for this comparative study.

2.2 Working Hypothesis and Goals

Zoning itself plays a major role in creating the future communities that people want by using building form and façade, streetscape, open spaces, landscape, and the public realm to integrate all other elements into the continuous structure of urban form. To create better communities of the 21st century which are more sustainable and revitalized, form-based codes will be one good option of an urban design because they can directly affect the physical structures and buildings of the city.

Throughout the history of urban planning and design, planners have noticed many problems caused by conventional zoning. Due to the segregation of land use as the most essential characteristic, conventional zoning codes or regulations often do not help communities and neighborhoods to create a "Public Realm" because these zoning codes control the built environment by using some numerical parameters and applying those numbers for all development projects without any consideration of the specific conditions and contexts of each development project. The rigid characteristics of traditional zoning codes have created urban environments that lack diversity, sustainability, connectivity, and compactness.

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[1] Georgia Department of Community Affairs has established form-based provision in the model codes in 2007 to help communities to develop their own community redevelopment plan or design standards for themselves.

Since form-based codes emerged in the early 1980s in the US, they have been implemented at both urban and neighborhood levels. Most planners agree that form-based codes fit 21st century urban planning and design trends because they emerged as a reaction to urban planning thoughts that put more emphasis on functions and uses over urban forms and placeness. Despite this general consensus regarding form-based codes, there are some critics of form-based codes that doubt its effectiveness because there have been very few attempts to study or evaluate or identify the advantages of form-based codes through comparative analysis of conventional zoning in both quantitative and qualitative ways. Therefore, through the comparison of actual community redevelopment plans based on conventional zoning codes and form-based codes, form-based codes have greater impact on the built environment and create higher quality places than conventional zoning codes in urban planning and design such as community redevelopment and revitalization projects. Furthermore, setting up evaluation criteria for form-based codes can provide us with strong predictability of what communities or cities will look like in the future – predictability as one critical characteristic of form-based codes.

2.3 Research Methodology

Before the physical comparisons, a detailed research literature review should be done. Through research literature review, a working definition, the historic context, and features of form-based codes, and differences and similarities between conventional zoning and form-based codes will be undertaken. Also, to incorporate quantitative and qualitative research to compare the impact and the effect between conventional zoning

and form-based codes, a set of evaluation criteria will be suggested for conventional zoning and form-based codes. Another research literature review on the evaluation criteria of form-based codes or design codes will be made, and case studies for actual development practices using form-base codes are needed. For the comparison, sets of rules or standards based on each design tool - conventional zoning/form-based codes - should be made; a set of rules for conventional zoning will be chosen from the City of Atlanta old zoning regulations in the 1990s which does not have any features of form-based codes; another set of rules for form-based codes will be chosen from the Georgia Department of Community Affairs' (DCA) form-based provisions.

After setting up the evaluation criteria, each model will be analyzed and evaluated by a set of evaluation criteria made from the literature review, Fleisigg's Smart Scorecard, and some case studies of form-based codes and zoning ordinances since the 1950s. The evaluation criteria will have several substantive components in terms of physical form, structure, process, and implementation. These results will prove how well form-based codes can improve or revitalize the built environment in both quantitative and qualitative way.

For a clear comparative analysis of the effectiveness of form-based codes over conventional zoning, several assumptions of conventional zoning and form-based codes are required to analyze the quality of the built environment in terms of design features. First, both models should have the same land use distribution table. If the amounts of residential, commercial, and industrial land uses are different in both models, it will be difficult to analyze which regulation has high-quality design characteristics. Variation of land use allocation can also affect the quality of the built environment. Second, for a

better comparison of conventional zoning and form-based codes, the 2002 City of Atlanta zoning codes are used for the physical alternative model of conventional zoning, and form-based codes provisions by Georgia Department of Community Affairs (DCA) are used for the model of form-based codes in the target area. The latest City of Atlanta zoning codes or regulations have already adopted many components of form-based codes, so the model for conventional zoning should be based on the old zoning ordinance which was used before a form-based code approach was adopted. Third, for conformity with the Ft. McPherson redevelopment plan which has already been developed, design issues and land use patterns in the plan are also used for this thesis. The purpose of this thesis is to prove that FBCs have more positive impacts on the creation of the future community in terms of urban design and urban form, not to design the target area from the beginning. Therefore, based on the facts that are already defined, the models will focus on the differences between those two regulations in terms of development patterns and design standards. Lastly, since this thesis limits its scope to physical design, other components of conventional zoning and form-based codes such as process and implementation strategies are not considered here.

The diagram on the next page shows the flow of research in this thesis.

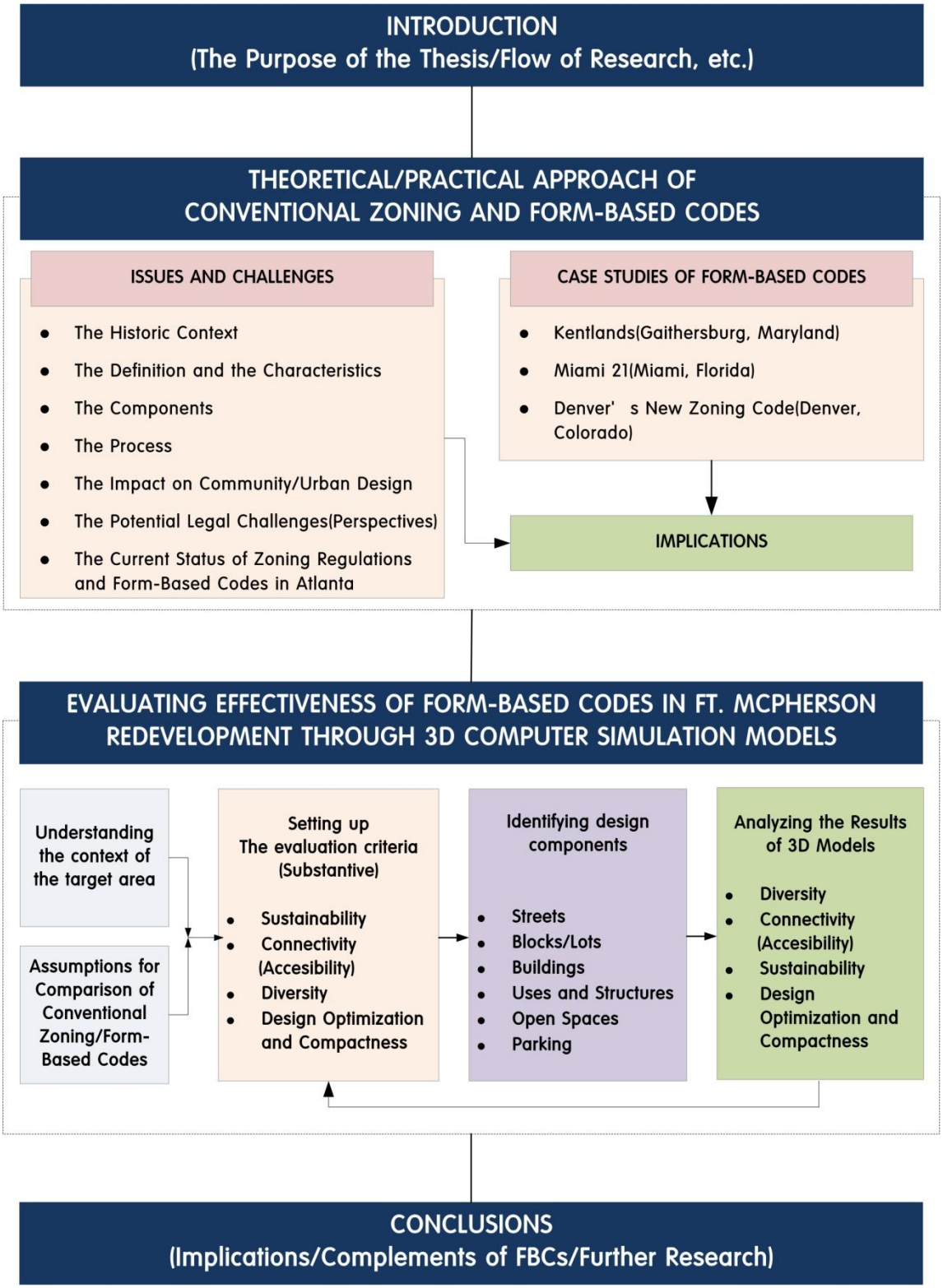

Figure 1. The Research Flow Diagram in the Thesis

CHAPTER 3

ISSUES AND CHALLENGES OF CONVENTIONAL ZONING AND FORM-BASED CODE

3.1 The Definition and Characteristics of Form-based Codes

The Form-Based Codes Institute provides a clear definition of form-based codes. Form-based codes, also called design codes or development codes, represent the relationship between building facades and the public realm, the form and mass of buildings in relation to one another, and the scale and types of streets and blocks by using both visual diagrams and words. As an alternative to conventional zoning, form-based codes foster predictable built results and a high quality public realm by using physical form instead of separation of uses that conventional zoning uses. As distinguished from design guidelines which are more advisory, form-based codes have more prescriptive and regulatory characteristics. They reflect a community's vision through public participation processes like design charrettes, and numbers or data are integrated with diagrams such as building sections and regulating plan maps. Also, to clarify the role of form-based codes, FBCI explains form-based codes as follows:

> "Form-based codes are drafted to achieve a community vision based on time-tested forms of urbanism. Ultimately, a Form-based code is a tool; the quality of development outcomes is dependent on the quality and objectives of the

community plan that a code implements."[2]

In addition, the Form-Based Codes Institute explains eight advantages of form-based codes. First, form-based codes are prescriptive, so they can achieve a more predictable result by controlling the elements for a high quality built environment. Second, form-based codes encourage public participation and specifically explain to people what they may be in the future and what aspects of their life may actually change. Third, form-based codes encourage independent development by multiple property owners by regulating development. Fourth, form-based codes provide communities with a diversity of architecture, materials, and uses based on community consensus. Fifth, form-based codes help communities to codify existing neighborhood design codes to change the built environment. Sixth, form-based codes are convenient enough for non-professional people to use them. Seventh, by using form-based codes, people do not have to consider design guidelines because the codes have a direct impact on urban form and building uses. Eighth, due to enforceability, form-based codes can pursue a shaping of the public realm and aesthetics of buildings, streets, open spaces, and landscape.[3]

Carmona et al suggest thirteen different definitions of design codes to which form-based codes belong.[4] These definitions include different kinds of names such as coding, design code, pattern book, and urban codes. In addition, characteristics of form-based codes can be divided into three categories - essential, typical, and optional. Case studies of form-based codes - which are called "design codes" in England - show most of

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[2] The Form-Based Codes Institute website, http://www.formbasedcodes.org/definition.html

[3] Ibid. http://www.formbasedcodes.org/advantages.html

[4] Carmona et al (2009). pp. 2643-2667.

the essential attributes and selectively use typical and optional attributes.

Talen[5] describes the similarities and differences between conventional zoning and form-base codes. In terms of the public realm, safety, aesthetics, order, and uniformity, both conventional zoning and form-based codes have pursued the ideal configuration of urban form, but form-based codes have many more regulations and standards than conventional zoning that directly affect urban form and the physical environment.

Conventional zoning was initially suggested to solve the problems of public health and safety, but failed to encourage a sense of community and social and economic integration of communities because it segregated different types of land and building uses too strictly. Form-based codes, however, have concentrated on mixed-use development for integrated communities and the balance between uniformity and flexibility. For more flexible application to development projects, form-based codes can consider how to create more mixed use development and integrated communities by setting up a few simple rules while leaving everything else to adaptation, innovation, and cultural distinctiveness within the coding frameworks as some argue existed before conventional zoning periods.

Third, conventional zoning generally controls the built environment by suggesting numerical parameters for urban form. By using these numbers, conventional zoning indirectly affects urban form and design, but cannot suggest exactly what a city will look like in the future. Because conventional zoning regulations are applied in a "one-size-fits-all" manner, it has been very hard for planners or officials to consider some

[5] Talen, Emily (2009). pp. 156-157

specific situations which conventional zoning does not fit.[6] However, form-based codes pay attention to the design of the public realm and the characteristics of individual buildings, public spaces, and streets. Through diagrams and tables, they suggest more detailed building uses and encourage the expression of community visions in the form of specific maps and drawings. Actually, the purpose of form-based codes is not to control or regulate buildings, streets, and land uses, but to suggest unique ways of creating the public realm in each specific planning site by suggesting diagrammatic standards that control buildings, streets, and lands.

Throughout most journal articles and research paper, the advantages of form-based codes are well argued by comparing them with conventional zoning codes. However, some papers also explain what the disadvantages of form-based codes are. It is very important to recognize the weaknesses of form-based codes because one goal of this thesis is to suggest ways to minimize their weaknesses to make a good comparison with conventional zoning.

Table 1. Comparison between Conventional zoning and Form-Based Codes

Conventional Zoning	**Form-Based Codes**
Often applied universally throughout a jurisdiction	Created for a specific planning area
Reactive, focusing on preventing bad things from happening	Purposeful, "pro-active", and focused on implementation of community planning goals and objectives
Focus on land use	Connects urban form and land use
Development standards inadvertently or intentionally discourage compact, mixed-use, and pedestrian-friendly development	Primary focus is on achieving compact, mixed-use, and pedestrian-friendly development
Text-based presentation	Liberal use of graphics to define key concepts and requirements

[6] Ibid. pp. 153-155.

Table 2. Definitions of Design Codes

Code	‘A code then, is an operating system. It is also a mediating document. It gives a vision, a language and a set of instructions for how a town, village or neighbourhood should be designed and built. A code is essentially a contract between a developer/builder and the municipality.It gives the builder/developer certain rights and requires in return the fulfilment of certain standards’.—Murrain and Bolgar (2004)
Coding	‘the idea that one set of rules on layout, building height, materials and design can be applied to entire developments’—Gardiner (2004: 27)
Codes	‘a set of rules, which can dictate everything from planning zoning to building materials to roadside setbacks’—Sutherland (2004)
Codes	‘a set of design and planning rules, which are applied across the whole development, and can dictate everything from street widths to building heights, to the use of materials, architectural design quality and planning uses’.—New Urban Futures (2004)
Codes (architectural)	‘Codes define the terms by which the built environment is designed, constructed, and used, and are equally constitutive of both the material production and discourse of architecture. While externally imposed codes have served to both regulate the shape of architectural and urban built form, as well as distinguish and professionalize architecture as a discipline, codes formulated within architecture have both focused and propelled that which was considered the theoretical center of architecture at any moment in its history’.- Perspecta35
Design code	‘Area related (but not site-specific) urban design codes or principles, usually used to structure areas of comprehensive development over long periods, but without two-dimensional masterplan. Can borrow cues from surrounding context or define anew, but no certainty over eventual form. Require long-term will to implement e.g. Hulme Regeneration Ltd and Manchester City Council (1994)’
Design code	‘A design code is a document (with detailed drawings or diagrams) setting out with some precision how the design and planning principles should be applied to development in a particular place. A design code may be included as part of an urban design framework, a development brief or a master plan when a degree of prescription is appropriate’ Cowan (2002: 16)
Design code	‘(1) A document (usually with detailed drawings or diagrams) setting out with some precision the design and planning principles that will apply to development in a particular place. It provides developers with a template within which to design individual buildings. The code may cover a group of buildings, a street or a whole area. Design codes are an important element of the New Urbanist approach. The New Urbanists argue that certain ways of building work in certain circumstances, and that it makes sense to agree and write down the approach that will be applied to a particular place. (2) General advice about design for an area. Elsewhere it would be called a design guide’.—Dictionary of Urbanism, Cowan (2004)
Design code	‘Design codes are the “working drawings” of master plans’. Evans (2003a)
Pattern book	‘Pattern books enable all participants to understand, embrace, and build from a shared perception of the desired outcomes. UDA Pattern Books are modelled after those used by builders in the past to establish the basic form of buildings and to provide key architectural elements and details’. UDA (2003: 12–13)
Town code	‘It’s a town code—no different from a kind of law—it’s the rules by which society decides it should live’—Paul Murrain, Gardiner (2004: 28)
Urban codes	The New Urbanist urban codes are not conventional ‘words-and-numbers codes’ that focus on land uses, road layouts, highways standards, etc. while containing no vision or expectation about the desired urban form. Instead, they illustrate graphically and pictorially the key principles such as street profiles, building volume, and, in particular, the relationship of buildings to streets (i.e. how private property defines public space) —Carmona et al., (2003: 252)
Urban coding	‘a system whereby land owners establish the key components of the design of new developments up front and, through legal requirement, then require abidance by any developers subsequently wanting to build in the area covered by the code. At its simplest, a code is a form of detailed guidance. A code potentially goes further. The parameters and requirements it sets out are likely to be stricter and more exact, and where possible, compliance is likely to form part of the legal arrangements governing what and how development occurs in the area governed by the code’. —CABE (2003)

Table 3. Characteristics of Coding Systems

(A)	**'Essential' attributes**
A1	Codes are in principle written by one party, with designs carried out to specification by another party or parties. In other words, there is a split between the roles of 'code writer' and 'building designer'
A2	Codes relate to more than one scale—from the built form of individual buildings to neighbourhoods and whole settlements
A3	Codes are proactive in specifying what is 'good' rather than opposing what is'bad'
A4	Codes are specific in terms of three-dimensional forms that may or must be used. In general, they are concerned with form and type rather than use. These are expressed in both written and graphic form
(B)	
B1	**'Typical' attributes**
B2	Codes tend to be prescriptive, providing a set of definite instructions, rather than providing general guidance or advice. More 'shall' than 'may'
B3	Codes tend to engage a range of 'urban design professions'—typically including architecture, planning, engineering and environmental design, etc.
B4	Codes tend to be specific about architectural features such as walls, roofs, and their materials, etc.
B5	Codes are typically associated with larger development sites—greater than the scale handled by a single architect
B6	Codes are typically intended as a guide to ongoing or long-term management of a development, not just a single act of conception followed through to construction
(C)	Codes typically seek to or actually form part of a
C1	legally binding agreement
	Optional attributes
C2	Codes may support a wider master plan; may be
C3	preceded by a spatial masterplan, development framework or other design work
C4	Codes may be drawn up for application to a specific site
C5	Codes may have public/stakeholder participation built into the process
	Codes may be used to generate traditional style urban development—but are capable of generating any other desired style
	Codes may be used to create high-quality developments using high-quality materials, etc.—but need not only be for the affluent

3.2 The Historic Context of Form-Based Codes

To understand how form-based codes can remain consistent and gain popularity, it is necessary to trace their historical context and origin. Throughout the limited literature on form-based codes, their historic context and origins can be identified in both a broad and narrow sense. Although most research literature agrees on the origin of form-based codes, the historic contexts of the use of form-based codes in contemporary urban planning are different in each country because cities in each country have developed their own solutions to different urban problems based on their own background of urban forms and development patterns.

According to Talen[7], the first attempts to create and implement codes for regulating the built environment were made by the earliest written laws such as 'Hammurabi' law and Indian laws dating back 3,000 or 4,000 years, which clearly mentioned quality building, layouts of streets and towns, and house placement. Based on these laws, the use of codes for regulating the built environment and urban forms can be seen throughout urban planning history. In ancient Greece, Hippodamus set up straight and wide streets for Greek colonial cities, and city plans during the Roman era had structured urban patterns and forms based on Roman street standards or Vitruvius' Ten Books on Architecture.

From the sixteenth to the nineteenth century, Europe and the United States used design codes to set up rules for comprehensive urban structure and layouts of buildings, streets, and parks. In the United States, the Laws of Indies in the sixteenth century set up rules for arranging streets and the location of buildings based on its importance to build

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[7] Ibid. pp. 147-149

colonial towns in America. In the eighteenth century, the planned city of Savannah, GA, by James Oglethorpe provided basic principles and provisions of modern zoning and subdivisions by setting up rules for fixed planned units and a uniform block structure. In Europe, written laws such as London's Rebuilding Act of 1667 which specified building heights based on type of street, and Dutch and Prussian's laws of regulating building frontage played an important role in creating modern design codes or form-based codes.

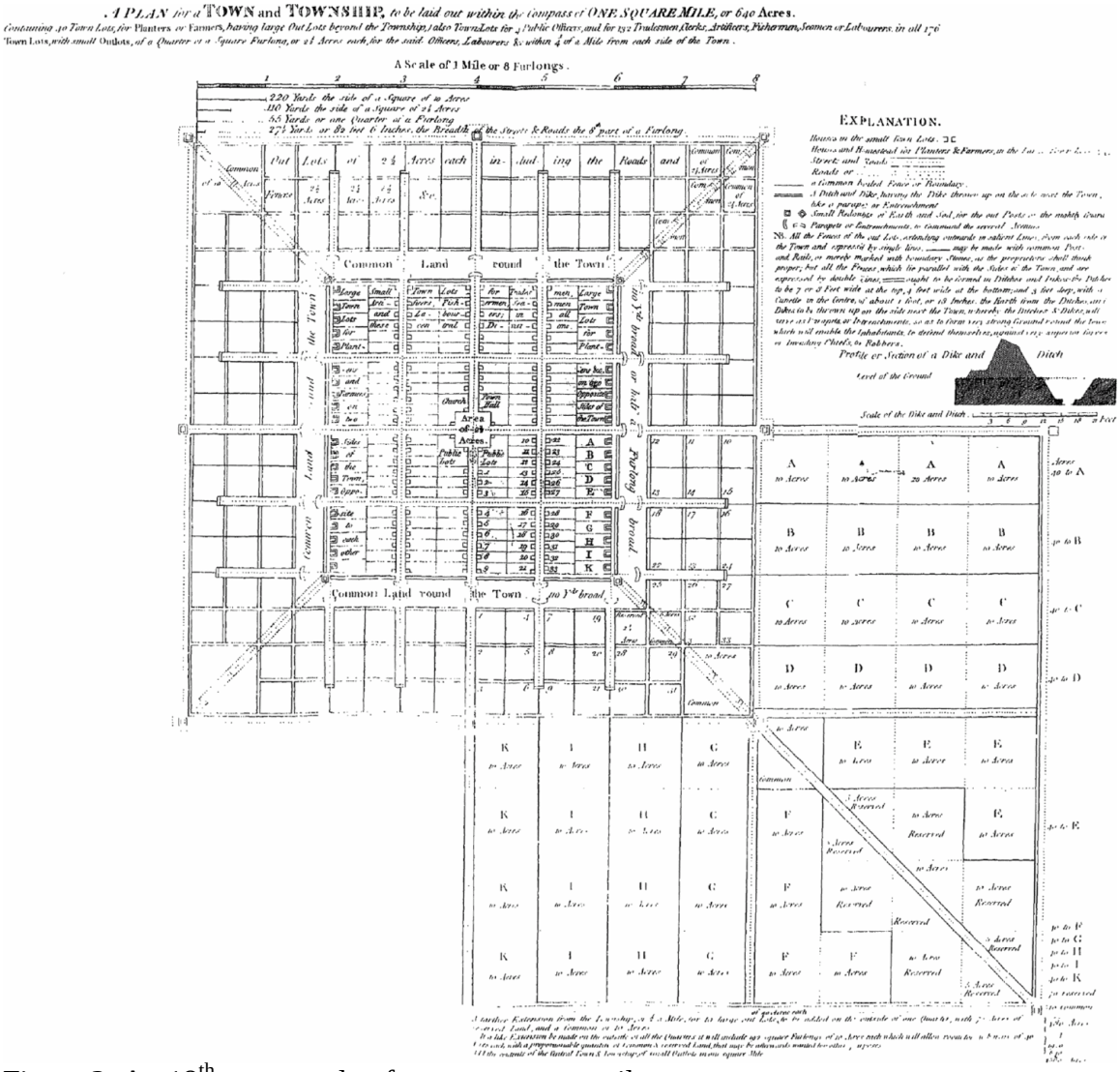

Figure 2. An 18th century plan for a one square-mile town

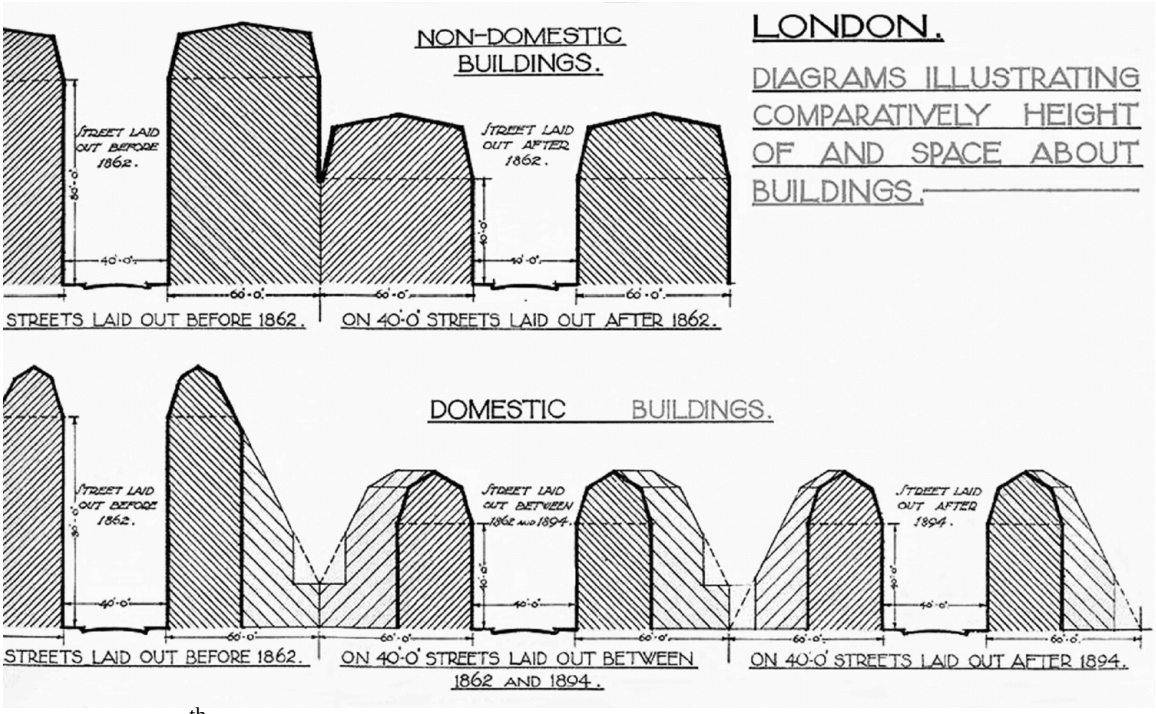

Figure 3. A 19th century code regulating building height and setbacks in London

As for the emergence of form-based codes or design codes in modern urban planning in the United States, design codes in European countries did not take root in the United States, and development regulations were developed separately as a response to urban conditions and problems such as public health, welfare, and private investment in housing. American urbanization in the nineteenth century did not clearly mention urban form or regulations such as building heights, street width, and frontage although there were laws affecting urban form indirectly such as New York's Tenement House Act of 1867. In the twentieth century, the codes and laws were incorporated by zoning regulations. As a technical solution to the negative aspects of industrial cities and urbanization at that time, zoning regulation – which also gained an enforceable legislative position after *Village of Euclid v. Ambler Realty* – suggested separating land uses for the protection of public health, safety, and welfare. Especially, as more comprehensive

schemes for zoning, the New York zoning ordinance of 1916 encouraged the separation of uses and decentralization of cities for a wider distribution of people by class or income. At the federal government level, the Standard State Zoning Enabling Act was enacted in 1926 and accepted by all 50 states later. Other then these traditions, Federal Housing Administration(FHA) regulations after World War II also had an indirect influence on setting up the urban form in the twentieth century by setting standards for street widths, block lengths, and dwelling sizes. Although there had been several revisions of and amendments to these zoning regulations and laws, cities in the US had expanded their boundaries into nearby rural areas and experienced urban sprawl without having proper controlling means.[8]

As early as the 1960s, planners began to recognize that the conventional (Euclidian) zoning that dominated during most of the twentieth century had caused negative effects on urban and suburban forms, including inefficient land use, serious social segregation, and added costs of conventional zoning codes. In response to these problems, form-based codes were promoted as the antidote by focusing on the physical urban form and affecting the built environment directly. In 1982, Seaside, Florida, planned by Andre Duany and Plater-Zyberk, was one of the early attempts to suggest a form-based approach to creating more revitalized communities. In 1993, Congress for the New Urbanism(CNU) supported form-based codes and suggested several aims: visual harmony in the public realm, continuous urban frontage for uniformity, and sensitivity to spatial context.

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8 Ibid. pp. 153-156

Parolek et al also explain the historic background of form-based codes.[9] For almost one-hundred years, traditional zoning regulations have undergone a lot of changes. The initial goal of conventional zoning in the early twentieth century was to protect residential districts from industrial districts for the improvement of public health, safety, and welfare. However, as the number of zoned municipalities was rapidly increasing - from only eight municipalities in 1916 when New York Zoning regulation was established to 874 municipalities in 1930 - conventional zoning codes faced their limitation of segregating land uses and urban sprawl. Although there were some "Band-Aid" solutions such as "performance zoning" and "incentive-based zoning", these "Band-Aid" zoning codes had only limited success, and communities were not satisfied with these modified zoning codes. In the 1990s, several cities and counties began adopting form-based codes in the form of Traditional Neighborhood Development ordinances, and city governments continued to advance their regulatory approach and expand its scope of work into "Greenfield" areas and the regional level.

Nevertheless, Kaizer explains that some municipalities are still using conventional zoning in the form of a "hybrid" code which combines form-based code components or principles into conventional zoning – for example, the mashing of conventional zoning codes with graphic urban design standards that typically address setbacks, parking placement, building bulk and heights, materials, and architectural features. [10] Such a hybrid code emerged recently because developers and local governments think that replacing conventional zoning for form-based codes seems daunting and because it is hard to understand and be integrated into existing zoning

[9] Parolek et al (2008). pp. 7-10
[10] Kaizer (2009). pp.84-85

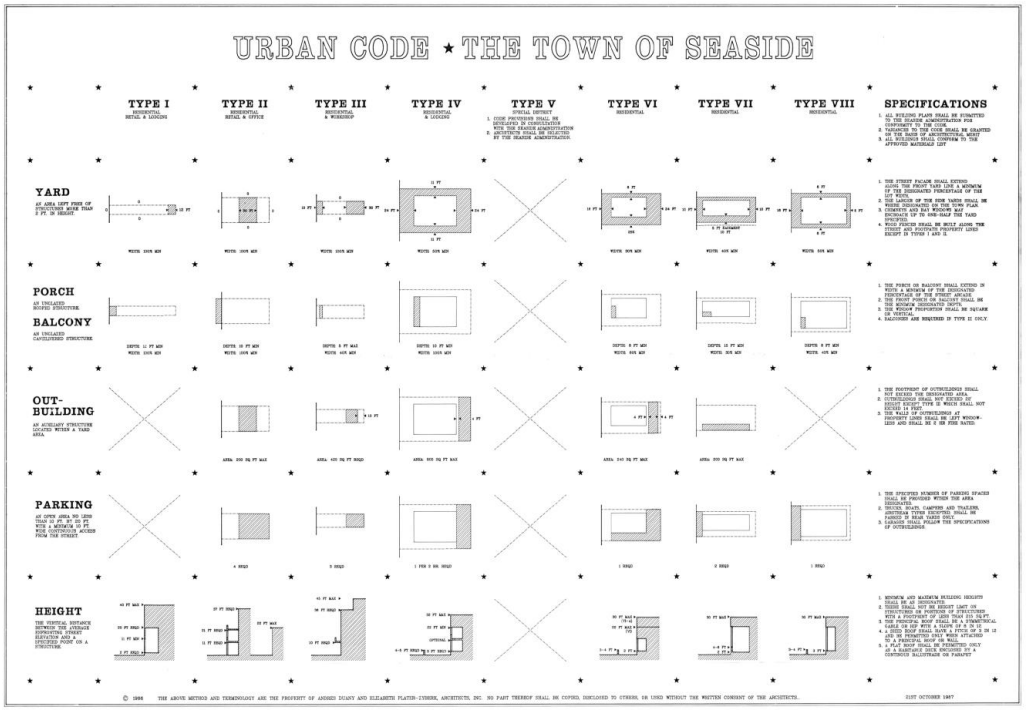

Figure 4. A Seaside Urban code

regulation or comprehensive city plans. However, a hybrid code cannot achieve the goal of the public realm and miss some important principles or strengths such as predictable outcomes and discretionary review process through public participation. Recently, form-based codes expend their scope of work into the regional level, and the integration into a citywide code is very similar with that of conventional zoning revision because their components such as building form standards, building height, street design standards, and building frontage are successfully compatible with components of conventional zoning like floor area ratios and density.

3.3 Components of Form-Based Codes

Components such as a regulating plan, public space standards, building form standards, and administration play a very important role in creating and maintaining

public realm. Most of components are illustrated and sometime explained by using form-based code matrix for building uses. Also, planners can add more form-base code standards such as architectural standards, block standards, and landscape standards if necessary. Each component has its own elements with typical descriptions and regulations included. Each element provides desirable levels of descriptions and regulations to which people do not have any resistance and generally reach consensus rather than regulations that intend to control and limit people's needs and demands.

Parolek et al specify these components and elements of form-base codes. In organizing a regulating plan, transect-based codes consisting of six continuous transect zones are the simplest and most convenient way to draw a regulating plan, and a regulating plan is generally created when the rest of the form-based codes are created. The public space standards have two elements – thoroughfare and civic space. To make communities more walkable and accessible, street types are drawn based on building use or transect zones as forms of elevations or sections of the streets. Civic spaces are determined based on acreage, location, size, allowable transect zones, and general character, and civic space types are illustrated. Through building form standards, frontage type standards, building type standards, block standards, and architectural standards, individual buildings can be thoroughly analyzed or controlled in the form-based codes.[11] Some elements of these standards related to buildings can be used instead of some of conventional zoning codes. For example, Build-to-Line (BTL) can replace setback in the conventional zoning codes. Build-to-Line is defined as a line parallel to the property line where the façade of the building is required to be located. It prescribes a consistent place

[11] Parolek et al (2008). pp. 39-58

of building facades along public frontages, including thoroughfares, parks, and alleys.[12] Build-to-Line also provides a useful tool for arranging building lines along streets and creating public realms. Like other standards of form-based codes, each element of the building-related components is documented in great detail.

As one example of form-based code practices in the actual plan, the Sacramento Area Council of Governments (SACG) explains the required components.[13] The form-based codes of Sacramento Area Council are based on "Smart Code," which provides a "package" of form-based code by Andre Duany. Unlike other form-based codes, The Sacramento Area Council also uses the term "Hybrid Form-Based Codes," which incorporates a form-base code approach toward form, but uses provisions, processes, and standards from the current code. This is another attempt which tries to reduce uncertainty by integrating pre-existing codes, not replacing them. All elements and components of the SACG form-based codes are also illustrated, and a matrix of form-based code descriptions and regulations is used for each building use and form.

3.4 Process of Form-Based Codes

As generative and stepwise layout guides, form-based codes can be logically ordered, but like other planning processes, it is hard to arrange the process and follow it because there are other unexpected variables that intervene in the form-based code process such as feedback and reconsideration of the concept in the middle of the process.[14] Also, the form-based code process can vary according to project types and

[12] Ibid. pp. 41-44
[13] Sacramento Area Council of Government (2008). pp. 10-15
[14] Talen, Emily(2009). pp. 152-153.

plan conditions. Setting up the process is very important because the impact of community redevelopment on the future built environment change can be determined by how to define the process and terms mentioned in the form-base codes.

Parolek et al provides the general form-based code process.[15] The form-based code process consists of one pre-phase and three major phases: scoping, documenting, visioning, and assembling. In the pre-phase, people create working groups for the codes, select a process, define the application area, and determine the implementation methods, which might include comprehensive replacement of existing code, optional/parallel, freestanding, and pilot projects. These decisions and definitions help people to keep their visions straight during the process.

In the documenting phase, form-based code teams do site visits twice. During the first site visit, people identify the macro scale, including defining neighborhoods, districts, and corridors. These macro elements will be used to help the participants understand the existing urban framework. Then, people create base drawings based on these macro data. During the second site visit, the macro scale such as streets, blocks, and buildings is identified. Sampling areas that show the typical characteristics of the entire site should be selected. Also, to collect more detailed data, the team prepares site visit materials by making block documentation matrix templates. The templates include blocks, building placement, building form, parking, building types, frontage types, and so on. Also, the team creates a thoroughfare data matrix with sections of the streets. Both the macro and micro scale analyses help planners to fully understand the project site and identify the design issues. In the visioning phase, a detailed vision which can put form-based codes in

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[15] Parolek et al (2008). pp. 95-97.

place is made, and illustrative plans in which the macro and micro scales are integrated are created. A regulation can be created based on the transect zones, and the teams can review those transect zones and their regulations. Also, by reviewing the transect-related regulations, the teams modify the transect zone drawings and regulations. In the assembling phase, the team finally publishes a form-based code book. To publish the form-base codes, the team decides on the paper size, font size, and layouts of the page.

As one best practice, the Sacramento Area Council of Government (SACG) also has its own process.[16] The SACG process is divided into five processes, but the framework of the SACG form-based code process is very similar to that of Parolek's approach. However, considering that it is a more participatory form-based code process, the SACG process is more focused on identifying people's demands and the methods or techniques.

3.5 Legal Perspectives on Form-based Codes

Although form-based codes are regulatory rather than advisory like urban design guidelines, research on legal perspectives of form-based codes still remains undiscovered. Despite the limited literature available, some literature of law schools has focused on legal issues that arise when local governments or communities begin to establish and implement their regulatory tools.

Sitkowski and Ohm[17] divide legal issues of form-based codes into three categories and suggest solutions to legal challenges of form-based codes. First, some states such as Pennsylvania, Wisconsin, and California began to authorize form-based

[16] Sacramento Area Council of Government (2008). pp. 22-24.
[17] Sitkowski and Ohm (2006). pp. 163-165.

regulatory techniques by integrating the existing zoning regulations or establishing a new bill for form-based codes. Notably, California Governor Arnold Schwarzenegger signed Assembly Bill No. 1268, which authorized the location and extent of land uses and the zoning ordinance that expresses community intentions regarding urban form and design. Also, the bill mentioned that the expressions in the zoning ordinance or city comprehensive plans should have form-based code components such as a mixture of land uses and housing types within each neighborhood district, and urban corridors, and provide specific measures for regulating relationships between buildings and between buildings and outdoor public areas, including streets. Also, for its authorization, form-based code land development regulations must satisfy the requirement of substantive due process because they are also enforceable, and should be used for the public health, safety, morals, and general welfare as conventional zoning regulations did after the case of *Village of Euclid v. Ambler Realty*.

In addition, form-based codes also meet the principles of procedural due process, which suggests sufficient details and standards to alert applicants to what is expected of form-based codes while allowing sufficient discretion in the decision-making organization to determine form-based code approval. However, local governments have chosen the middle point between discretion and prescription by using design guidelines without the requisite disciplines.[18] Also, as mentioned in the difference between form-based codes and design guidelines, when design guidelines do not have detailed standards and are not regulatory but only advisory, authority for design guidelines becomes delegated, resulting in decisions based on board members' tastes or preference. Therefore,

[18] Ibid. pp. 165-169

by establishing the discretion and prescription continuum, form-based codes can maintain detailed design standards such as architectural standards or street design standards while satisfying the requirement of procedural due process through public participation like that which takes place in a design charrette.

Form-based codes must have delegation as one of their fundamental legal principles. Actually, form-based codes have not been seen and administered by local government officials because they are usually developed by private developers or community people through public involvement in activities like design charrettes. Due to this, the organizations which can successfully review ideas and make substantive decisions during the form-based code process do not have authority to implement form-based codes regulations for themselves without any approval in the local governmental context. To solve this problem, local governments can create a "Town Architect" position that can function as a mediator.[19] This local governmental employee also reviews applications and makes reports to the decision-making organizations. However, when local governments create this position, the issue becomes how much authority should be given to a town architect to provide form-based codes with a legal basis for delegation.

3.6 Critiques about Form-based Codes and New Urbanism

As for the disadvantages of form-based codes, Mary E. Madden et al mention their weakness based on the time and the cost which that they require due to their characteristics and process.[20] First, a certain amount of cost should be required to obtain the advantages of form-based codes, and sometimes this cost will be much bigger than

[19] Ibid. pp. 169-172
[20] Mary E. Madden et al (2006). pp. 174-178.

the cost of conventional zoning because many local government officials still do not understand form-based codes, and it takes more time for developers to reach consensus with communities and local governments for final approval of development projects. These administrative and time costs may be beyond some developers' capacity. Also, since they have inherent uncertainty, form-based codes require patience and perseverance on the part of the participants if the process is to be followed. Third, due to their indifference toward the long-term vitality of the community and fear of the risk of a different development, developers frequently do not want to change their conventional zoning approach into a form-based code approach because they are not willing to fully understand form-based codes, which seem daunting and risky for them to apply to their development. However, the time and the cost required by the process and features of form-based codes need to be considered and weighted against how much time and cost would be actually wasted through any quantitative benefit and cost analysis of form-based codes and a comparison with that of conventional zoning.

Apart from these internal weaknesses, Innis tried to find some critiques of form-based codes from social and political points of view while focusing on the decline of civic life.[21] First, in terms of social aspects, form-based codes are based upon New Urbanism in response to solving problems of conventional zoning such as social exclusion by segregation of land uses and the unpredictability of the future outcome. However, New Urbanism, which form-based codes come from, has no single definition or type and has suffered from many competing types of forms, planning, and cultures. For instance, some types of urbanism pursue an exurban view that looks at the areas

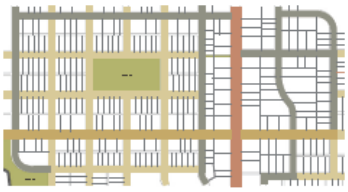
[21] Innis (2008). pp. 75-90.

outside cities, whereas other types of urbanism suggests an ecological view for sustainable development and harmony with the built and natural environments. These competing and contradictory ideas of urbanism make it hard to define and provide multiple definitions. Second, the components of traditional urban design codes upon which New Urbanism is based result from accidental developments, so it would be nearly impossible for planners to make them clear through a highly stylized and categorized planning scheme like form-based codes. Third, the concepts of New Urbanism such as the integration of community and the identification of spatial relationship between building facades and the public realm are a rhetoric expression, and people living in cities do not have a clear idea of what those concepts mean in terms of physical design. People only have an abstract desire or demand for "community." Even traditional communities, ones which New Urbanism seeks to create, have often abandoned people who were disadvantaged or had low income by using their "well-designed" communities as barriers against other people and making their communities distinctive from others. Lastly, in a sense of commonality, some people in the city are not willing to promote their communal interactions or communal consensus for integrated communities based on New Urbanism. Instead, some interest groups usually get involved in the design charrette process and exclude persons who are against their interests or goals. The sometimes elitist characteristic of form-based codes may cause more serious social segregation of building uses, land allocation, and connectivity within the city.

Finally, although some New Urbanists mention that the form-based codes in the urban planning history emerged as a response to problems of conventional zoning, conventional zoning did not exclude a form-based approach due to preference of a use-

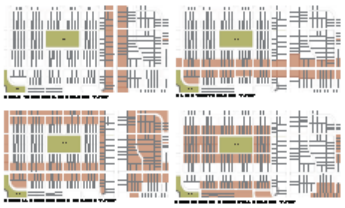
based approach.[22] For example, as the current basis for many conventional zoning regulations, the 1926 Standard State Zoning Enabling Act has also provided many physical design components such as height, number of stories, size, lot coverage, density, and location of structure and land in the "Grant of Power" provisions. These components affect the key regulatory components of form-based codes, and also provide chances to "create" the key regulatory tools or components by reinterpreting conventional zoning components and adding more variations or combinations of design components to form-based codes. For example, instead of setback regulations, form-based codes also consider a "Build-To-Line" for continuous building facades along the streets; instead of floor area ratio, minimum stories and maximum stories of buildings and building uses by section are included in the form-based codes. Instead of categorizing land uses into residential, commercial, and industrial uses on the land use map, a regulating plan organizes and regulates land uses based on three basic organizational approaches – street-frontage hybrid, building type-based, and modified transect.[23]

Table 4. Three Basic Organizational Approaches of FBCs

Code Type	Sample	Application	Comment
Street-Frontage Hybrid		A street-frontage hybrid form-based code establishes the character and design of the various street types within a community. Building design and frontage standards and street types may be mixed and matched where needed.	This type of code is most appropriate for an area where there are both existing streets as well as new streets that can be designed to respond to desired building frontage types. This approach helps to give definition and character to streets and buildings facing the street.

[22] Garvin and Jourdan (2008). pp.395-421.
[23] Sacramento Area Council Government (2008). p. 33.

Table 4. Continued

Code Type	Sample	Application	Comment
Building Type-Based		Individual building types and the design requirements for each are applied to different blocks or districts within the planning area.	This approach tends to work best for small or large planning areas where the primary design focus is directed toward the compatibility of building types within a block of neighborhood. This type of code is applicable to greenfield or infill, and can be combined with the street-frontage hybrid type.
Modified Transect		while the transect is largely theoretical in nature, modifying the transect to address local conditions produces a code that is consistent with the community's character and its vision for the future.	The modified transect approach has the capacity to address unique community character and conditions. This type of code is applicable to large or small zones, greenfield or infill, and can be combined with the street-frontage hybrid type

3.7 The Impact of Form-based Codes

As Innis (2009) mentioned, form-based codes are implemented by a spontaneous, self-generated form of social organization based on economic concerns rather than social and political concerns.[24] Therefore, the impact of form-based codes can be identified in terms of economic development. Polikov explains that the nature of economic development has changed.[25] Before New Urbanism, economic development was generally focused on how to attract businesses into the community, but economic development is now more concerned about how economic development remains connected to place and the environment to improve the quality of life for all people in the city. In terms of economic perspectives, the goal of New Urbanism is a "back to the

[24] Innis (2009). pp. 90-103
[25] Polikov (2008). pp. 7-16.

tradition" approach by finding the relationship between real estate development, architecture, and urban planning. As mentioned in the "Ahwahnee Principles" before New Urbanism, sustainable economic development can be achieved by the creation of complete and integrated communities containing housing, shops, work places, schools, parks, and civic facilities for the daily life of the residents, and they will compromise its components. These compact, efficient mixed land use developments, designed with form-based codes and New Urbanism principles, will prevent urban sprawl and provide ideas of "where cities should grow" and "how cities should grow." Also, the predictable outcomes after form-based codes are implemented can promote predictability in land markets and protection of value over time. That is, place-making and the public realm as one of predictable outcomes create opportunities for value capture. Value capture which results from form-based codes can cause some marginal improvement in the value of the surrounding lands or districts; in addition, design and implementation under the same sets of rules or standards like form-based codes over multiple parcels or blocks increases adjacency predictability and land value. Therefore, the concept of value capture for sustainable economic development can be used as one fundamental evaluation criteria for form-based codes.

3.8 Future Trends in Form-based Codes in Urban Planning and Design

Two future urban development approaches to code making that Ben-Joseph suggests are entrepreneurial private urbanism and ecologically oriented developments. When form-based codes and Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) provide people with a kind of societal learning,

entrepreneurial urbanism and eco-projects will play an important role in making new and universal design codes.[26] By entrepreneurial urbanism, many mega-projects that are usually implemented by public sectors can be planned and implemented by large private development companies that have various skills and techniques to support large-scale development. These Entrepreneurial Urban Projects (EUPs) create two perspectives on design codes and regulation. First, EUPs that are planned and implemented by international development companies will create universal design codes that can be used to develop any development sites regardless of their local characteristics, and these codes will change the perceived urban image of the people living that specific area. The universal codes will contain homogeneous attributes and build projects with the "symbolic aesthetic of up-to-dateness".[27] Second, due to these universal and generic codes, local government will allow for different sets of rules and regulations because large-scale projects will be implemented by international development companies, and local government are possessed by their marketing and internationalization of design via media and the Internet. This tendency will make local governments accept universal codes without much consideration of their unique local characteristics. In ecologically oriented projects(Eco-projects), environmentally oriented checklists will serve as a new tool for influencing the coding process. Especially, LEED-ND, as a voluntary, consensus-based, market-driven building rating system based on environmental performance, will promote more place-based and well-design communities. LEED-ND also fits the components because it is based on evaluation of current policies and practices to consider barriers to code making for sustainable development. The scoring and rating system of

[26] Ben-Joseph (2009).pp. 2692-2696.
[27] Ibid. p. 2696-2699.

LEED-ND provides form-based codes with bases for structural incentives like density and height bonuses and financial incentives such as lower impact fees or tax increment financing.[28]

Talen also emphasizes several trends of form-based codes in the future. First, unlike past codes that had ordered urban framework achieved by a few simple rules, modern form-based codes will have more comprehensive, precise, and specified characteristics by setting up various components. However, codes will be organized and formatted so that normal people can easily understand and predict the future outcome. Public participation process such as design charrette process of form-based codes will provide communities with shared community visions and consensus of goals of form-based codes. Lastly, in contrast with the first trends, planners will also think about the way of minimizing regulations like past codes. In other words, determining the degree to which form-based codes can or should regulate the physical environment will be one of the main issues for planners in the future. To solve this problem, planners should be careful to define the "essential" components and choose the "typical" and "optional" components of form-based codes for a specific development.[29]

3.9 Evaluation Criteria for Form-based Codes

The Form-Based Codes Institute suggests lists of questions for effective form-based codes. The enforceability of form-based code section should reflect specific community intentions, clearly describe the components, texts, and diagrams, be coordinated with other applicable policies and regulations for the same property or

[28] Ibid. pp. 2699-2700.
[29] Talen, Emily (2009). pp. 157-159.

districts, and be designed to be regularly updated. In the usability of form-based codes section, the format and the structure of form-based codes should be made so that people can easily access what they want to find; users should be easily able to identify the physical form in the future which is planned and designed by the form-based codes. In terms of functionality, the codes should shape the public realm to encourage pedestrian use and social interaction; the codes should be based on a sufficiently detailed physical plan and contain clear community visions that directly reflect development and contribute to implementation. [30] Also, before evaluating the form-based codes, the clear identification of their characteristics should be made.

Despite these evaluation checklists, planners have been dependent upon case studies because New Urbanism, which compromises the ideology of form-based codes, is based on a "case-by-case" approach by accepting a kind of "accidental" development from traditional urban design. However, for setting up evaluation criteria for comparison between conventional zoning and form-based codes through the physical alternative models, Fleissig and Jacobsen's Smart Scorecard can be very useful to evaluate and compare the impact and effectiveness of form-based codes with that of conventional zoning. Smart Scorecard was suggested to evaluate the effect and the impact of smart growth development projects, but the ten components for smarter projects also fit form-based codes well because the principles of smart growth and form-based codes have a lot in common in terms of creating the public realm and the place-base approaches. Each component of Smart Scorecard has its own possible measures for evaluating smart growth development projects. Each possible measure has points, and the total points of

[30] Form-Based Code Institute Website. http://www.formbasedcodes.org/checklist.html.

Smart Scorecard determine whether the development project contains smart growth components and follows the smart growth objectives such as sustainability, diversity, mixed use, and connectivity.[31]

3.10 Conventional Zoning and Form-based Codes in Atlanta

The current zoning ordinance of Atlanta is based on the 1980 zoning ordinance which contains Atlanta Code of Ordinance. It consists of twenty-nine chapters, and some chapters have several sections. It contains standards for each of the land uses and implementation strategies and provisions. Since 1980, the City of Atlanta zoning ordinance has had several revisions and gradually adopted some components of form-based codes such as mixed-use development districts.

In 2007, the Georgia Department of Community Affairs (DCA) proposed DCA's 2007 Model Land Use Management Code, which was the final product of the "Alternatives to Conventional Zoning" project. This Model Code was suggested to help communities throughout Georgia to make community plans for themselves. By providing local governments with a set of relatively simple tools, both old and new, the Model Codes serve as a one-stop shop for a variety of regulations designed for communities with limited capacity to prepare and administer these types of tools like a Smart Code by Andre Duany. Along with traditional tools, such as subdivision regulations, the code introduces a variety of alternative and innovative approaches such as a Land Use Guidance System and Design Guidelines. Form-based code provisions are provided in parts 9-5 and contain several requirements such as building, parking, street, streetscape,

[31] Fleissig and Jacobsen (2002). p. 2.

architecture, and landscape. The definition section clearly defines "Residence as Part of Mixed-Use Building" as one of type of dwelling and suggests four character areas – Urban (URB), Traditional Neighborhood (TND), Suburban Residential (SUB), and Rural/Exurban (R-EX) – based on the transect-based approach.[32] Each character area has permitted/exception/excluded uses and detailed design standards such as height, build-to-line, minimum building frontage, maximum building intensity, maximum impervious surface coverage, off-street parking, open space, street, and streetscape. Like other form-based codes, the form-based code provisions in the Model Codes also use jargon different from that of conventional zoning. This jargon may help people and planner to understand the form-based codes easily, but also provides authority which means whether the form-based code provisions are compatible with the terms in the City of Atlanta Comprehensive Plan and zoning ordinance. To solve applicability, administrative, and legal considerations, Attorney Frank Jenkins, III reviewed all the selected policy tools of the original code as to their legality in Georgia. Professor Julian Juergensmeyer of Georgia State University provided the legal review for the modules of phase 2. In addition to this legal review, all policy tools considered for inclusion in the original model code were first reviewed and discussed by the advisory committee, which included representatives of Georgia's regional development centers, and DCA's planning office and quality growth office. Based on the consensus of legal issues, DCA's model codes and form-based codes can play a major role in developing community design plans or planning strategies in the future.

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[32] Georgia Department of Community Affairs Website. http://www.dca.state.ga.us/development/planningqualitygrowth/programs/modelcode.asp

3. 11 Implications from the Literature Review

Through the research literature review, two important implications on conventional zoning and form-based codes are considered. First, throughout the history of urban planning, efforts have been made to codify the built environment and urban form. In a broad sense, form-based codes, such as those included in Hammurabi's Law and Indian's Law, date back to ancient cities. In a narrow sense, London's setbacks and height regulations in the 19th century based on street type gave some thought of how to create "public realm," which is the main purpose of form-based codes.

Second, through the research literature review, there has been no research or attempts to prove how form-based codes or conventional zoning can provide the better physical environment by actually selecting a target area and simulating it. Also, there are a lot of discussions about why form-based codes provide better physical environments, but there are no studies that prove such claims. Even if form-based codes take a "case-by-case" approach, setting up the evaluation criteria and making comparisons between conventional zoning and form-based codes may help urban planners and designers to recognize the impact of the different regulation systems on community revitalization.

CHAPTER 4

PREPARATION FOR COMPARATIVE ANALYSIS OF CONVENTIONAL ZONING AND FORM-BASED CODES

4.1 Defining the Target Area: Fort McPherson Redevelopment

4.1.1 Understanding the Historic Context and Existing Framework

As a 488-acre military base in south Atlanta, Fort McPherson has remained the first permanent Army base in the Southeast since 1889. In the northeast portion of the Fort McPherson site, there are 40 historic buildings that are already registered in the National Register of Historic Places. On the base, there are 71 acres of land for administration use, 58 acres for residential use, and an eighteen-hole golf course.

As Fort McPherson was designated for closure, the Fort McPherson redevelopment plan has been prepared to transform the base into a new mixed-used neighborhood.[33] Through broad participation and cooperation among the surrounding neighborhoods, the city government, developers, and the U.S. Army, the phase one envisioning process and guiding principles were suggested within ninety days, and the current status of Fort McPherson was analyzed to identify design issues and design standards. The final community workshop was held on April 27, 2010, and land use

[33] In the 1980s, due to advanced military technology, the United States Army considered closing and realigning some excess bases for more efficiency of military services with declining budget and providing quality services to local communities around the bases. In 1988, based on the Base Realignment and Closure Act of 1988, the first round of Base Realignment And Closure (BRAC) was announced and determined which bases would close and how to reorganize exiting bases (See Defense Base Closure and Realignment website. http://www.brac.gov/).

categories and the Fort McPherson Zoning Blueprint were suggested.

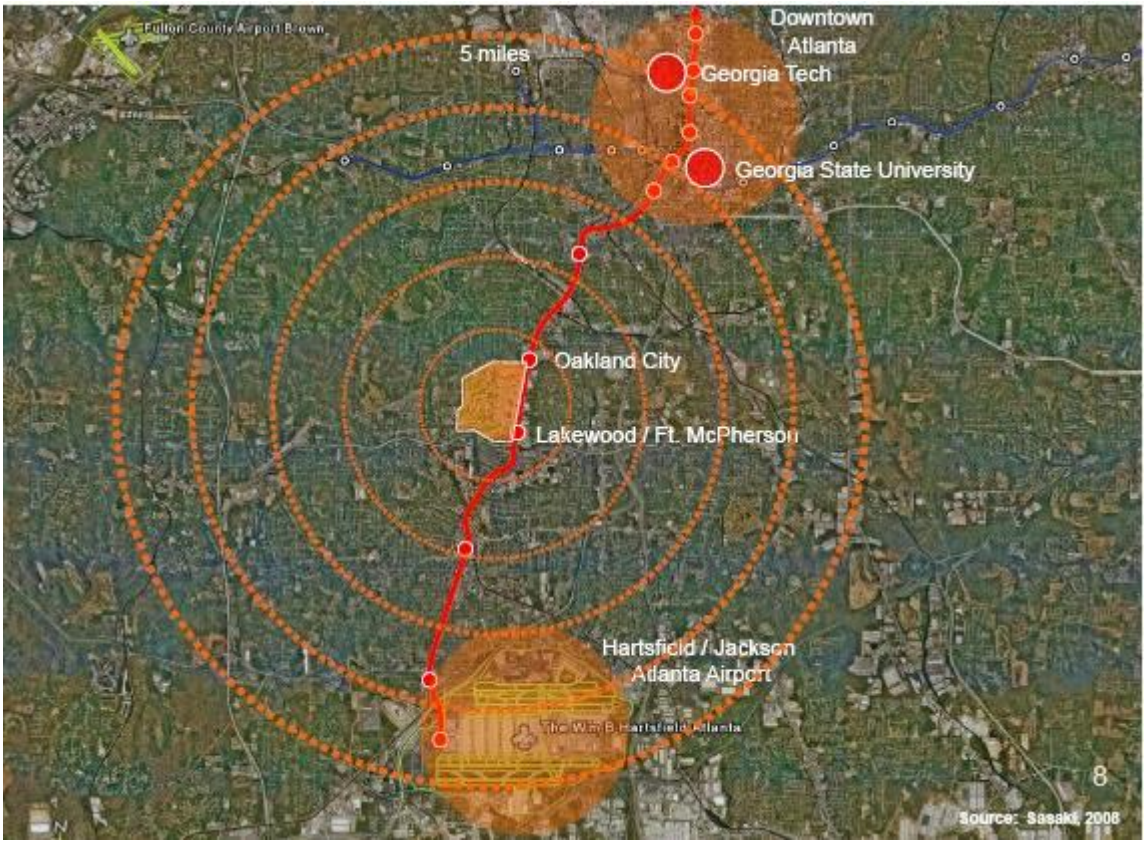


Figure 5. A Location Map of Ft. McPherson

By using the process of form-based codes, the existing framework and current status of Fort McPherson can be understood at both the macro and micro level. At the macro level, Fort McPherson is located between downtown Atlanta and Hartsfield-Jackson International Airport, so it has excellent access and potential as an office and commercial district combined with residential use as a part of the surrounding neighborhoods. Near the base, there are two MARTA stations – the Lakewood/Ft. McPherson station and the Oakland City station – both of which provide convenient access to the base. Also, according to the Beltline and the Peachtree Corridor transit plan, a 22-mile transit route will pass by Fort McPherson, and a street car will run from

Buckhead to Fort McPherson, which will strengthen accessibility from many places in Atlanta. Around Fort McPherson, there are fifteen educational facilities – one high school, three middle schools, eight elementary schools, and three other educational facilities. Schools around the base are operated by the Atlanta Public Schools(APS) or the Fulton County Schools except for Woodward Academy, which is operated independently. Third, Fort McPherson belongs to NPU-S, but the base is adjacent to NPU-X and R. In the 2008 Atlanta Land Use Plan, most of the areas to the west and north side of the site have residential uses, but across Lee street, there is a deteriorated industrial area, whose land use will be converted into mixed-use districts.[34]

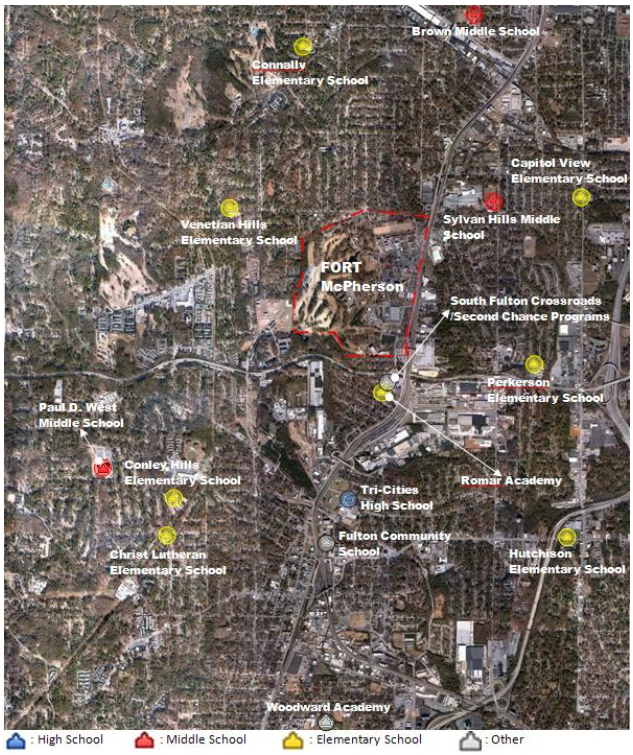


Figure 6. Education Facilities in Ft. McPherson

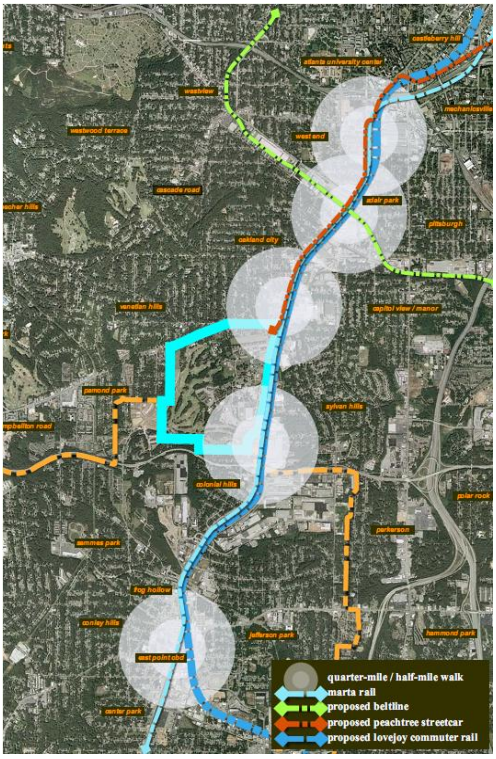


Figure 7. MARTA stations and Proposed Transit Lines

[34] McPherson Local Redevelopment Authority (2007). pp. 7-11.

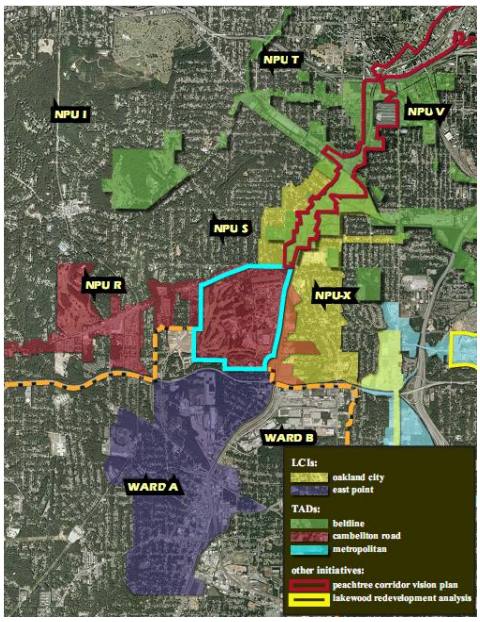


Figure 8. NPUs around Ft. McPherson

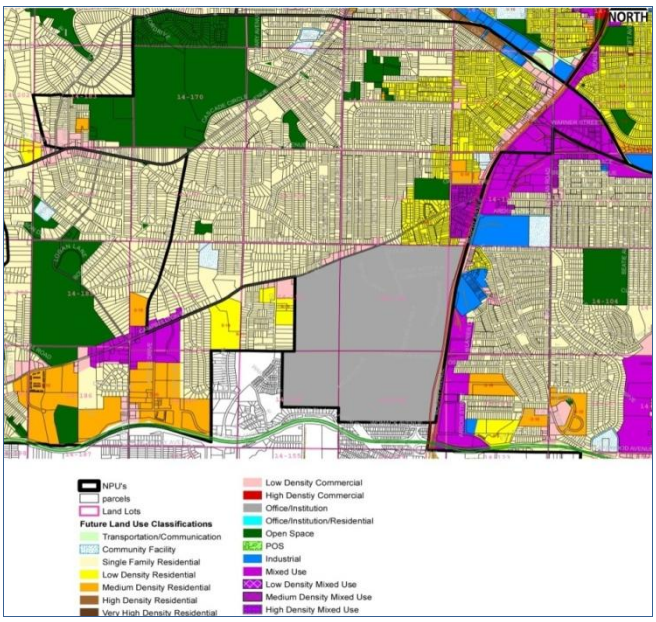


Figure 9. The 2008 Land Use Plan around Ft. McPherson

At the micro level, about 260 acres of land are occupied by 253 buildings, and 220 acres of land consists of recreational spaces largely taken up by an eighteen-hole golf course. Most of buildings are located on the east side of the base, and each block is developed at a low density. The historic district located on the northeast side of the base has buildings dating back to the 1800s is being prepared for designation as a national historic districts. As for street network, there is Langford Parkway to the south, and Lee Street and Campbellton Road separates single family neighborhoods and industrial areas from Fort McPherson respectively. The vehicle capacity of Lee street is about 1200 vehicles per hour, which is about half of the maximum capacity, but the vehicle capacity of Campbellton road is about 1200 to 1700 vehicles per hour, which is three times to four times the maximum capacity of 400 vehicles per hour. In terms of pedestrian network, the streets inside the base have good pedestrian paths, but the existing pedestrian paths of Lee Street and Campbellton road are too narrow to walk on easily, so the redevelopment

plan also includes a street improvement plan for Lee street and Campbellton Road.[35]

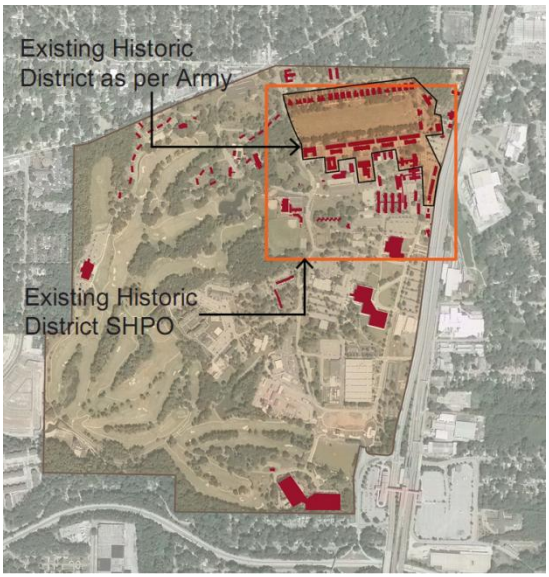


Figure 10. Historic Boundaries


Figure 11. Road Access

4. 1.2 Envisioning Fort McPherson Redevelopment Plan

According to the 2007 Fort McPherson outreach and land use plan, ten visions for creating a revitalized community where people live, work, and play for 24 hours are suggested as follows:[36]

1. Guided by market realities and adaptable to changing conditions.

2. Target knowledge-based industries.

3. Generate a variety of jobs and mixed-income neighborhoods.

4. Economically uplift surrounding communities and the region, enabling existing residents to benefit from the growth.

[35] Ibid. pp. 10-11.
[36] Ibid. p. 25.

5. Enhance community services and promote life-long learning.

6. Develop through collaborative processes.

7. Honor the history of the site.

8. Promote sound environmental and energy-efficient concepts.

9. Promote green space.

10. Coordinate closely with other regional developments to complement rather than compete.

As a preliminary framework for Fort McPherson, the districts are grouped into four different types: in the Historic District, all buildings, streets, and blocks will be preserved; on the west side of the base, low- and medium-density residential development will occur; green space will penetrate between residential districts, and the size will be reduced, but used for community events and recreation; on the east side of the base down to the Historic District, bio-science research and an employment center will be developed, and high-density mixed-used development will be located along Lee Street. Based on these four grouping types, eight subarea categories are defined: A-I as Historic Preservation; A-II as Historic Infill; B-I as Main Street; C-I as an Employment Center(Office/Residential/ Hospitality); C-II as an Employment Center (Research and Development/Office/ Educational); D-I as Neighborhood Commercial; E-I as Active Recreation Green Space; and E-III as Special Events.[37]

[37] Fort McPherson Planning Team (2010). pp. 5-12.

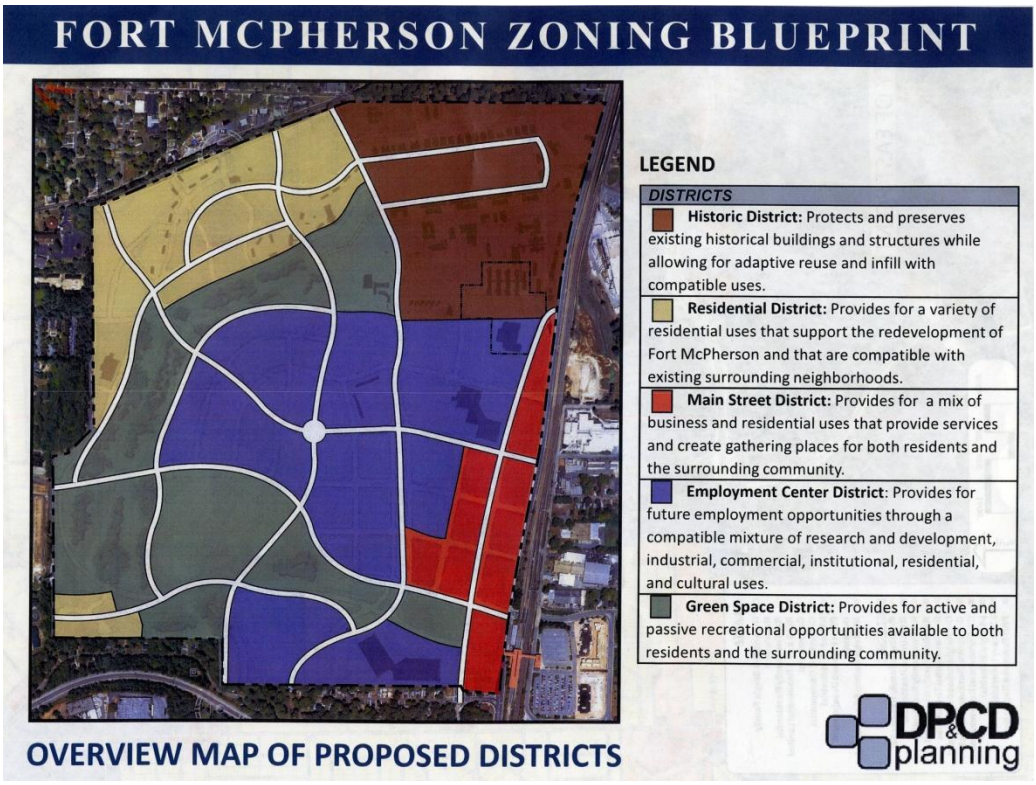


Figure 12. Proposed Zoning Blueprint Map of Fort McPherson

For residential development, about 4,600 units of housing will be provided in the Fort McPherson site. To create mixed-income and scattered residential neighborhoods, four housing types are suggested – housing for the homeless, affordable housing, market rate housing, and high-end housing. For diverse housing choices, affordable housing should make up at least twenty percent of the total housing units. For research and office space, four million square feet of floor area will be built in the Employment Center and the Mixed-Use District, and 400,000 square feet of floor area for commercial use.

Because the Fort McPherson redevelopment plan creates a community mixed with residential, commercial, and office uses, a Special Public Interest (SPI) district and Quality of Life (QOL) Zoning Code should be designated according to the City of Atlanta zoning ordinance. As a regulation focusing on components of urban form, SPI

and QOL zoning districts have intents and regulations in the following table below.

Table 5. The Intent and Regulations of SPI Zoning District

Zoning District	Intent or Regulation
Special Public Interest(SPI) Zoning District	• Intent 1. Preserve, protect and enhance Downtown's role as the civic and economic center of the Atlanta region; 2. Create a 24-hour urban environment where people can live, work, meet and play 3. Encourage the development of major commercial uses and high intensity housing that provides a range of housing opportunities for citizens within the district 4. Encourage a compatible mixture of residential, commercial, entertainment, cultural and recreational uses 5. Improve the aesthetics of street and built environments; 6. Promote pedestrian safety by ensuring and revitalizing pedestrian-oriented buildings which create a sense of activity and liveliness along their sidewalk-level facades; 7. Facilitate safe, pleasant, and convenient sidewalk-level pedestrian circulation that minimizes impediments by vehicles 8. Encourage the use of MARTA and other public transit facilities; 9. Enhance the efficient utilization of accessible and sufficient parking facilities in an unobtrusive manner including encouraging shared parking and alternative modes of transportation; 10. Provide safe and accessible parks and plazas for active and passive use including protecting Centennial Olympic Park as an Olympic legacy and a local and regional civic resource 11. Preserve and protect Downtown's historic buildings and sites; 12.Recognize the special character of Fairlie-Poplar and Terminus through the administration of specific standards and criteria consistent with the historic built environment as recognized by the inclusion of several blocks and buildings on the National Register of Historic Places. • Regulations 1. Use restrictions including a specific list of permitted uses and uses requiring special use permits 2. Building design specifications including allowable bulk, density, and sometimes façade design requirements 3. Streetscape requirements including lighting, screening, trees, setbacks, and yard requirements 4. Parking requirements 5. Open and public space requirements 6. Affordable housing and mixed-use requirements

Table 6. The Intent and Regulations of QOL Zoning District

Zoning District	Intent or Regulations
Quality of Life(QOL) Zoning Code	• Regulations 1. Improve the aesthetics of the built environment. 2. Facilitate safe, pleasant, and convenient pedestrian circulation. 3. Maximize pedestrian amenities, including open spaces, public art and public signage. 4. Transition between densities to reinforce visual continuity, linkages, and existing street patterns. 5. Provide multi-family housing that does not detract from adjacent single-family housing. 6. Prevent encroachment of incompatible commercial uses and parking into neighborhoods. 7. Encourage a compatible mixture of residential and commercial uses. 8. Encourage community oriented retail uses.

When Fort McPherson is closed in 2011, the Fort McPherson redevelopment plan should be carried out over thirty years. During the construction process, the interim plan for Fort McPherson will be implemented, and the redevelopment should be done in a two-phase redevelopment.

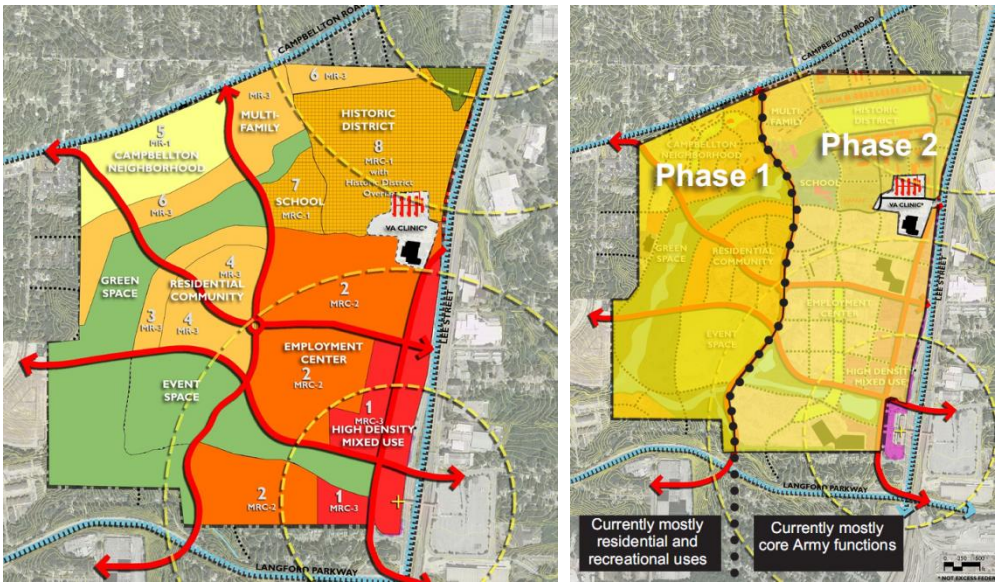


Figure 13. Recommended Zoning(Left) and Proposed Phasing(Right)

4.1.3 Urban Design Issues in Fort McPherson

From August to December in 2009, people from the surrounding neighborhoods, Georgia Standup, and the School of City and Regional Planning at the Georgia Institute of Technology developed a study report for the Fort McPherson Redevelopment Plan. The report consisted of seven chapters by subject – land use and zoning, environment, housing, transportation, jobs and economic development, public safety, and education and culture.

After developing the study report, people in the surrounding neighborhoods organized their own planning advisory committees based on the subjects in the report. The Fort McPherson Planning Team, created by the City of Atlanta Office of Planning, conducted five surveys of residents from the cities of Atlanta and East Point during March and April of 2010. During that period, the team sent 250 survey papers, and 276 surveys were returned. Based on these surveys, the community's overall zoning intent of Fort McPherson was established as follows:[38]

1. Encourage a compatible mixture of residential, commercial, industrial, cultural and recreational uses
2. Formulate a rezoning plan that is realistic and financially feasible
3. Promote pedestrian safety by providing for pleasant and convenient sidewalk level pedestrian circulation that minimizes impediments by vehicles.
4. Preserve and protect Fort McPherson's historic buildings and sites as recognized by the inclusion of several buildings on the National Register of

[38] The City of Atlanta Department of Community Planning and Development (2010). p. 8.

Historic Places

5. Provide for a safe and accessible trail and park system for active and passive use
6. Preserve, protect and foster the redevelopment of Fort McPherson through the integration of transportation and land planning in a way that balances local, regional, and state economic benefits
7. Integrate activities with the surrounding community
8. Create a world class multi-modal, industrial and commercial park that will provide jobs and increase city revenues
9. Encourage the use of MARTA and other public transit facilities
10. Enhance the efficient utilization of accessible and sufficient parking facilities in an unobtrusive manner, including encouraging shared parking and alternative modes of transportation
11. Allow for appropriate and distinct entry features into Fort McPherson subareas.
12. Encourage the development of housing that provides a range of opportunities for citizens within the District
13. Create a 24-hour urban environment where people can live, work, and play
14. Provide for a Special Events area as a local and regional civic resource

Based on the survey results, the community in the surrounding neighborhoods and the Fort McPherson Planning Team made two decisions. First, the uses which should be added or removed in the suggested building uses are suggested in each subarea to

maintain the characteristic of Fort McPherson area. Second, the survey result shows community planning and development priorities and issues which should be reflected in the Fort McPherson Zoning Blueprint.

Table 7. Proposed Used Added/Removed and Prohibited Uses

Subarea	Uses Added	Uses Removed	Prohibited Uses
A-I	Library, Bookstore	Private Schools, Personal Care Homes, Nursing Homes	Adult Entertainment, Check cashing Establishments, Tattoo and body piercing establishments, Day Labor Areas, Tire Shops, Park-for-hire surface parking lots, Pawn shops, Stand-alone storage facilities, Auto Repair Shops, Auto Parts Store
A-II	Library, Bookstore, Community Center,	Private Schools	
B-I	Farmer's Market	Auto Parts Store, Laundromat	
C-I	Colleges and Universities	Dormitories	
C-II	N/A	Personal Care Homes, Nursing Homes	
D-IV	N/A	Sales and Repair Establishments	
E-I	Community Center,	BMX	
E-III	Farmer's Market	N/A	

4.2 Assumptions for the Comparison

Based on the current status of Fort McPherson and its redevelopment plan, some assumptions need to be mentioned when we compare for the conventional zoning and form-based codes. First, although the Fort McPherson redevelopment plan also has many socio-economic data such as demographics, an impact analysis of the redevelopment, and a cultural plan, only physical aspects will be considered here. Actually, although it may be very hard to think about physical aspects without considering any social, economical, and even political background, the final result of this thesis will be produced by comparing the physical elements of the alternatives to demonstrate how much the built environment will be changed in both regulation systems.

Second, in the evaluation criteria, some checklist evaluation indicators will not be considered. Checklist-type questions do not help determine how much, or to what extent, one regulation system provides a better physical environment than another. Therefore, the evaluation indicators in each general category will have some quantitative evaluation indicators, which will be drawn from Fleissig's Smart Scorecard and other resources on neighborhood redevelopment such as LEED-ND.

4.3 Setting up the Evaluation Criteria

4.3.1 Considering the land use scenarios and land use allocations

Fort McPherson is a 488-acre army base, and most of the land areas are used for recreational use which is an eighteen-hole golf course and about the half amount of land area which are 282 acres have been developed for family housing, administration,

medical, community use, and so on. When Fort McPherson was selected as one of the army bases for closure in 2005, Phase 1 of the Fort McPherson Redevelopment Plan was launched by stakeholders, a planning company, and the U.S. army. As the final draft of the Fort McPherson Redevelopment Plan was established in September, 2007, a new land use scenario was suggested.

Table 8. Exsting Land Use Allocation in Fort McPherson

Category	Approx. Land Use Acreage	Percentage
Administration	71	15%
Community	51	10%
Family Housing	58	12%
Medical	38	8%
Recreation	206	42%
Research & Development	61	12%
Training	3	1%
Total	488	100%

Table 9. New Land Use Allocation in Fort McPherson

New Land Use Category	Approx. Acreage	Percentage
High Density Mixed-Use District	35 acres	7.8%
Medium-Density Employment Center	115 acres	25.6%
Historic District	12.4 acres	2.8%
Campbellton Residential District	82 acres	18.2%
Park Residential District	55 acres	12.2%
Green Space	150 acres	33.4%
Total	449.4 acres	100%

In order to create a reasonable comparison for the evaluation of conventional

zoning and form-based codes in terms of physical and environmental aspects, it is very important what land use scenario is used. First, the new land use scenario which is already defined in the Fort McPherson Redevelopment Plan can be considered. As shown in the table on the previous page, the Fort McPherson Redevelopment plan divided its land use into six different categories. The categories in the land use table show that the plan put a strong emphasis on mixed use development after the base closes, allocating residential, commercial, and office uses within the area. This also means that the redevelopment plan aims to encourage accessibility of buildings and infrastructure by locating them within walking distance.

Through the 90-day visioning process by the Fort McPherson Local Redevelopment Authority and various stakeholders in phase one, the vision and guiding principles which concentrated on mixed-use and economic development were set out and became the basis of phase two of the outreach and land use study. In the high-density mixed-use district, located along Lee Street and close to a MARTA station, mid-rise residential development of six to ten stories with commercial/retail use on the first and second floors will be built. Parking decks or garages will be located within the block, and pocket parks inside mid-rise residential buildings or along the street will be developed. Commercial and retail uses such as outdoor cafés, grocery stores, and offices will serve not only residents in the building but also support the basic needs of the employees of Bio-science employment center and neighbors. In the Employment Center district, buildings of four to six stories will be built and create “campus” atmosphere. Many bio-science research centers and academic facilities will be included, and pocket parks or regional open spaces will be created. In the Historic district, the existing family houses

which have a traditional character will remain as they are for historic conservation district designation, and some historic buildings will be considered for adaptive reuse, including an art museum, an auditorium for elementary, middle and high school students, or community facilities such as elderly services or childcare centers for the neighborhoods around the base. In the Campbellton Residential district and Park Residential district, various kinds of housing types ranging from single-family detached houses to multi-family apartments will be built. The residential blocks in the Park Residential district and some lots of the Campbellton Residential district close to the Employment Center district will have high-density residential units for employees, families without children, or singles. In the Green Space district, the net land area will be reduced but create a linear-shape regional park space that promotes a pedestrian-friendly environment and local events by neighborhoods.

This new land use scenario mainly focuses on highly mixed-use redevelopment, and its land use categories tend to have the characteristics of hybrid codes because some building uses are controlled vertically, as form-based codes do, and the quality of life zoning district regulation in this plan has many characteristics of form-based codes such as improving the aesthetics of the built environment and creating pedestrian amenities. However, this land use scenario's zoning regulations are based on a Special Public Interest district mentioned in the existing Atlanta zoning ordinance and even on a Quality of Life district regulations suggest appendix for full zoning purposes and districts for mixed residential commercial and multi-family residential zoning districts. If this land use scenario is used for this research, it should be converted into components of land and building uses suitable for both the 1995 City of Atlanta zoning codes and the form-based

codes of Georgia Department of Community Affairs.

Accepting the land use categories and conditions of the Fort McPherson Redevelopment Plan is reasonable for comparing the conventional zoning and form-based codes. The next important points, as mentioned above, will be how to reflect the zoning categories of the existing conventional zoning codes into the land use categories .

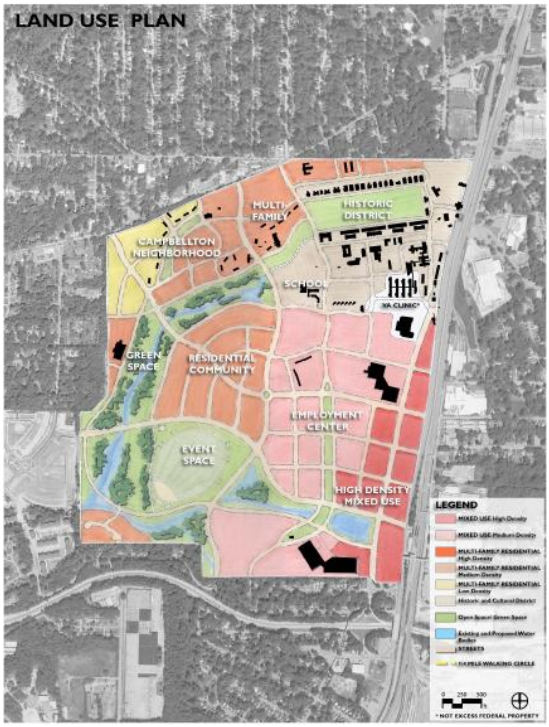


Figure 14. Proposed Land Use Plan

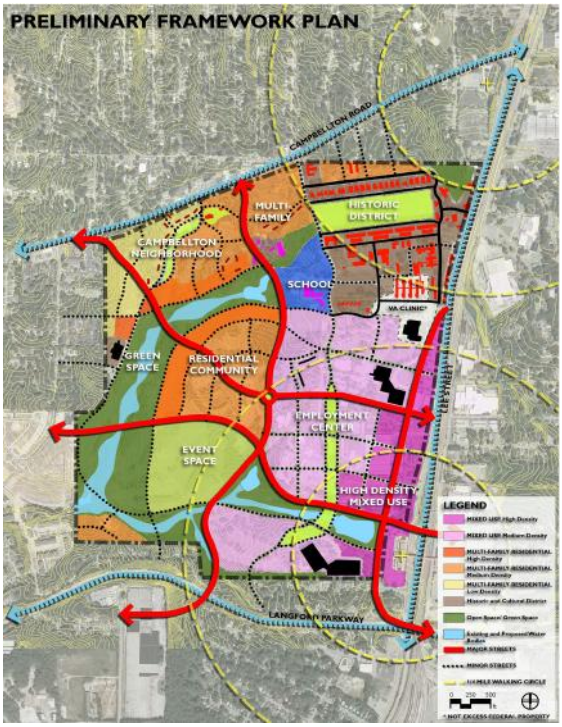


Figure 15. Prelimary Framework Plan

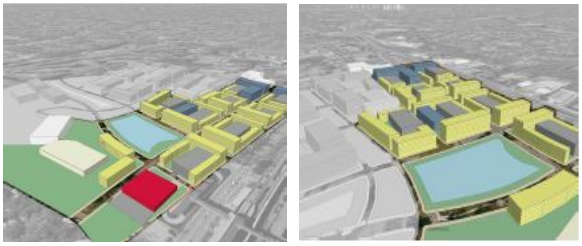


Figure 16. Mass Models for High-Density Mixed-Use District

Figure 17. Mass Models for Employment Center Dictrict

4.3.2 Considering and Selecting a Land Use Slice

With the land use scenario, the proposed land use can be grouped into a few large identical areas. For comparison purposes, it is reasonable to take one land use slice from the entire area which can show continuous land use pattern.

To select a land use slice in the entire area, a land use slice sample should be selected based on the main street shown in the preliminary framework plan. The width of a land use slice should contain at least two blocks penetrating the main street in the center. Also, a land use slice sample should be straight to show the transect features of the form-based codes in that slice. Because a land use slice sample is selected along the main streets shown in the preliminary framework plan, it is also easy to show the transect of form-based codes and see how the street or building images change.

As shown below, two alternatives of a land use slice sample can be considered. The first option picks up the area extending from East to West. This land use slice sample contains the High-Density Mixed-Use Residential, Employment Center, Park Residential, and Green Space districts. However, it cannot contain the Campbellton Residential district and the entire east-west main street, so it will be hard to present the street and building changes by using the transect.

The second land use slice option covers the land use area penetrating the north and south part of the entire area along the north-south main street. Unlike the first option, this land use slice can contain all land use categories except for the Historic district in the patterns when conventional zoning and form-based codes are compared. In addition, this land use slice option can be very useful when creating the transect covering the from downtown Atlanta to Hartsfield International Airport because this land use slice option

covers a north plan can be identified in the context of the entire Atlanta metro area and help determine the effectiveness of conventional zoning and form-based codes based on the urban context as a whole. However, this option does not include a single-family district and other residential areas.

Considering these two options, the first land use slice will be selected as the target site.

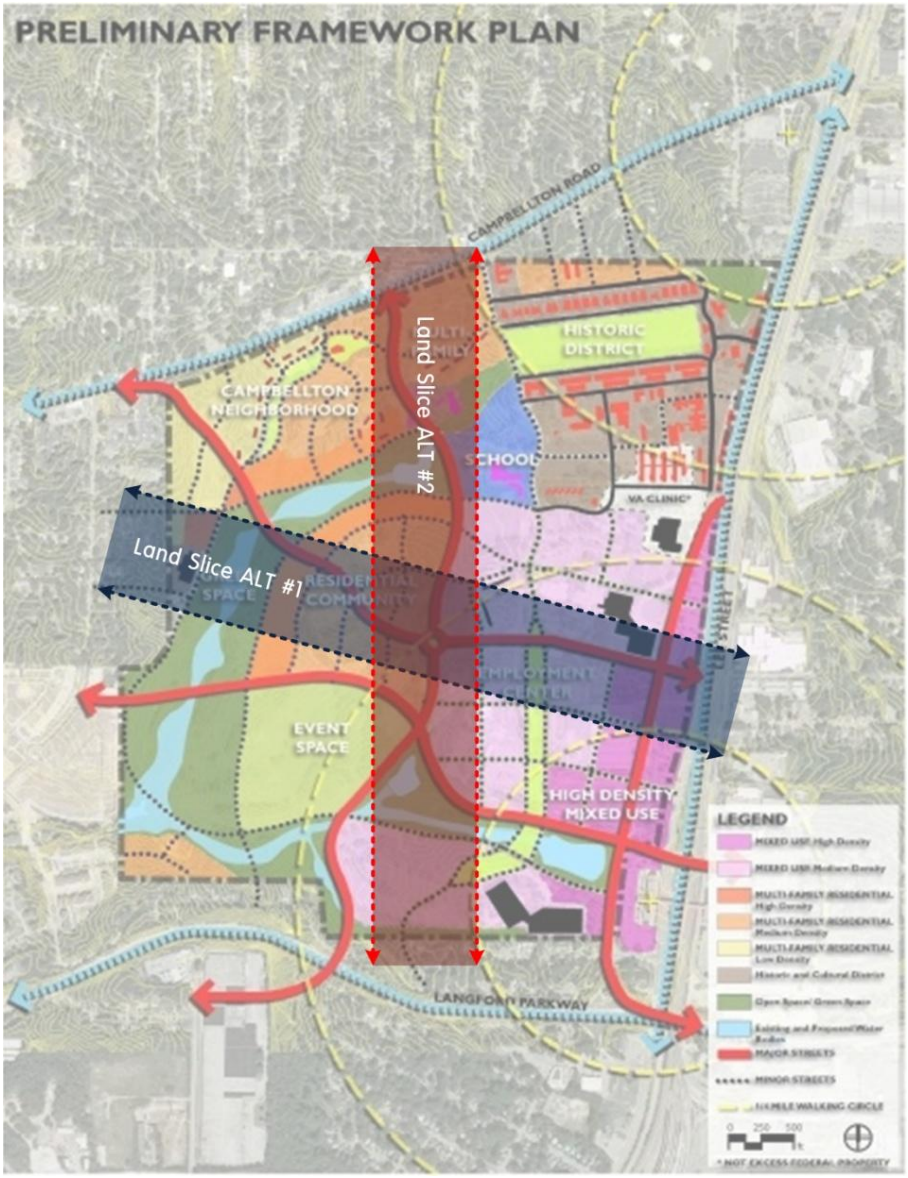


Figure 18. Alternatives for land use slices for Ft. McPherson

4.3.3 Comparing the Variables of Conventional Zoning with Those of Form-Based Code

Before setting up the evaluation criteria for the comparison of conventional zoning and form-based codes, it is important for planners to determine the physical components of conventional zoning and form-based codes have and how to evaluate them based on the same evaluation criteria. In order to define the evaluation criteria for the physical alternative models, the first step is to compare the components or variables of conventional zoning with those of form-based codes and to find any common components or variables which can apply to both.

Since 1989, the City of Atlanta zoning ordinance has been used to create the physical environment in Atlanta. As a basis for planning regulation and development, the City of Atlanta zoning ordinance has also been revised to reflect the changing planning conditions and promote future urban growth.

Table 10. Site Planning and Design Elements for each zoning districts in the Atlanta Zoning Ordinance

Zone	Density	Minimum Lot Requirements	Bulk Limitations	Min. Yard Requirements			Max. FAR	Max. Lot Coverage	Max. Height
				Front	Side	Rear			
R-1	1 Dwelling Units/ 2 Acre	≥2 acres frontage: ≥200 ft.	N/A	≥60 ft.	≥25 ft.	≥35 ft.	≤0.25	≤25%	≤35 ft.
R-2	1 Dwelling Units/ 1 Acre	≥1 acres frontage: ≥150 ft.	N/A	≥60 ft.	≥15 ft.	≥30 ft.	≤0.30	≤35%	≤35 ft.
R-2A	1 Dwelling Units/ 30,000 sq. ft	≥30,000 sq. ft. frontage: ≥100 ft.	N/A	≥60 ft.	≥15 ft.	≥30 ft.	≤0.35	≤35%	≤35 ft.
R-3	1 Dwelling Units/ 18,000 sq. ft	≥18,000 sq. ft. frontage: ≥100 ft.	N/A	≥50 ft.	≥10 ft.	≥20 ft.	≤0.40	≤40%	≤35 ft.
R-3A	1 Dwelling Units/ 13,500 sq. ft	≥13,500 sq. ft. frontage: ≥85 ft.	N/A	≥50 ft.	≥10 ft.	≥15 ft.	≤0.45	≤45%	≤35 ft.
R-4	1 Dwelling Units/ 9,000 sq. ft	≥9,000 sq. ft. frontage: ≥70 ft.	N/A	≥35 ft.	≥7 ft.	≥15 ft.	≤0.50	≤50%	≤35 ft.
R-4A	1 Dwelling Units/ 7,500 sq. ft	≥7,500 sq. ft. frontage: ≥50 ft.	N/A	≥30 ft.	≥7 ft.	≥15 ft.	N/A	≤50%	≤35 ft.
R-4B	N/A	≥2,800 sq. ft. frontage: ≥40 ft.	N/A	≥20 ft.	≥5 ft.	≥5 ft.	N/A	N/A	≤35 ft.

Table 10. Continued

Zone	Density	Minimum Lot Requirements	Bulk Limitations	Min. Yard Requirements			Max. FAR	Max. Lot Coverage	Max. Height
				Front	Side	Rear			
R-5	N/A	(*) Single-family detached and all other uses : ≥7,500 sq. ft./frontage: ≥50ft. (*) Single-family-zero-lot-line development : ≥2,800 sq. ft. w/ combined area of 7,500 sq. ft. : frontage: ≥10 ft. w/ combined width of 50 ft. (*) Two-family Dwelling : ≥7,500 sq. ft./frontage: ≥50ft.	N/A	≥30 ft.	≥7 ft. (*)zero-lot-line Dev. : 0 ft.	≥7 ft. (*)zero-lot-line Dev. : 0 ft.	N/A	≤50%	≤35 ft.
R-G	N/A	(*) Churches, Temples, and Religious Facilities : 1 acre when permitted by special exception (*) Single-family and two-family dwellings : min. lot area - 5,000 sq. ft : min. lot width - 50 ft. (*) Two-family dwellings, multi-family dwellings, zero-lot-line dwellings, residence hotels, apartment hotels, rooming houses, boarding, houses, dormitories, fraternities, and sorority houses : "Land Use Intensity Ratios" Table is applied	N/A	≥40 ft.	D = 4 + s + (L/10) D: depth in feet L: length in feet s: height in stories Sector 1 - 3: ≤7 ft. Sector 4 - 6: ≤20 ft.		by Land Use Intensity Ratios Table	N/A	**Transitional Height Planes** above 35 ft. : at an angle of 45 degrees
R-LC	N/A	(*) Churches, Temples, and Religious Facilities : 1 acre when permitted by special exception (*) Single-family and two-family dwellings : min. lot area - 5,000 sq. ft : min. lot width - 50 ft. (*) Multi-family dwellings, zero-lot-line dwellings, and lodgings : Sector 2 in "Land Use Intensity Ratios" Table	(*) non-residential uses : equal to 0.50 times net lot area (*) residential uses : up to the max. ratios in sector 2 of "Land Use Intensity Ratios" Table	30 ft.	7 ft. (*)adjoining a residential district : 20 ft.	20 ft.	N/A	N/A	≤35 ft.
O-I	N/A	No minimum lot width and areas are established in this area.	(*) non-residential uses : equal to 5.0 times net lot area (*) residential uses : up to the max. ratios in sector 5 of "Land Use Intensity Ratios" Table	50 ft.	15 ft.	25 ft.	N/A	N/A	N/A **Transitional Height Planes** above 35 ft. : at an angle of 45 degrees
				(*) Transitional Yard :side yard adjacent to "R" district - 20 ft. adjacent to a street - one-half the front yard : rear yard - 30 ft. or 10% of the depth of the lot - not exceed 50 ft.					
C-1	N/A	N/A	(*) non-residential uses : equal to 2.0 times net lot area (*) residential uses : up to the max. ratios in sector 3 of "Land Use Intensity Ratios" Table	10ft. Min.	N/A	N/A	N/A	N/A	N/A **Transitional Height Planes** above 35 ft. : at an angle of 45 degrees
				(*) Transitional Yard :side yard adjacent to "R" district - 20 ft. : rear yard adjacent to "R" district - 20 ft.					
C-2	N/A	N/A	(*) non-residential uses : equal to 3.0 times net lot area (*) Multi-family dwelling : up to the max. ratios in sector 3 of "Land Use Intensity Ratios" Table	10ft. Min.	N/A	N/A	N/A	N/A	N/A **Transitional Height Planes** above 35 ft. : at an angle of 45 degrees
				(*) Transitional Yard :side yard adjacent to "R" district - 20 ft. : rear yard adjacent to "R" district - 20 ft.					

Table 10. Continued

Zone	Density	Minimum Lot Requirements	Bulk Limitations	Min. Yard Requirements			Max. FAR	Max. Lot Coverage	Max. Height
				Front	Side	Rear			
C-3	N/A	N/A	(*) non-residential uses : equal to 5.0 times net lot area (*) residential uses : not exceed an amount equal to 3.2 times gross lot area in "Land Use Intensity Ratios" Table	10ft. Min.	N/A	N/A	N/A	N/A	N/A **Transition-al Height Planes** above 35 ft. : at an angle of 45 degrees
I-1	N/A	N/A	floor area: not exceed an amount equal to 2.0 times net land area	40ft.	(*)Street :half the front yard (*) not built to lot-lne : at least 5 ft.	N/A	N/A	N/A	N/A **Transition-al Height Planes** above 35 ft. : at an angle of 45 degrees

Unlike the City of Atlanta zoning ordinance as conventional zoning, form-based codes control the physical environment by providing as many physical elements of lots and blocks as possible, and planners or stakeholders in the planning process can set up their own design standards. After the existing framework has been identified at both macro and micro levels, form-based codes regulate the built environment by developing the regulating plans and regulations just as conventional zoning ordinances use zoning districts to regulate building and land uses.

However, the differences of form-based codes from conventional zoning ordinances are that the regulating plan in form-based codes can define building and land uses according to the current conditions of the target site area. The regulating plan does not have restrictions from the existing zoning districts of zoning ordinances. The actual building and land uses are determined by decisions made about the precise application of the transect zones to physical locations.[39] Starting from a small, complicated area in the target site area, planners review the first regulating zone by using a block documentation

[39] Parolek et. al, (2008). p. 152.

matrix template which contains both macro and micro physical elements.[40] After setting up the first transect zone, planners begin to add additional transect zones around the previous zone to establish a continuous transect zone throughout the entire target area. Each transect zone has a column beneath the illustrative images which provides detailed physical regulation values just as conventional zoning ordinances do by using the numbers and percentages in each zoning district. Unlike the City of Atlanta zoning ordinance, various physical elements which determine the actual physical form of buildings are provided. Due to the flexible settings of the physical design elements for each transect zone and the repetitive process for making the regulating plan and the transect zone matrix, form-based codes can be used to create a better environment specified for the distinctive characteristics and visions of the target area.

[40] These macro and micro elements can be identified by using various kinds of physical data or base maps. Also, planners or participants in the form-based codes making process visit the site and intuitively figure out physical data of buildings, lots, and blocks which are useful in filling out more detailed existing framework analysis(Parolek et. al, 2008; p. 128).

Note: All requirements in this Table are subject to calibration for local context.

	T1 NATURAL ZONE	T2 RURAL ZONE	T3 SUB-URBAN ZONE	T4 GENERAL URBAN ZONE	T5 URBAN CENTER ZONE	T6 URBAN CORE ZONE	SD SPECIAL DISTRICT	
a. ALLOCATION OF ZONES per Pedestrian Shed (applicable to Article 3 only)							(see Table 16)	
CLD requires	no minimum	50% min	10 - 30%	20 - 40%	not permitted	not permitted		
TND requires	no minimum	no minimum	10 - 30%	30 - 60 %	10 - 30%	not permitted		
RCD requires	no minimum	no minimum	not permitted	10 - 30%	10 - 30%	40 - 80%		
b. BASE RESIDENTIAL DENSITY (see Section 3.4)								
By Right	not applicable	1 unit / 20 ac avg.	2 units / ac. gross	4 units / ac. gross	6 units / ac. gross	12 units / ac. gross		
By TDR	by Variance	by Variance	6 units / ac. gross	12 units / ac. gross	24 units / ac. gross	96 units / ac. gross		
Other Functions	by Variance	by Variance	10 - 20%	20 - 30%	30 - 50%	50 - 70%		
c. BLOCK SIZE								
Block Perimeter	no maximum	no maximum	3000 ft. max	2400 ft. max	2000 ft. max	2000 ft. max *		
d. THOROUGHFARES (see Table 3 and Table 4)						* 3000 ft. max with parking structures		
HW	permitted	permitted	permitted	not permitted	not permitted	not permitted		
BV	not permitted	not permitted	permitted	permitted	permitted	permitted		
AV	not permitted	not permitted	permitted	permitted	permitted	permitted		
CS	not permitted	not permitted	not permitted	not permitted	permitted	permitted		
DR	not permitted	not permitted	permitted	permitted	permitted	permitted		
ST	not permitted	not permitted	permitted	permitted	permitted	not permitted		
RD	permitted	permitted	permitted	not permitted	not permitted	not permitted		
Rear Lane	permitted	permitted	permitted	permitted	not permitted	not permitted		
Rear Alley	not permitted	not permitted	permitted	required	required	required		
Path	permitted	permitted	permitted	permitted	not permitted	not permitted		
Passage	not permitted	not permitted	permitted	permitted	permitted	permitted		
Bicycle Trail	permitted	permitted	permitted	not permitted *	not permitted	not permitted		
Bicycle Lane	permitted	permitted	permitted	permitted	not permitted	not permitted		
Bicycle Route	permitted	permitted	permitted	permitted	permitted	permitted		
e. CIVIC SPACES (see Table 13)						* permitted within Open Spaces		
Park	permitted	permitted	permitted	by Warrant	by Warrant	by Warrant		
Green	not permitted	not permitted	permitted	permitted	permitted	not permitted		
Square	not permitted	not permitted	not permitted	permitted	permitted	permitted		
Plaza	not permitted	not permitted	not permitted	not permitted	permitted	permitted		
Playground	permitted	permitted	permitted	permitted	permitted	permitted		
f. LOT OCCUPATION								DISPOSITION
Lot Width	not applicable	by Warrant	72 ft. min 120 ft. max	18 ft. min 96 ft. max	18 ft. min 180 ft. max	18 ft. min 700 ft. max		
Lot Coverage	not applicable	by Warrant	60% max	70% max	80% max	90% max		
g. SETBACKS - PRINCIPAL BUILDING (see Table 15)								
(g.1) Front Setback (Principal)	not applicable	48 ft. min	24 ft. min	6 ft. min 18 ft. max	2 ft. min 12 ft. max	2 ft. min 12 ft. max		
(g.2) Front Setback (Secondary)	not applicable	48 ft. min	12 ft. min	6 ft. min 18 ft. max	2 ft. min 12 ft. max	2 ft. min 12 ft. max		
(g.3) Side Setback	not applicable	96 ft. min	12 ft. min	0 ft. min	0 ft. min 24 ft. max	0 ft. min 24 ft. max		
(g.4) Rear Setback	not applicable	96 ft. min	12 ft. min	3 ft. min *	3 ft. min *	0 ft. min		
Frontage Buildout	not applicable	not applicable	40% min	60% min	80% min	80% min		
h. SETBACKS - OUTBUILDING (see Table 15)								
(h.1) Front Setback	not applicable	20 ft. min +bldg setback	20 ft. min +bldg setback	20 ft. min +bldg setback	40 ft. max from rear prop	not applicable		
(h.2) Side Setback	not applicable	3 ft. or 6 ft.	3 ft. or 6 ft.	0 ft. min or 3 ft.	0 ft min	not applicable		
(h.3) Rear Setback	not applicable	3 ft. min	3 ft. min	3 ft.	3 ft. max	not applicable		
i. BUILDING DISPOSITION (see Table 9)								
Edgeyard	permitted	permitted	permitted	permitted	not permitted	not permitted		
Sideyard	not permitted	not permitted	not permitted	permitted	permitted	not permitted		
Rearyard	not permitted	not permitted	not permitted	permitted	permitted	permitted		
Courtyard	not permitted	not permitted	not permitted	not permitted	permitted	permitted		
j. PRIVATE FRONTAGES (see Table 7)								CONFIGURATION
Common Yard	not applicable	permitted	permitted	not permitted	not permitted	not permitted		
Porch & Fence	not applicable	not permitted	permitted	permitted	not permitted	not permitted		
Terrace or Dooryard	not applicable	not permitted	not permitted	permitted	permitted	not permitted		
Forecourt	not applicable	not permitted	not permitted	permitted	permitted	permitted		
Stoop	not applicable	not permitted	not permitted	permitted	permitted	permitted		
Shopfront & Awning	not applicable	not permitted	not permitted	permitted	permitted	permitted		
Gallery	not applicable	not permitted	not permitted	permitted	permitted	permitted		
Arcade	not applicable	not permitted	not permitted	not permitted	permitted	permitted		
k. BUILDING CONFIGURATION (see Table 8)								
Principal Building	not applicable	2 Stories max	2 Stories max	3 Stories max, 2 min	5 Stories max, 2 min	8 Stories max, 2 min		
Outbuilding	not applicable	2 Stories max	2 Stories max	2 Stories max	2 Stories max	not applicable		
l. BUILDING FUNCTION (see Table 10 &Table 12)								FUNCTION
Residential	not applicable	restricted use	restricted use	limited use	open use	open use		
Lodging	not applicable	restricted use	restricted use	limited use	open use	open use		
Office	not applicable	restricted use	restricted use	limited use	open use	open use		
Retail	not applicable	restricted use	restricted use	limited use	open use	open use		
ARTICLE 5								
ARTICLE 2, 3, 4								

Figure 19. Examples of the Transect Zone Regulation Matrix

According to the Model Land Use Management Code, which was established by Georgia Department of Community Affairs(DCA) in 2007, a form-based code provision is provided in Chapter 9. In the provision, the future development map as a regulating plan has four character areas: Urban(URB), Traditional Neighborhood(TND), Suburban Residential(SUB), and Rural/Exurban(R-EX). Each character area can be defined by physical components such as building uses, building height, building setback and build-to-lines, minimum building frontage, maximum building intensity, maximum impervious surface coverage, and so on. For compatibility with the existing planning regulations, the form-based provision in DCA's Model Land Use Management code takes many physical components from the City of Atlanta comprehensive plan and zoning ordinance.

Table 11. Physical Components of a Form-based Code Provision in the Model Land Use Management Code

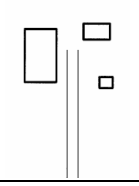
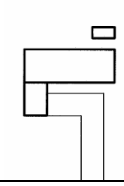
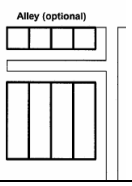
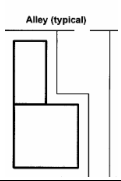
Categories		Rural/ Exurban (R-EX)	Suburban Residential (SUB)	Traditional Neighborhood (TND)	Urban (URB)
Image					
USE	Agriculture	Permitted	Excluded	Excluded	Excluded
	Manufactured Home	Permitted	Excluded	Excluded	Excluded
	Detached, Single-Family	Permitted	Permitted	Permitted	Exception
	Attached, Single-Family(Townhouse)	Excluded	Excluded	Permitted	Permitted
	Residential condominium or apartment (freestanding)	Excluded	Excluded	Permitted	Exception
	Residence as part of mixed-use building	Excluded	Excluded	Permitted	Permitted
	Accessory Apartment	Exception	Exception	Permitted	Permitted
	Civic and institutional	Permitted	Exception	Permitted	Permitted
	Office and professional	Excluded	Excluded	Permitted	Permitted
	Service and retail	Excluded	Excluded	Permitted	Permitted
	Industry	Excluded	Excluded	Excluded	Exception
	Other(Unspecified)	Exception	Exception	Exception	Exception

Table 11. (Continued)

Categories		Rural/ Exurban (R-EX)	Suburban Residential(SUB)	Traditional Neighborhood (TND)	Urban (URB)
Building Height	Maximum	Home: 2 stories Agriculture: 75’	Home: 3 stories	Home: 4 stories	Mixed-Use Building : 6-10+
	Minimum	None	None	2 stories	3 stories
Build-to Line		May be required	None	10’ to 15’	0’ to 10’
Set-backs	Front, min.	70’	35’	10’	None
	Front, max.	None	None	20’	15’
	Side, min.	40’	10’	10’	None
	Rear, min.	50’	20’	10’	0’ to 20’
	Rear, abutting alley	Not applicable	Not Applicable	None	None
Min. Building Frontage		None	None	40-50%	60-80%
Max. Building Intensity	Max. FAR	None	None	0.4-0.6	0.8-1.0+
	Max. Residential Density	1 unit per 2-25 acres	1 unit per 25,500-43,560 sq. ft.	5-8 units per acre (1 unit per 6,000 sq. ft.)	FAR of 0.4 to 5.0 (Included within max. FAR)
Max. impervious surface coverage		5-15%	12-25%	40-65%	70-90%
Max. Block width		None	800-1,000’	600’	300-500’
Max. Block Perimeter		None	3,200-5,000’	2,400-3,000’	1,200-1,800’
Min. Percent of Lot Devoted to Open Space		None	0-15%	15-30%	5-15%
Location of Open Space		Within lots and farmsteads (private)	Within lots(private) and/or in community recreation facilities, parks and playgrounds	Pocket Parks, greens, and squares	Pocket Parks, greens, squares, and urban plazas

4.4 Drawing the Evaluation Criteria from Research Resources

As the tables above show, variables or components of conventional zoning and form-based codes are very different because they regulate and control the urban form by using different land categories and terms. Although there are a few terms used in both systems such as setbacks and building height, the mechanism to apply them in the built environment does not produce the same results. That is, setting up the evaluation criteria requires first defining some general evaluation categories. More specified quantitative and qualitative evaluation indicators for analyzing the actual impact and effectiveness of

conventional zoning and form-based codes should be contained in each related general category.

The next step is to define both the general categories and the specific evaluation indicators that can be applied for both conventional zoning and form-based codes. One way to identify general evaluation categories is to select some good general categories from existing research literature on components of evaluating urban form or a new development. Among this research, Smart Scorecard, suggested by Will Fleissig and Vickie Jacobsen, has ten general components for evaluating new development projects and detailed critical factors in each general evaluation component. Published in 2002, Smart Scorecard was suggested as a tool for evaluating the long-term viability and impact of a community generated by a new development project. Based on both checklist and point systems, Smart Scorecard was designed to evaluate how much a new development project satisfies a list of policy and planning tools referred to as Smart Growth. A list of policy and planning tools is as follows:[41]

1. Build new neighborhoods in a compact form
2. Connect street systems that are designed to balance auto, pedestrian and bicycle movement
3. Maintain and enhance existing infrastructure
4. Actively pursue redevelopment, including infill residential development
5. Encourage mixed-use development, preferably near transit service
6. Connect open spaces, parks, and trails into a system

[41] Fleissig, Will and Jacobsen, Vickie (2002). p. 4.

7. Vigorously protect sensitive habitat and watershed land
8. Build mixed-density and mixed-income housing
9. Recognize traditional downtowns and urban neighborhoods as being a critical anchor for the economic and community vitality of a region
10. Promote stable neighborhood schools as a focal point for all adults, children, civic groups, and businesses
11. Establish predictability in the development process; development projects that enhance the economy, the community and the environment receive expedited approval

As a tool for evaluating the relative impact and performance of a new development, Smart Scorecard is useful for comparing the models in this thesis for several reasons. First, Smart Scorecard is based on Smart Growth principles and agenda: minimizing the impacts of new development; providing greater accessibility and choices; stabilizing and improving long-term financial performance; maximizing the return from public investments; protecting natural habitat and watersheds; fostering a greater sense of connection, responsibility and continuity.[42] These agenda have a lot in common with the objectives of form-based codes and the intent of conventional zoning in terms of physical aspects such as mixed building use and creation of public realm. Ten critical components in the Smart Scorecard also reflect the goals of form-based codes and conventional zoning. Theoretically, Smart Growth and form-based codes come from New Urbanism, so the evaluation components in the Smart Scorecard are very suitable for comparing

[42] Ibid. p. 4.

models of form-based codes. In the case of conventional zoning, Smart Scorecard components are also suitable in terms of evaluating the environmental quality, balancing land and building uses, site optimization, and so on. Third, the checklist and point system in the Smart Scorecard helps to predict the impact of conventional zoning and form-based codes on the Fort McPherson redevelopment. By evaluating both regulation systems in a quantitative way, the effectiveness of both systems on community redevelopment can be easily compared. The point system in the Smart Scorecard is especially useful because planners can prove by how much percent form-based codes can improve the built environment compared with any improvements that result from conventional zoning. This also provides a basis by which to evaluate which system is more suitable or desirable for a new development project with planners. Finally, according to the Fort McPherson zoning blueprint, the community's overall zoning intent for Fort McPherson put great emphasis on ten general categories of Smart Scorecard, including a mix of building uses and accessibility through promoting sufficient sidewalks and trails.

Table 12. Ten Components of Smart Scorecard

1. Proximity to existing/future development and infrastructure
2. Mix and Balance of Uses
3. Site Optimization and Compactness
4. Accessibility and Mobility Choices
5. Community Context and Site Design
6. Fined-Grained Block, Pedestrian and Park Network
7. Environmental Quality
8. Diversity
9. Re-use and Redevelopment Options
10. Process Collaboration and Predictability of Decisions

To define the evaluation criteria suitable for comparing alternative physical models, however, Smart Scorecard needs to be modified by grouping ten general categories into four categories – sustainability, connectivity, diversity, and design optimization and compactness. Although the ten general categories are straightforward, some of them overlap if they are grouped into more substantive categories to evaluate conventional zoning and form-based codes by using a uniform evaluation package: from a sustainability perspective, environmental quality and park network can be grouped into the single term of "sustainability" because sustainability is related to the quality and the impact of the built and natural environment. Mix and balance of uses and diversity can also be grouped into the single term of diversity because those categories provide people with options for they way they want to live, work, and play. Site optimization and compactness show the different aspects of creating building form and public realm. By evaluating the models based on connectivity, we can identify the difference between conventional zoning and form-based codes in terms of streetscape and how planners can provide access to buildings and spaces without any obstacles or within a short distance. In the case of process collaboration, however, it is not suitable for evaluating alternative physical models because the models in this thesis can show only the physical aspects of the built environment and because it is almost impossible to say how much more efficient the process of form-based codes is than that of conventional zoning and vice versa.

Second, to make appropriate quantitative evaluation criteria, it is also necessary to add more critical factors to the four general categories. In the Smart Scorecard, there are several critical factors in the ten categories, but some checklist factors are difficult to evaluate in a quantitative way. Therefore, it is better to remove these checklist factors and

add some quantitative factors which can be compared in the two models. Also, conventional zoning systems have shown ways of creating urban form by providing various dimensions and measures of buildings, land, and open spaces – a density bonus in a bonus zoning and overlaying zoning district with existing zoning like Atlanta's Special Public Interest zoning districts. To use the evaluation criteria as a tool for analyzing the computer models in a quantitative way, it is important to determine the physical components which define the building placements or streetscape and add them into the four general categories that are used for the comparison.

Based on the process of making the evaluation criteria above, there are four general categories for comparing alternative physical models for Fort McPherson – sustainability, connectivity, diversity, and design optimization and compactness. Also, all the critical indicators in each general category will be quantified as numbers, which will then be used as the raw data to show to what degree form-based codes or conventional zoning will be expected to increase or decrease.

4.4.1 The First Criteria on Sustainability

The term, "sustainability," which has been used as a general term in urban planning and design, based on the Brundtland Commission of the United Nations on March 20, 1987 as follows:

> "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

At the 2005 World Summit, sustainability was also defined as the reconciliation of economic, social, and environmental demands. In terms of creating the physical environment, sustainability here is closely related to the expected environmental quality of Fort McPherson.

To compare conventional zoning and form-based codes, sustainability can be measured in terms of the impact of the natural and built environment. Based on the Smart Scorecard, the environmental quality section consists of several checklist indicators. Since it is impossible to quantify those checklist indicators as they are, they need to be modified into quantitative indicators so that they can be expressed in numbers or values.

As another study on evaluating sustainability, the 2009 LEED for Neighborhood Development (LEED-ND) provides good sustainability factors for neighborhood development. As a set of performance standards for neighborhood development, the LEED-ND suggests five general categories – Smart Location and Linkage, Neighborhood Pattern and Design, Green Infrastructure and Buildings, Innovation and Design Process, and Regional Priority Credit – , and each general category has detailed quantitative and qualitative evaluation measurements. As for the evaluation criteria for sustainability, the solar orientation in blocks and buildings can be used.

Based on the Smart Scorecard and the 2009 LEED-ND, possible quantitative measures are summarized in the following table on the next page.

Table 13. The Evaluation Indicators for Sustainability

Indicators	Source
1. The total area of solar access panel that can be expected to install in the site	Smart Scorecard
2. The total vegetation garden area in the site	
3. The number of trees that can be expected to plant in the site	
4. The possible front/side/back yard area for green spaces per residential lot	
5. Solar orientation in blocks and buildings	LEED for Neighborhood Development

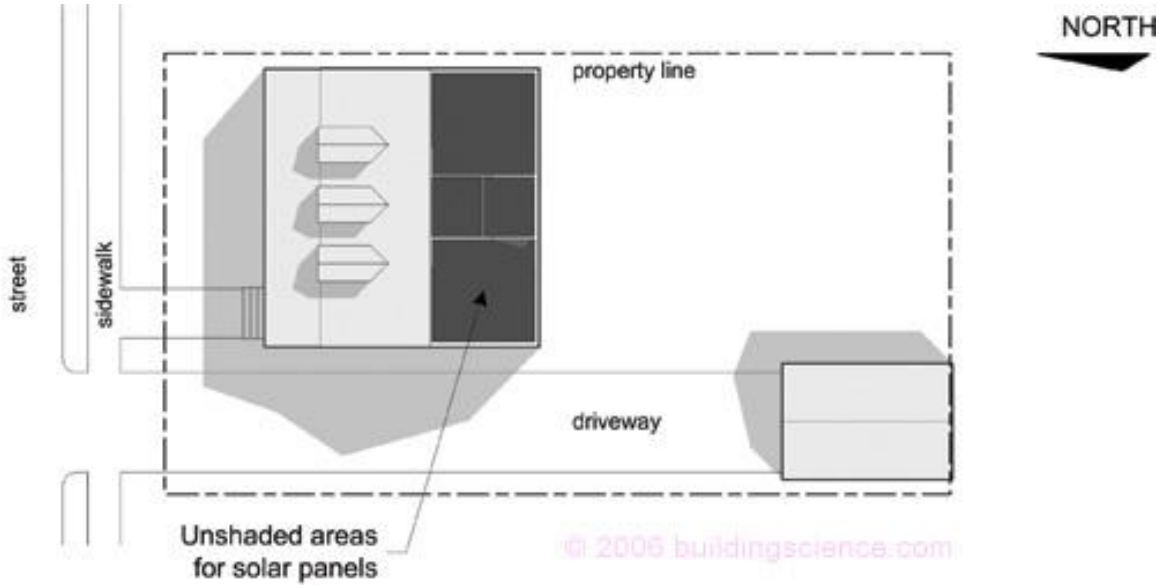


Figure 20. Definition of the Solar Access Panel Area in Buildings

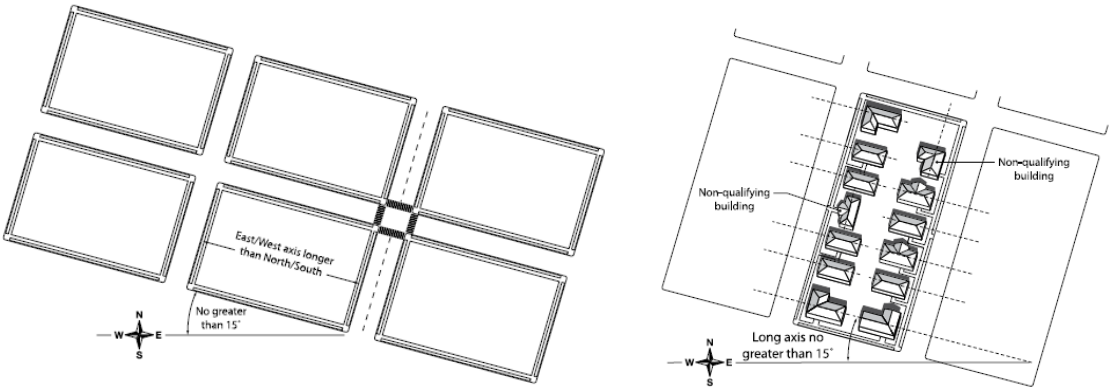


Figure 21. Solar Orientation in Blocks and Buildings

4.4.2 The Second Criteria on Connectivity

When planners design a specific area, the connectivity of blocks, buildings and streets can be identified and defined in various ways. In terms of land and building use, good connectivity means that people in the site can have easy access to all blocks and buildings within a short distance and in short period of time. If high-density and mixed-use buildings are built on a single parcel, people in the building also have vertical access. At street level, connectivity means that streets support all modes of transportation, including pedestrian. Connectivity among streets can be improved by providing a lot of intersections and reducing time for moving from one intersection to another.

To identify the evaluation indicators for connectivity, street dimensions in the street section are explained clearly in the conventional zoning and form-based codes, so the difference of street dimensions between conventional zoning and form-based codes can help prove which regulation system will provide wider or narrower width streets and support all modes of transportation by having enough widths for pedestrian and bicycle sidewalks and by providing enough parking lots or facilities.

In the Smart Scorecard, the length of block at the long side and the number of intersections can serve as a good evaluation indicator of connectivity because fine-grained blocks provide more intersections, and more intersections increase pedestrian activity on the street. Also, the total length of pedestrian paths or bicycle paths in the Smart Scorecard can be used because bicycle paths can be cut according to street hierarchy within the site. The 2009 LEED-ND also provides some evaluation indicators for connectivity, and the intersect interval distance – the distance between two intersections – can be used.

Based on the Smart Scorecard and the 2009 LEED-ND, possible quantitative measures of connectivity for the comparison are summarized in the following table.

Table 14. The Evaluation Indicators for Connectivity

Indicators	Source
1. General dimensions of street - pedestrian path width - bicycle path width - the number of auto lanes provided - Right-of-Way(ROW) Width - The number of parking lots and facilities	Street requirement and parking standards in the Atlanta zoning ordinance Thoroughfare standards and parking standards in form-based codes
2. The total length of pedestrian and bicycle path	Smart Scorecard
3. The number of intersection expected in the site	
4. The length of block at the long side	
5. The intersect interval distance	LEED for Neighborhood Development

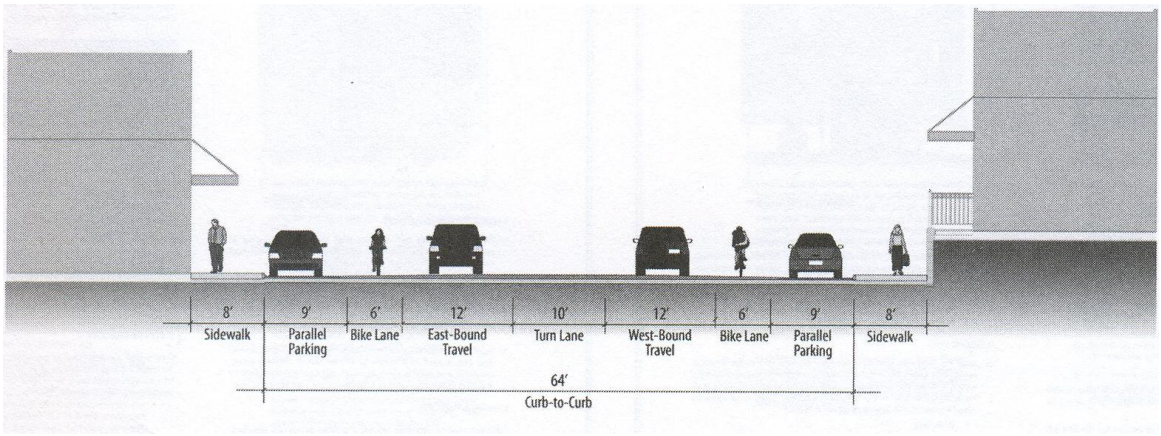


Figure 22. Basic Dimension of Street

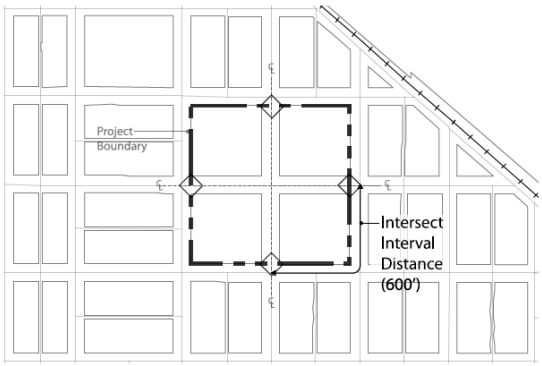


Figure 23. Intersect Interval Distance

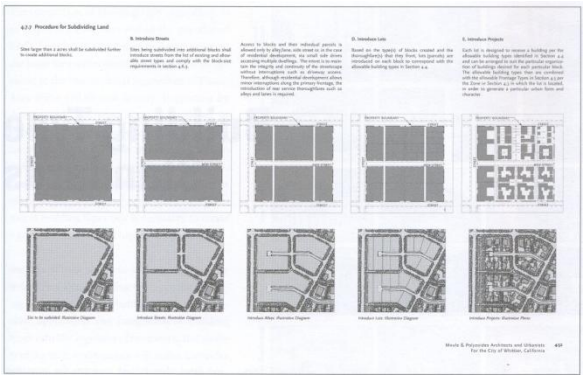


Figure 24. Block Standards in Form-Based Codes

4.4.3 The Third Criteria on Diversity

Diversity is closely related with mixed-used development patterns and balance of land and building uses between conventional zoning and form-based codes. The degrees of land use details in the land use plan of conventional zoning and form-based codes can be considered in this thesis. In addition, the number of additional uses in existing neighborhoods and the number of uses that can be mixed within a block or a parcel may also be compared. At a parcel level, features of mixed-use development can be analyzed vertically as well as horizontally.

Another important consideration of diversity is whether there are various housing options for residents in the site. Providing various housing options for future residents can create a more socially mixed community, where people live together regardless of income or social status. This may have a positive impact on a strong sense of community and lead to creating dynamic places in a social and cultural sense.

To make the evaluation indicators for diversity, the Smart Scorecard suggests that a variety of building types and standards as well as building densities should be provided in the development area. In the diversity categories, variation in setbacks and lot

size can be used because setbacks and lot size give more diverse streetscapes as well as diverse building forms. Also, variation in development densities can determine the overall skyline of the site and provide flexibility for developing the site. In terms of housing development, types of building frontage or façades can be used as an evaluation indicator. Particularly, community and planners can develop architectural standards in establishing form-based codes for community redevelopment. Also, in terms of mix and balance of uses, the number of uses that are vertically mixed can increase the usability of buildings.

Based on the Smart Scorecard, possible quantitative measures of diversity for the comparison are summarized in the following table.

Table 15. The Evaluation Indicators for Diversity

Indicators	**Source**
1. Variety of setbacks in the standards	Smart Scorecard
2. Variation in residential lot-sizes	
3. Density variation in the standards - proportion of high-density, median density, and low-density expected in the conventional zoning and form-based codes	
4. The number of building types and styles suggested	

4.4.4 The Fourth Criteria on Design Optimization and Compactness

According to the Smart Scorecard report, design optimization and compactness helps the public and the private sector to make highest and best use of the site.[43] Cities in the U.S., especially Atlanta, have experienced suburbanization since World War II. As one of the best solutions to suburbanization, an appropriate concentration of buildings in the downtown area and development projects for attracting people in suburban areas back to urban areas have been an important issue for urban revitalization and urban growth. Therefore, an incentive zoning in Chicago and New York from the late 1950s to the 1970s was used as a tool for increasing developers' interest in large-scale downtown development and encouraging urban growth to balance suburban growth.

In considering tools for site optimization and compactness, however, the issue is how to determine the appropriate development density for the site so that the development can achieve both compactness and the amenities in the target site. For this reason, the Smart Scorecard suggests that allowable dwelling units per acre in the residential districts and maximum floor ratio can be used as an evaluation indicator for design optimization and compactness when analyzing the alternative physical models. Also, maximum allowable floor area in the commercial, office, and mixed-use districts can be a good indicator because high-density commercial or office districts attract people from other neighborhoods. Minimum setbacks and build-to-line standards are useful in evaluating design optimization and compactness. Finally, the amount of density bonus and the percentage of usable open space area to undeveloped open spaces are indicators for analyzing the computer models.

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[43] Fleissig, Will and Jacobsen, Vickie (2002). pp. 9-10.

Based on the Smart Scorecard, possible quantitative measures of connectivity for the comparison are summarized in the following table.

Table 16. The Evaluation Indicators for Design Optimization and Compactness

Indicators	Source
1. Allowable dwelling units per acre	Smart Scorecard
2. Maximum floor area ratio expected in the conventional zoning and form-based codes	
3. Maximum allowable floor area ratios in the commercial, office, and mixed-use buildings (i.e. multiplication of allowable FAR)	
4. Minimum setbacks and build-to-line standards	
5. The amount of density bonus	
6. The percentage of usable open space area to undeveloped open spaces area	

Considering the detailed evaluation indicators mentioned in each general evaluation category, the proposed criteria for analyzing the alternative physical models based on conventional zoning and form-based codes can be summarized in the following table on the next page.

Table 17. The Proposed Criteria for Analyzing the Alternative Physical Models

General Categories	Indicators	Source
Sustainability	1. The total area of solar access panel that can be expected to install in the site	Smart Scorecard
	2. The total vegetation garden area in the site	
	3. The number of trees that can be expected to plant in the site	
	4. The possible front/side/back yard area for green spaces per residential lot	
	5. Solar orientation in blocks and buildings	LEED for Neighborhood Development
Connectivity	1. General dimensions of street - pedestrian path width - bicycle path width - the number of auto lanes provided - Right-of-Way(ROW) Width - The number of parking lots and facilities	Street requirement and parking standards in the Atlanta zoning ordinance Thoroughfare standards and parking standards in form-based codes
	2. The total length of pedestrian and bicycle path	Smart Scorecard
	3. The number of intersection expected in the site	
	4. The length of block at the long side	
	5. The intersect interval distance	LEED for Neighborhood Development
Diversity	1. Variety of setbacks in the standards	Smart Scorecard
	2. Variation in residential lot-sizes	
	3. Density variation in the standards - proportion of high-density, median density, and low-density expected in the conventional zoning and form-based codes	
	4. The number of building types and styles suggested	
Design Optimization and compactness	1. Allowable dwelling units per acre	Smart Scorecard
	2. Maximum floor area ratio expected in the conventional zoning and form-based codes	
	3. Maximum allowable floor area ratios in the commercial, office, and mixed-use buildings (i.e. multiplication of allowable FAR)	
	4. Minimum setbacks and build-to-line standards	
	5. The amount of density bonus	
	6. The percentage of usable open space area to undeveloped open spaces area	

CHAPTER 5

BUILDING ALTERNATIVE PHYSICAL MODELS AND IDENTIFYING THE PHYSICAL COMPONENTS

After setting up the criteria for the alternative physical models, the next step is to create the comparison models for the conventional zoning and form-based codes of Fort McPherson. Based on the assumptions that are made in the previous chapter and the land slice that is selected, the 2001 City of Atlanta zoning ordinance and Georgia DCA's Model Code will be used for creating the models because the current City of Atlanta zoning ordinance has many form-based features. To make a clear comparison, the old City of Atlanta zoning ordinance will be better. Finally, in designing the alternative physical models, I will explain what standards will be applied to create the models – the process of creating the models for conventional zoning and form-based codes. For creating the models, six design elements will be considered in this study – land uses, streets, blocks and lots, buildings, open spaces, and parking.

5.1 Building up a Physical Model for Conventional Zoning

5.1.1 Land Uses

The 2002 City of Atlanta zoning ordinance defines detailed zoning districts based on the three traditional land uses – residential, commercial, and industrial. Each zoning district also has detailed physical requirements such as minimum lot requirements, minimum yard requirements, maximum height, and minimum off-street parking

requirements. To make the computer model based on the land use framework of the Fort McPherson Redevelopment Plan, five different zoning districts can be considered in the target area. For residential, R-4 and R-G zoning district regulations should be applied. In terms of dwelling density, the R-4 district can build one dwelling unit per 9,000 square feet, but the R-G district allows a wide range of residential densities according to the context of the surrounding neighborhoods. This R-G district can help the target site provide various housing choices ranging from single-family to apartments. Also, to support small retail services in the residential districts, R-LC should be suggested in the western edge of the target area.

For employment center and high density in the target site, O-I and C-1 district zoning regulation should be applied. Since the employment center in the land use plan contains bio-science research labs and a technology research center, O-I zoning district helps to provide a wide range of official and institutional uses in the site. In the case of high-density mixed-use, C-1 zoning district should be suitable because C-1 zoning also encourages mixed-used development.

5.1.2 Streets

Street standards can be found in the City of Atlanta Land Subdivision Ordinance, not in the zoning ordinance. In the Land Subdivision Ordinance, streets should be planned and designed to follow the existing street system, and closed-end street patterns like cul-de-sacs should be prohibited if possible. The Land Subdivision Ordinance provides minimum right-of-way and pavement widths as follows:

Table 18. Minimum Street Right-of-way and pavement widths

Street Type	Right-of-way	Pavement Width
Arterial Street	114 feet	86 feet
Major collector street	80 feet	60 feet
Residential collector	50 feet	32 feet
Residential collector with bicycle lane	55 feet	37 feet
Residential access street and residential subcollector	32 feet	28 feet

5.1.3 Blocks/Lots

Because the zoning ordinance takes a "lot-by-lot" approach to control the area, there are no specific block standards. Each zoning district used in the models has minimum requirements. In the R-4 district, a single-family detached lot should have an area of at least 9,000 square feet with at least 70 feet of lot frontage. This means that an almost square-shaped lot with ninety feet of width and 100 feet of depth should be considered at the minimum level. The minimum lot requirement for a single-family residential in the R-G district should have an area of at least 5,000 square feet with at least 50 feet of lot frontage. This means that a lot with a fifty-foot width and a 100-foot depth can be made for a single family housing. For residential use in the R-LC district, lots for single-family housing and two-family housing should have at least 5,000 square feet with fifty feet of lot width.

The C-1 districts also have minimum lot requirements for single-family housing, which is at least 5,000 square feet of area and a minimum lot width of 50 feet. For the O-I district, there are no exact minimum lot requirements, but enough lot area should be provided to meet the lot requirements of other zoning districts.

Table 19. Land Use Intensity Ratios

TABLE I

LAND USE INTENSITY RATIOS

LUI Ratios Times Gross Land Area

	Floor Area (FAR)	*Total Open Space (TOSR)*	*Useable Open Space (UOSR)*	*Parking Spaces Per Lodging Unit*	*Parking Spaces Per Dwelling Unit*
Sector 1	.100	.80	.65	1.0	2.2
	.107	.80	.62	1.0	2.1
	.115	.79	.60	1.0	2.1
	.123	.79	.58	1.0	2.0
	.132	.78	.55	1.0	1.9
	.141	.78	.54	1.0	1.9
	.152	.78	.53	1.0	1.8
	.162	.77	.53	1.0	1.8
Sector 2	.174	.77	.52	.67	1.7
	.187	.77	.52	.67	1.7
	.200	.76	.52	.67	1.6
	.214	.76	.51	.67	1.6
	.230	.75	.51	.67	1.5
	.246	.75	.49	.67	1.5
	.264	.74	.48	.67	1.5
	.283	.74	.48	.67	1.4
	.303	.73	.46	.67	1.4
	.325	.73	.46	.67	1.3
	.348	.73	.45	.67	1.3
Sector 3	.373	.72	.45	.60	1.3
	.400	.72	.44	.60	1.2
	.429	.72	.43	.60	1.2
	.459	.72	.42	.60	1.2
	.492	.71	.41	.60	1.1
	.528	.71	.41	.60	1.1
	.566	.71	.40	.60	1.1
	.606	.70	.40	.60	1.0
	.650	.70	.40	.60	1.0
	.696	.69	.40	.60	.99
Sector 4	.746	.69	.40	.45	.96
	.800	.68	.40	.45	.93
	.857	.68	.40	.45	.90
	.919	.68	.40	.45	.87
	.985	.68	.40	.45	.85
	1.06	.68	.40	.45	.83
	1.13	.67	.41	.45	.81
	1.21	.67	.41	.45	.79
	1.30	.67	.42	.45	.77
	1.39	.68	.42	.45	.75
	1.49	.68	.43	.35	.73
Sector 5	1.60	.68	.43	.35	.71
	1.72	.68	.45	.35	.69
	1.84	.69	.46	.35	.67
	1.97	.70	.47	.35	.65
	2.11	.71	.49	.35	.63
	2.26	.72	.50	.35	.61
	2.42	.75	.51	.35	.60
	2.60	.76	.52	.35	.58
	2.79	.81	.56	.35	.56
	2.99	.83	.57	.35	.55
	3.20	.86	.61	.35	.54
Sector 6	3.43	.91	.64	.27	.53
	3.63	.95	.67	.27	.52
	3.95	1.00	.71	.27	.50
	4.24	1.05	.75	.27	.49
	4.55	1.11	.79	.27	.48
	4.88	1.17	.83	.27	.46
	5.23	1.24	.89	.27	.45
	5.60	1.31	.94	.27	.44
	5.99	1.39	.99	.27	.43
	6.40	1.46	1.05	27	.42

5.1.4 Buildings

The City of Atlanta Zoning Ordinance controls buildings by using minimum yard requirements, maximum height, or bulk limitation. In the R-4 districts, the minimum front, side, and back yard requirements are at least 35 feet, 7 feet, and 15 feet, respectively. Also, the lot coverage should not exceed fifty percent, and the maximum height may not exceed thirty-five feet. The floor area ratio should be less than 0.5. In the R-G district, residential units for two-family housing, multi-family dwellings, zero-lot-line dwellings, and apartments should be built according to the table "Land Use Intensity Ratio." These building uses are allowed at the maximum ratios of each sector in the table. The Total Open Space Ratio (TOSR), Usable Open Space Ratio (UOSR), and parking spaces can be defined based on the floor area ratio. In the R-LC district, floor area should be less than 0.5 of the net lot area for non-residential uses and the maximum ratios of sector 2 in the "Land Use Intensity Ratio" for residential uses, which means 0.348 FAR can be applied for residential uses in the R-G district. A thirty-foot front yard, a seven-foot side yard, and a twenty-foot rear yard should be required, but the side yard requirement increases up to twenty feet when the R-LC lot abuts a residential district.

In the O-I district, buildings for nonresidential uses can be built up to three times of the net lot area, and buildings for residential uses can be permitted up to the maximum ratio of sector 5 in the "Land Use Intensity Ratio" which means 3.2 times of the net lot area. The minimum yard requirements are fifty feet for the front yard, fifteen feet for the side yard, and twenty-five feet for the rear yard, respectively. There is no height limitation, but an O-I site adjacent to an R-1 through an R-G district should meet the transitional height and yard requirements. The O-I lots abutting an R-1 district should

protrude through a height-limiting plane from thirty-five feet above the lot at an angle of forty-five degrees. The transition side yard should be at least twenty feet. In the case of the rear yard, developers can choose a larger value between a thirty-foot rear yard and ten percent of the depth of the lot, but it should not be more than fifty feet.

Like the O-I district, the C-1 district also has the same transitional planes for building height limitation when the C-1 lot abuts an R-1 through R-G district. The transition yard requirement is slightly different: the transitional side yard is twenty feet, and the transitional rear yard should be twenty feet. The bulk limitation for nonresidential use is up to two times of the net lot area, and the bulk for residential use can be permitted up to the maximum floor area ratio of sector 3 in the "Land Use Intensity Ratio". Under the general conditions, only a ten-foot front yard should be required, and no side and rear yards are required. No height limitation is required in this district like the O-I district.

5.1.5 Open Spaces

In the City of Atlanta Zoning Ordinance, yard requirements are used as open space requirements. Particularly in the R-G district, the "Land Use Intensity Ratio" table provides how much the Total Open Space Ratio(TOSR) and the Usable Open Space Ratio(UOSR) can be defined according to the floor area ratio. In the O-I and the C-1 districts, there are no specific open space standards, and yard requirements can replace open space standards.

5.1.6 Parking

For residential uses, single-family housing in the R-4 and R-G districts has one

parking lot per dwelling unit. Multi-family housing and apartments built in the R-G district should provide parking spaces according to the "Land Use Intensity Ratio" table. Although there are other permitted principal uses, such as nursing homes and childcare centers, they are not considered here because they might be located outside of the target site according to the Fort McPherson Redevelopment Plan. For some retail uses in the R-LC district and community business uses in the O-I and C-1 districts, the following off-street standards should be used in the three-dimensional models of Fort McPherson.

Table 20. Off-Street Parking Standards for Retails and Community Business in R-LC, O-I, and C-1 districts

Districts	Uses	Off-Street Parking Requirements
R-LC District	Offices, studios, clinics, clinical laboratories	one space per 300 square feet floor area
	Barbershop, beauty shops, and similar personal service establishments	one space per 200 square feet floor area
	Specialty shops	one space per 300 square feet floor area
	Accessory uses	one additional space per 300 square feet of the floor area used for this purpose
	Restaurants	one space per 100 square feet of floor area
	Other uses	one space per 300 square feet of floor area
O-I District	Banks, savings, and loan institutions	one space per 200 square feet floor area
	Clubs and lodges	one space per 200 square feet floor area
	Hotels	one space per rental unit plus one-half space per employee
	Accessory uses	one additional space per 300 square feet
	Other uses	one space per 300 square feet
C-1 District	Banks, savings, and loan institutions	one space per 200 square feet floor area
	Clubs and lodges	one space per 200 square feet floor area
	Hotels	one space per rental unit plus one-half space per employee
	Retail establishments	one space per 200 square feet floor area
	Eating and Drinking Establishment	one space per 100 square feet floor area
	Laundry and dry cleaning plants, collection stations	one space per 200 square feet floor area
	Tailoring, custom dressmaking	one space per 400 square feet floor area

Table 20. (continued)

Districts	Uses	Off-Street Parking Requirements
C-1 District	Repair Establishment for home appliance, bicycles, etc.	one spaces per 200 square feet floor area
	Bowling alleys, pool rooms, billiard parlors	one per 100 square feet floor area
	Theaters	one space per 100 square feet floor area
	Hotel and motels	one space per rental unit plus one-half space per employee; one space per 100 square feet of restaurant/lodge gross leasable area; one space per 300 square feet of other conventional facilities
	Accessory uses	one additional space per 300 square feet devoted to this use
	Other uses	one space per 300 square feet

5.2 Building up a Physical Model for Form-Based Codes

5.2.1 Land Use

DCA's Land Use Management Model Code suggests four different land use categories for a new development according to the location of the development site – Rural/Exurban(R-EX), Suburban Residential(SUB), Traditional Neighborhood(TND), and Urban(URB). Fort McPherson, which is located on the south side of downtown Atlanta, has both neighborhood and commercial development features. Considering these location factors and the Fort McPherson Redevelopment land use plan, Traditional Neighborhood(TND) or Urban(URB) can be considered in creating the physical models of Fort McPherson.

Unlike conventional zoning, which applies uniform land uses to portions of the site, form-based codes do not limit the land use categories, so land use categories can be set up more freely than under the conventional zoning. Fort McPherson belongs to NPU-S and is adjacent to NPU-X and R. According to the neighborhood planning unit map, the west, south, and north sides of the site consist of single-family residential areas, but there

are industrial use areas on the east side of the site. Based on DCA's Model Code and the Fort McPherson Redevelopment land use framework, the western portion of the site should be designated as TND to put some emphasis on single-family housing because that area should focus on providing amenities like green spaces for the area, whose surrounding neighborhoods consist of a single-family housing. On the east side of the site, it will be more desirable to designate the area as URB because more compact development and mixed-use development should be required.

In DCA's Model Codes, TND can permit eight detailed land uses, and URB has six detailed land uses. Based on the permitted uses of TND and URB in the Model Codes and the Fort McPherson Redevelopment Land Use plan, residential use in the target site area should be as follows: in the TND area on the west side of the site, detached single-family, attached single family housing, and residential condominium should be allowed; in the URB area on the east side of the site, high-density residential units such as townhouses, residences as part of mixed-use building, and accessory apartments should be permitted. For commercial, office, and institutional uses, URB design standards should be applied in the area, but in the commercial area adjacent to the TND residential area, TND standards for commercial and retail should be applied.

5.2.2 Streets

The Model Code suggests principles of smart street design which provides the basic framework for a better streetscape. There are seven principles for smart street design, but six principles for designing the TND and URB area in the Fort McPherson target site: skinny streets which are no wider than the minimum width; residential streets

with a variety of widths and types; streets for encouraging people to choose alternative modes; two-lane streets divided by wide, planted medians like two one-way streets; avoiding cul-de-sacs and dead-end streets; and streets adjacent to the natural area.

Table 21. A Healthy Street of Typology

Type	Purpose	Right-of-way width	Road Pavement Width	Other Features
Alleys/Lanes	Service access Access to homes	20 feet 38 feet	10 – 12 feet 16 – 18 feet	Landscaping and sidewalks
Streets	Access to single and multi-family housing	48 – 50 feet	24 – 26 feet	Landscaping and sidewalks; on-street parking on both sides
Avenues	Connect neighborhoods to town centers	80 feet	48 feet	Raised center median; landscaping, sidewalks, bike lanes and on-street parking on both sides
Main Streets	Neighborhood and commercial access	60 feet	36 feet	Landscaping, sidewalks and on-street parking on both sides
Boulevards	Multi-lane access to commercial buildings; carry regional traffic	104 feet	70 feet	Raised center median; landscaping, sidewalks, bike lanes and on-street parking on both sides
Parkways	Carry traffic through natural areas; not designed to accommodate adjoining development	120 feet	44 feet	Four travel lanes; raised center median; landscaping and trails(separate bike and pedestrian access) on both sides

The form-based code provision of DCA's Model Code also suggests four street types: commercial streets, alleys, TND residential streets, and rural lanes. For creating three models of the Fort McPherson target site, commercial streets, alleys, and TND residential streets should be suggested. Especially in the TND area, alleys should be encouraged because this allows car access to the garages in the back of the site. This can improve streetscape and prevent cars from parking on the street. Based on a healthy street typology and street requirements in the form-based codes provision, street standards for Fort McPherson can be described in the following table.

Table 22. Street Requirements in the form-based code provision of the Model Code

	Commercial Street	**Alley**	**TND Residential Street**
Traffic lanes	Two ways	Two ways	Two ways
Parking lanes	Both sides	None	Both sides
Right-of-way	60 feet	24 feet	60 feet
Pavement width	24 – 36 feet	20 feet	24 – 38 feet
Curb type	Raised	Rolled	Raised
Curb Radius	15 feet	15 feet	15 feet
Sidewalk width	6 – 10 feet	None	4 – 5 feet
Planter width	4 feet	None	Varies
Planting	Trees in wells, continuous 30 feet	None	Trees in strip with variable spacing

In the shop front area, the Model Code suggests at least ten feet of clear zone, where no street furniture or structures are allowed, and five feet of furniture zone filled with trees, benches, trash cans, signs, and so on. This is because pedestrian pathways should be secured and people walking on the street should feel spatial continuity that the storefronts create. Also, for a safer pedestrian path, pedestrian patterns should be kept in the pedestrian crossings.

5.2.3 Blocks/Lots

In the Model Codes, maximum block width and total maximum block length are defined. For TND areas, the maximum block width should be 600 feet, and the maximum block perimeter can be from 2,400 to 3,000 feet, which means the block can have 600 feet of width and 900 feet of depth at the maximum level. In the URB area, the maximum block width should be 300 to 500 feet, and the maximum block perimeter should be between 1,200 and 1,800 feet since the purpose of URB is to create more compact, mixed use development. Therefore, the URB area will have smaller block sizes than the TND area, and will have more intersections.

5.2.4 Buildings

The Model Code for TND has many design standards for residential use. Under the TND categories, all housing types – detached and attached residential, apartments, residential as part of mixed-use building, and accessory apartments – can be used in the TND. For residential use, the height should be from two stories to four stories. As for building placement, both setback and build-to-line can be used for consistency of building facades to provide the continuity of streetscape that a solid wall of buildings creates. Another means to secure continuity of streetscape by buildings will be a minimum building frontage, which will be applied forty to fifty percent of the length of lot facing to the street. The residential density should be five to eight units per acre, which means one unit per 6,000 square feet. As mentioned in the assumptions, the model for form-based codes will be assumed to design the site at the maximized level.

As for URB, it suggests building standards for mixed-use buildings with

residential use. It has the minimum height limitation of three stories, and the maximum building height can be built up to six to ten stories for mixed-use buildings. To have direct access to buildings from the street, zero-lot-line development should be encouraged, so there is no maximum front yard standard for URB area and no limitation for side yard requirement. Also, URB areas should have more maximum building frontage than TND areas, which should have sixty to eighty percent of the width of the lot abutting the street. The maximum building density for mixed-use buildings is FAR of 0.8 to 1.0, with an FAR of 0.4 to 0.5 for residential use included within the total FAR.

5.2.5 Open Spaces

The Model Code suggests a minimum percentage of lot devoted to open space should be used to create integrated amenities in both lots and blocks. In the TND area, fifteen to thirty percent of available open space within the lot should be created because the TND area in Fort McPherson will mainly consist of a variety of housing types. To create a better living place, development should be carried out to create as much available open space as possible within the residential lots for amenities. This means that under the possible conditions, thirty percent of available open space should be considered in subdividing and making residential lots.

For the URB area, more compact, mixed-use development is more important than open space, so the minimum percent of lot devoted to open space is smaller than that of TND because sixty to eighty percent of minimum building frontage is used for URB area. Therefore, only five to fifteen percent of open space area within the lot will be allowed.

5.2.6 Parking

In the Model Code, required parking spaces shall be available for the parking of operable passenger vehicles for residents, customers, patrons, and employees, as appropriate given the subject use (DCA, 2007). Also, all parking spaces should be located within the same lot of the main building that they support. The Modes Code sets the minimum number of off-street parking standards according to land uses and building uses. The following table shows off-street parking standards that are required for developing Fort McPherson based on the Model Code.

Table 23. Minimum Number of Off-Street Parking Spaces Required

Use	Parking Spaced Required (Per Gross Floor Area Devoted to the Use or Per Employee on Largest Shift, Except as Otherwise Specified)
Commercial Uses	
Art Gallery	One per 400 square feet
Auto parts store	One per 400 square feet plus one per employee
Automobile sales	One per employee, plus one per 150 square feet of repair space, plus one per 600 square feet of showdown
Automobile service and repair	Two per service bay
Bank, credit union,savings and loan	One per 300 square feet
Barber shop or beauty parlor	One and one-half per operator's chair, plus one per employee
Bed and breakfast inn	Two for the owner-operator plus one per guest bedroom
Billiard hall/amusement arcade	One per 200 square feet
Bowling alley	Two for each alley, plus one per each employee
Convenience store	One per 250 square feet plus one per employee
Dance hall or school	One space per 150 square feet
Funeral home or mortuary	One per 1,000 square feet plus one per employee and one per delivery truck
Grocery or food store	One per 200 square feet
Hardware store	One per 400 square feet plus one per employee
Health or fitness club	Ten plus one per each 250 square feet over 1000 square feet
Hotel or motel	One per guest room, plus one per employee, plus one per specified requirements for restaurants and meeting rooms as applicable
Kennel	One per 400 square feet, plus one per employee
Laundromat	One per each two washer/dryer combinations
Nursery or greenhouse	One per 1000 square feet devoted to sales
Office	One per 300 square feet
Photographic studio	One per 400 square feet
Restaurant, bar, or tavern	One per 100 square feet

Table 23. (Continued)

Use	Parking Spaced Required (Per Gross Floor Area Devoted to the Use or Per Employee on Largest Shift, Except as Otherwise Specified)
Self store facility (mini-ware house)	One per facility manager, plus one per each forty storage units, with two spaces total minimum
Service station	One per two employees plus three for each service bay
Shopping center	Four and one-half spaces per 1000 square feet
Theater, cinema	One per three fixed seats
Veterinarian, animal hospital	Four per practitioner
Institutional Uses	
Church, temple, synagogue and place of worship	One per four seats in the room with the greatest seating capacity
Day care center	One per employee, plus one per eight children, plus one space for each vehicle associated with facility
Hospital	One per four beds, plus one per two employees
Library or museum	One per 300 square feet
Nursing home	One per three patient beds
Post Office	One per 200 square feet
School - elementary	One per employee plus one additional per 10 employees
School - middle	One per ten students or one per five seats in auditorium or main assembly area, whichever is greater
Residential Uses	
Apartment, one bedroom	One per unit
Apartment, two bedroom	One and one-half per unit
Apartment, three bedroom	Two per unit
Boarding or rooming house	One space for every two guest rooms, plus one additional space for the owners, if resident on the premises
Residence within building containing a non-residential use	One per unit
Single-family detached or attached(including manufactured home)	Two per unit
Two family dwelling	Two per unit
Recreational Uses	
Amusement Park	Per parking generation study funded by applicant and approved by the Land Use Officer
Assembly hall or auditorium	One per four fixed seats, or one per 150 square feet of seating area, whichever is greater
Basketball court	Five per court
Community center	One per 250 square feet
Golf course	Three per hole
Golf driving range, principal use	One for every tee
Swimming pool – subdivision amenity	One per 150 square feet of surface water area
Swimming pool – public	One per 150 square feet of surface water area

The TND and the URB areas allow on-street parking on all streets except within

twenty-five feet of the right-of-way of an intersecting street. For the storefront streets of the TND and the URB areas, on-street parking is mandatory. Also, when off-street parking is located in the TND and URB areas, it needs to avoid the place between the street right-of-way and the building fronting the street. Finally, if an off-street parking deck is facing a shopfront street, the ground level of the parking deck facing the street should be used as retail and represent the shopfront characteristics for a continuous space context of the retail district.

Based on the design standards of both regulation systems, a comparison of alternative physical models under the maximized development conditions can be described in the following chapter.

CHAPTER 6

IMPLICATIONS OF CONVENTIONAL ZONING AND FORM-BASED CODES IN THE FORT MCPHERSON

Based on a comparison of the standards between conventional zoning and form-based codes, the detailed evaluation indicators can be found in the previous chapter. To identify the difference of the impact of both regulations on community revitalization, the next step will be to apply the evaluation criteria to the Fort McPherson target site and consider the implications of both regulations.

As discussed in the previous chapter, implications of conventional zoning and form-based codes will be analyzed from four different general categories drawn from Fleissig's Smart Scorecard and LEED-ND guidelines – sustainability, connectivity, diversity, and design optimization and compactness. Also, based on the implications of both regulations, important issues such as public health, safety, and welfare which are closely related to the two regulation systems will be described in general categories.

To identify the implications clearly, all values and standards will be selected by precisely following the maximum or minimum requirements. Therefore, there might be a confliction between the actual built environment and the models. However, by comparing the differences between the conventional zoning and the form-based codes, planners can recognize what aspects of the built environment will change and whether those changes will have a positive or negative impact on the community redevelopment and revitalization, both of which are major goals of the Fort McPherson plan.

6.1 Sustainability

As discussed in Chapter four, sustainability is closely related with environmental quality in the development site. Among five indicators, three will be selected for a comparison of conventional zoning and form-based codes in Fort McPherson. First, to create environmentally friendly living places, the Fort McPherson Redevelopment Plan focuses on developing solar access systems such as solar panels throughout the site and fuel cell shuttle buses. Also, the study of Fort McPherson by the School of City and Regional Planning at the Georgia Institute of Technology suggests urban agribusiness on the site. Estimating the total area for vegetation or green space will be a good indicator.

6.1.1 The Total Area of Solar Access expected in the Site

Actually, there are no exact design requirements or standards for installing solar panels or the area of solar panel in both regulations. Assuming that solar panels are placed on the roof of the buildings for maximum efficiency, the total area of solar panels on the target site can be estimated by using the total roof area of the buildings. However, it is impossible to cover the entire roof area with solar panels because the shade of the buildings can affect one another. Also, the efficiency of solar panels is influenced by the sunshine time throughout the year.

Under the City of Atlanta Zoning Ordinance, lots and blocks in each zoning district can have minimum yard requirements so that the sun can shine on the ground. For example, when the O-I district is adjacent to residential districts, twenty feet of side yard and thirty feet of rear yard are needed to avoid building shade from the O-I district. Also, transitional height planes in the O-I district and the C-1 district in the target site can help

to allow more natural lighting on the ground.

Like conventional zoning, DCA's Model Code does not provide standards for solar panel area ratios in the TND and URB area. However, some residential areas adjacent to the URB areas in the target site will not use solar panels because DCA's Model Codes reduce front, side, and rear yard setback requirements for more mixed-use and compact development within small areas. Therefore, more restrictive yard regulations in the conventional zoning provide more possibilities to expose buildings on the site to encourage installation of solar panels to create an environmentally friendly built environment.

6.1.2 Minimum Yard Areas for Green Spaces per Residential Lot

The possible areas of front, side, and back yard for green space shows the possibilities of creating residential amenities in the residential lot, so this will be a very good indicator for measuring the livability of the residential area in a quantitative way. According to Georgia DCA's Model Code, the minimum lot size for single-family housing is 6,000 feet, and the minimum setback for front, side, and back yard is ten feet. When a single-family house is built according to the Model Codes, the maximum lot FAR is 0.6, which means the total floor area for the residential lot is 3,600 square feet. When we build a two-story single-family house, each floor area can have 1,800 square feet. When a single-family house is placed on the lot under maximized conditions, its dimensions will be thirty feet wide and sixty feet deep. With a single-family building on the lot, the total area of front, side, and back yard for green space will be illustrated as follows:

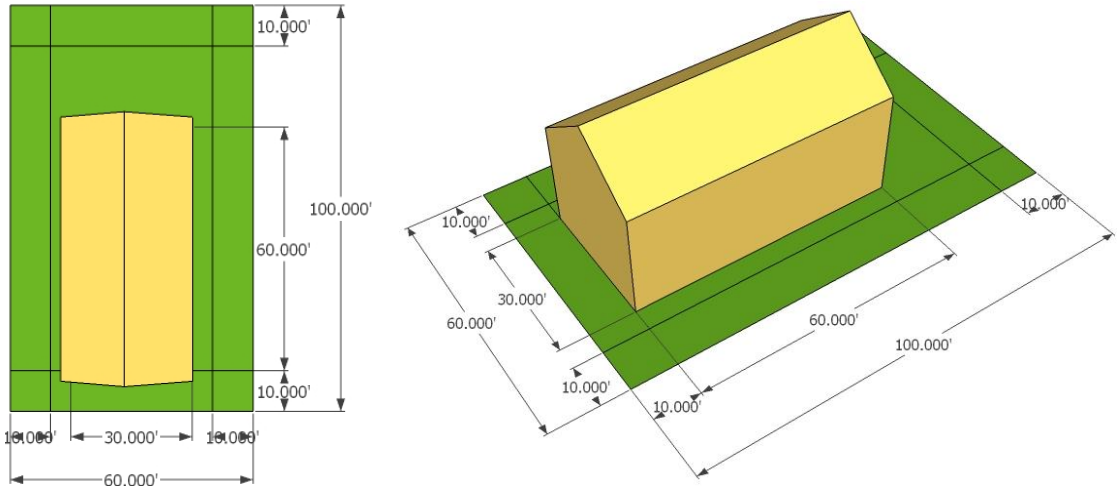

Figure 25. The Minimum Yard area for Green Space in the Model Code

Assuming that the buildable area is completely built out, the residual lot area will be 4,200 square feet. However, the Model Code suggests about forty to sixty-five percent of maximum impervious surface coverage, so only thirty-five to sixty percent of the lot area can be used as green space. Therefore, the total area of front, side, and back yards for green space per residential lot will be estimated as follows:

(6,000 square feet – 1,800 square feet (maximum buildable area in the residential lot))*(1-0.4) = 2,520 square feet

This means that the maximum usable green space for the front, side, and back yards will be 2,520 square feet.

In the models of the City of Atlanta Zoning Ordinance, single-family housing will be located in the R-4 and R-G districts. In the R-4 district, the minimum lot area is 9,000 square feet. To meet that lot area requirement, it will be reasonable to create lots

dimension with ninety feet width and one hundred feet of depth because, due to irregular block shapes, it is hard to fit the normal lot size with seventy-five feet of width and 120 feet of depth. Also, in the zoning ordinance, the FAR of the R-4 district is less than 0.5, so the total floor area for a single-family house will be 4,500 square feet. As with the form-based code, each floor area in the two-story single-family housing will be 2,250 square feet. Therefore, 6,750 square feet in the lot will be possible area for green space in the front, side, and back yards. Like form-based codes, the percentage of the maximum impervious surface coverage should be considered, but there is no standard for the impervious surface coverage percentage in the residential lot. When forty-five percent of the impervious surface coverage is applied in the conventional zoning ordinance, it will be estimated as follows:

(9,000 square feet – 2,250 square feet) *(1-0.45) = 3,712.5 square feet

This means that the maximum usable green space for front, side, and back yards will be 3,712.5 square feet.

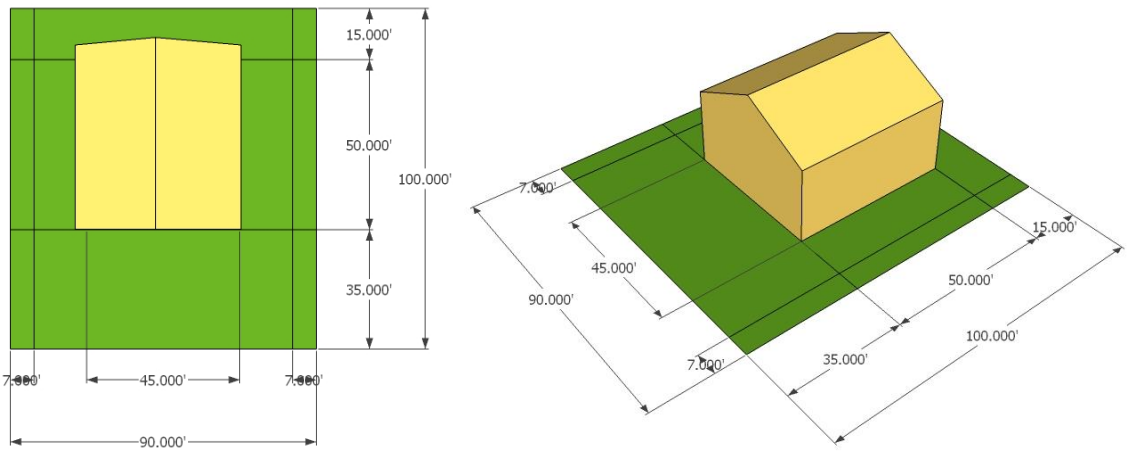

Figure 26. The Minimum Yard area for Green Space in the Conventional Zoning(R-4)

In the R-G district, the minimum lot area is 5,000 square feet. The front, side, and rear setbacks in the R-G district are forty feet, seven feet, and seven feet, respectively. Therefore, there will be a buildable lot area with thirty-six feet of lot width and fifty-three feet of lot depth. The minimum floor area ratio for single-family in the R-G district is 0.5, so the maximum floor area for a single-family house in the R-G district will be 2,500 square feet. For a two-story single-family house, each maximum floor area will be 1,250 square feet, which gives the building a dimension of thirty feet wide and forty-two feet deep. However, like other residential districts, green space area in the front, side, and back yards is much smaller than this value. When forty-five percent of the maximum impervious surface coverage is applied, the area for green space in the front, side, and back yards can be estimated as follows:

(5,000 square feet – 1,250 square feet) *(1-0.45) = 2,062.5 square feet

This means that the maximum green space will be 2,062.5 square feet.

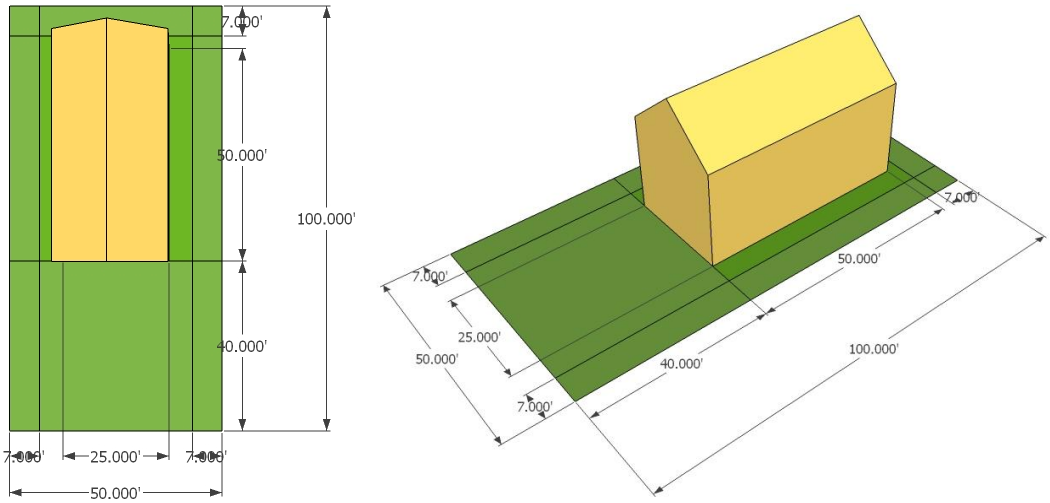

Figure 27. The Minimum Yard area for Green Space in the Conventional Zoning(R-G)

Based on these estimations, it seems that conventional zoning can provide more front, side, and back yard for green space because the R-4 district provides more green space in the yards than the TND district in the Model Code. However, in a comparison between the R-G district of the zoning ordinance and the TND district of the Model Code, the TND residential district provides more green space in the front, side, and back yard than the zoning ordinance does. Although the target area in Fort McPherson has an R-4 zoning district, most of the residential districts will consist of areas designated as R-G because these residential areas focus on employees working in the Bioscience Employment Center according to the Fort McPherson Redevelopment Plan, and they cannot afford to buy houses in the R-4 district. Therefore, the TND residential district will provide more green space in the residential lots for residents' amenities and the creation of a more compact, high-density development in the site.

In the TND residential district, single-family houses are placed on the lot close to the street, which provides more green space behind the residential buildings. This indicates that the TND residential lot tries to suggest more private green spaces by placing the residential buildings in front. This building placement also helps to achieve two major goals – improving more physical contact with people on the street for safety and street activities and securing private space for private activities inside the residential lot, such as planting trees, vegetation in the rear yard or enjoying family activities.

6.1.3 Solar Orientation in Blocks and Buildings

The solar orientation of blocks and buildings helps to create blocks and building placement which can minimize the negative impact of building shade on nearby

properties. The buildings affected by other buildings' shades can be negatively impacted regarding heating, cooling and natural light. Also, if building shade spreads across the main street in the target area, it can reduce street activities. The shadows caused by the solar orientation of blocks and buildings depend on the seasons and the time.

In the City of Atlanta Zoning Ordinance, building shade in the O-I t and the C-1 districts in the target site will affect other buildings throughout the year. In spring, fall, and summer, building shade rarely affects another property, but long building shadows in the winter affect the bottom floor area of buildings and the street. This leads to the need for more lighting and heating in the affected buildings.

The buildings in DCA's Model Code are affected by building shade in winter. However, when compared with the conventional zoning standards, the effect is relatively small because the building density in the URB area is lower than the zoning ordinance and the distances among buildings are wide enough not to be affected by the shadows of other buildings. Also, the main street in the conventional zoning is covered with building shade for most of the time in winter, but the main street in DCA's Model Code is not. This also means that DCA's Model Code has a better street environment because natural light can be shed down to the ground.

In terms of sustainability in Fort McPherson, there is only a slight difference between the conventional zoning and the form-based code models. Based on the standards, the R-4 zoning district in the Atlanta zoning ordinance provides the most green space within the residential lot, but this is because the lot area requirement is bigger than that of the form-based code. Under the same amount of lot area, the form-based code can provide more green space than the R-G and R-LC zoning districts, which mean the form-

based codes can provide slightly more green space in the residential lot and have more possibilities for urban agribusiness. A solar access system is considered important in the Fort McPherson plan, but it is difficult to compare conventional zoning and form-based codes in terms of this issue because there are no standards or physical requirements in both regulations. For more sustainable and environmentally friendly development, design standards on solar energy systems or other renewable energy should be included in both regulations.

6.2 Connectivity

The Fort McPherson Redevelopment Plan also focuses on improving connectivity by providing more mobility choices and encouraging "Public Realm" on the street because the neighborhoods around the base have had a lot of street networking problems such as narrow pedestrian sidewalks, narrow car lanes, poor street furniture, and so on. Designing the streetscape relating to public safety is also a critical issue around the Fort McPherson base. Considering these design issues, three evaluation indicators of connectivity – the number of intersections, the general dimensions of street standards, and the total estimated pedestrian and bicycle length in the site – should be analyzed to evaluate the two regulation systems.

6.2.1 The Number of Intersections Expected in the site

The number of intersections is related with viability of street activity as well as connectivity. In terms of connectivity, many intersections shorten the block length. If the block length is shortened, residents tend to walk to a specific place rather than drive a car.

When people go around their neighborhoods on foot, more people will walk on the sidewalks, and this leads to increase chances to have physical contact among residents. Stimulating physical contact among neighbors leads to neighborhood events and makes street activities revitalized and safe. Therefore, a difference in the number of intersections between the conventional zoning and the form-based codes indirectly indicates which regulation system provides more chances to vitalize street activities as well as connect blocks.

Actually, the number of intersections between the conventional zoning and the form-based codes is not that different. DCA's Model Code has slightly more intersections than the City of Atlanta Zoning Ordinance. What is important is that the number of intersections of the residential district in DCA's Model Code is more than the number in the City of Atlanta Zoning Ordinance. In the residential blocks close to the commercial districts in the center, the blocks in the model of DCA's form-based code are divided into two blocks, whereas the model of the City of Atlanta Zoning Ordinance has one single block instead. The reason why DCA's Model Code divided one block into two blocks is that DCA's Model Codes suggest that the maximum width of the block be 600 feet because people feel exhausted when they walk over 600 feet and may choose to drive a car to move from one block to another rather than walk. The width of those blocks is more than 600 feet, so the blocks should be separated into two blocks according to DCA's Model Code. However, the zoning ordinance does not have block standards for each zoning district, so block size with over 600 feet of the width can be created.

Since this separation of blocks occurs in the residential districts, it is possible to say that more intersections in the model of DCA's Model Code can provide more

opportunities to have physical contact among neighbors and encourage more street activities in the residential districts. This also means that the form-based codes limit the maximum block sizes, whereas conventional zoning provides permissive block standards.

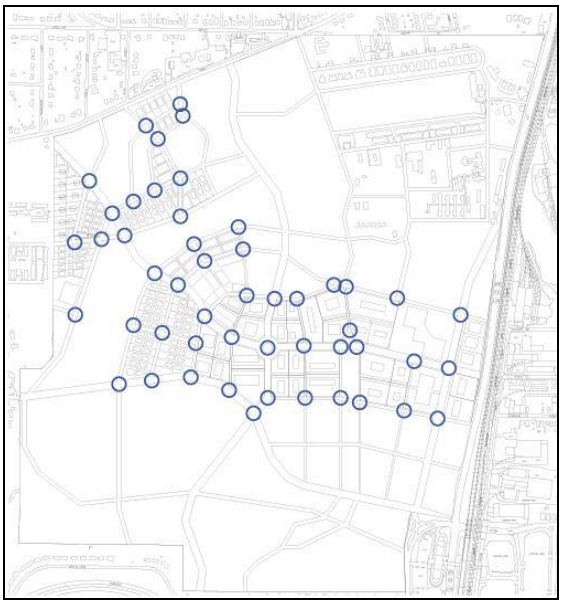

Figure 28. Intersections in the Model Code

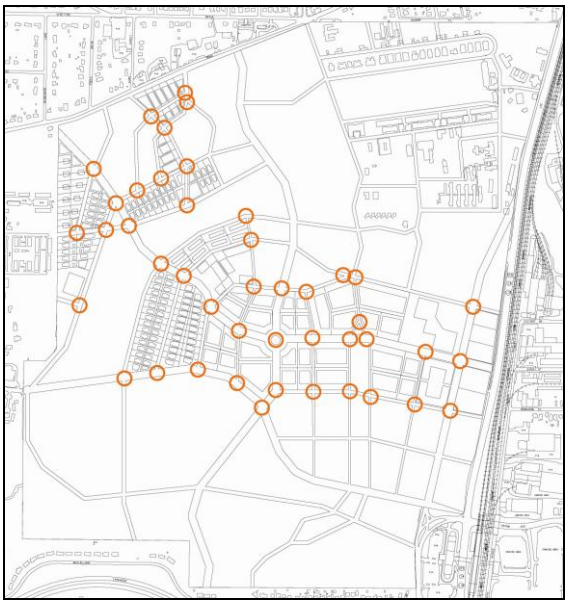

Figure 29. Intersections in the Conventional Zoning

6.2.2 Considering General Dimensions of Streets

The Fort McPherson target area is sliced based on the main street running from east to west. The street design standards will provide strong activity on the street and strengthen accessibility to anywhere. Comparing the street dimension changes between the conventional zoning and form-based codes shows how much streets can change according to the regulation systems.

DCA's Model Code suggests sixty feet of right-of-way as a healthy main street and thirty-eight feet of right-of-way as a local street to provide access to residential units. If main street in Fort McPherson has four car lanes, there will be two twelve-foot car

lanes for high-speed traffic in the center and two ten-foot car lanes for slow-speed traffic. Eight-foot pedestrian paths will be built on each side, which is still wide enough for people to walk on the sidewalk with safe.

The City of Atlanta Land Subdivision Ordinance suggests a main street design standard with a fifty-foot right-of-way. Like the Model Code, if four car lanes are built, two eleven-foot car lanes and two ten-foot car lanes might be possible, but only four-foot pedestrian sidewalks can be created on each side without planting trees. Therefore, it would be impossible to design a main street with four car lanes within a fifty-foot right-of way. For more mobility choices mentioned in the Fort McPherson Plan, the number of car lanes should be reduced to two, with on-street parking on one side, and eight-foot pedestrian paths on each side, which is the same width as allowed in the Model Code.

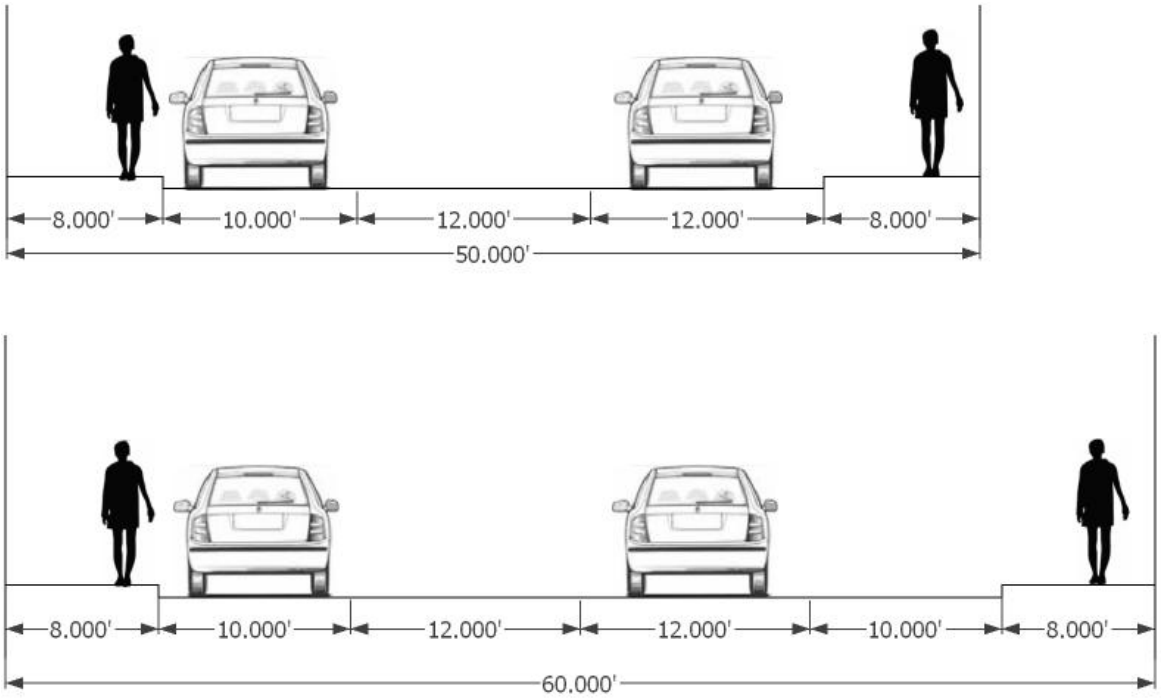

Figure 30. The Main Street Section in the Atlanta Zoning Ordinance(Top) and the Model Code (bottom)

In the local residential street, the City of Atlanta Zoning Ordinance suggests a local street with a thirty-two-foot right-of-way. When two ten-foot car lanes are built to mediate traffic speed, it can only provide four-foot pedestrian paths on each side. Otherwise, one car lane with on-street parking space can be suggested, and six-foot pedestrian paths will be built on each side. In DCA's Model Code, however, a thirty-eight-foot street provides residents with eight-foot pedestrian paths on each side. Also, the trees on each side can serve as a pedestrian park. Based on this, it is possible to say that DCA's Model Codes can encourage more transportation choices than a car because these codes can provide wider pedestrian paths and car lanes which do not conflict with each other. As with the main street, properly wide local streets also provide more vitality.

Based on this comparison, it is possible to say that the Model Code provides wider pedestrian paths, better quality of pedestrian environment, and ultimately more balanced mobility choices than does the City of Atlanta Zoning Ordinance.

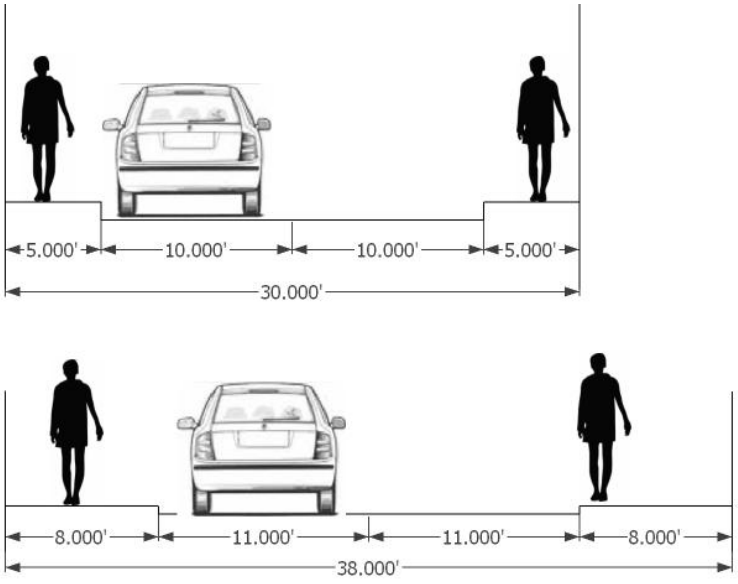

Figure 31. The Local Street Section in the Atlanta Zoning Ordinance(Top) and the Model Code (bottom)

6.2.3 Estimating the Length of Pedestrian and Bicycle Length

By creating bicycle lanes near to pedestrian paths, residents can have more mobility choices and improved street connectivity. Generally, an additional three to five feet of street width is required to allow for the width of a bicycle lane. Considering both regulation systems and the Fort McPherson street widths, it is quite difficult to provide bicycle paths on the main streets because pedestrian paths will be reduced to less than five feet if bicycle paths are provided on the main street. In the local streets of residential areas, it is also difficult to provide bicycle paths under the Land Subdivision Ordinance because the car lanes would have to be reduced to one-way for bicycles. It may be possible to create one-way streets with wider pedestrian paths and bicycle paths, but cars would have only limited access to residential streets. However, DCA's Model Code can provide three-foot bicycle paths on each side in the residential district while keeping two car lanes.

Based on this, the total length of allowable bicycle lanes in the target site can be predicted. It may be difficult for the City of Atlanta Land Subdivision Ordinance to provide bicycle paths in the site. Therefore, the total length of bicycle is zero, which means the City of Atlanta can provide only two types of transportation modes – by car or on foot. Although it may be possible to provide two nine-foot and two ten-foot car lanes on the main street and build a bicycle lanes on each side, cars would have to proceed slowly, causing traffic problems on the main streets, which would also have a negative impact on the environment, street safety, and connectivity. Therefore, it is possible to say that the City of Atlanta Land Subdivision Ordinance does not provide for various transportation choices. The Model Code also has difficulty providing bicycle lanes on the

main streets based on the street dimensions, but bicycle paths can be provided on the local streets with thirty-eight feet of right-of-way. The total length of allowable bicycle lanes in DCA's Model Code can be estimated by calculating the total length of thirty-foot local streets to access residential units. Bicycle lanes in the TND residential districts help to improve more street activity and reduce dependence on automobiles at the local residential street level.

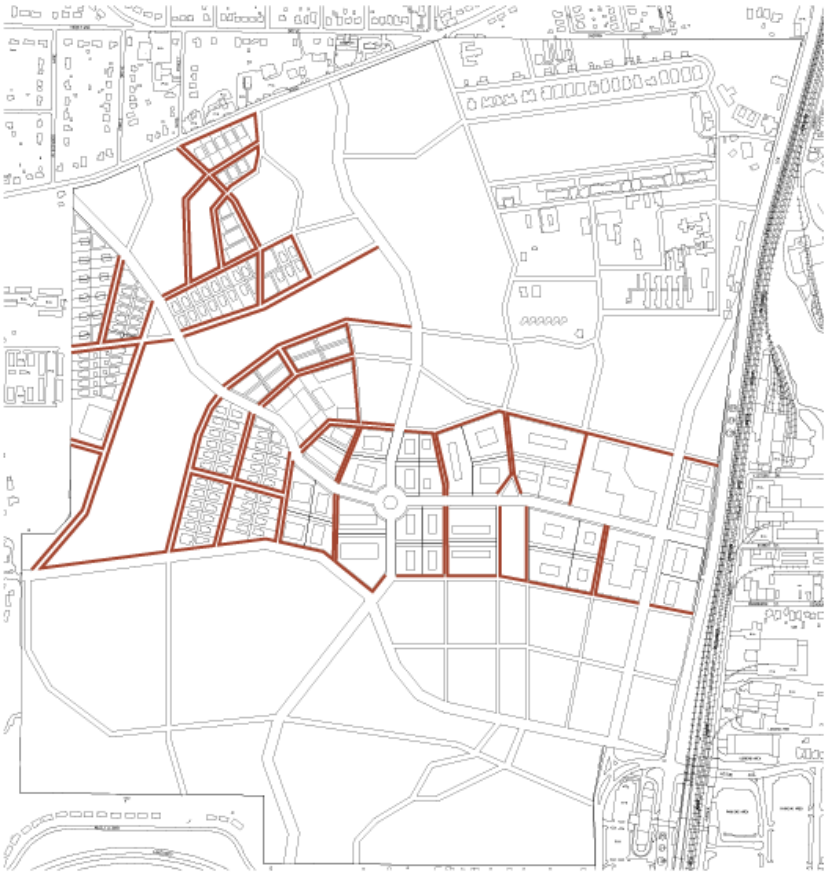

Figure 32. The Estimated Bicycle Path in DCA's Model Code

6.3 Diversity

The third criteria, diversity, can be analyzed in two ways. First, mixed-use development creates more compact land use patterns and provides possibilities to

combine building uses vertically as well as horizontally. In both the City of Atlanta Zoning Ordinance and the Model Code, mixed-use development is highly recommended. Especially in the commercial and office districts, both regulations suggest that office and commercial buildings in the mixed-use district can provide residential uses up to fifty percent of the total floor area. There may be differences in terms of development density, but the basic principles of mixed-used development are very similar with each other.

As for the residential unit, however, there are several differences between the zoning ordinance and the Model Code. By the diverse setbacks and various lot sizes, the residential buildable area will be very different, and the building shapes in the residential lots under the maximized development conditions present various building types such as bungalows and shotgun houses. Particularly, the diverse front setbacks in the residential districts can determine the continuity of building frontage to create public realm. Therefore, diversity in the residential district should be considered in detail.

6.3.1 The Variety of Setbacks in the Standards

Since the City of Atlanta Zoning Ordinance takes a lot-by-lot approach, it provides more detailed setback regulations than DCA's Model Code. Based on the minimum lot requirement in the zoning ordinance, each lot in specific zoning districts has front, side, and rear yard setback regulations. Buildings in the same zoning district are affected by the same setback regulations and should maintain spatial continuity on the street level in the same zoning districts. However, this also means that building frontages made by the front setback regulation in the zoning ordinance can be difficult to maintain in the different zoning districts: for example, when the zoning district is changed from R-

4 to R-G, the minimum front yard setback of the R-G district is 5 feet deeper than that of the R-4 district. However, the setback can be kept uniform in the same districts.

The DCA's Model Codes, however,, provide a uniform building frontage by defining constant building setbacks regardless of the type of Fort McPherson residential areas. As for the front setbacks, a ten-foot setback regulation is generally adopted in the TND and the URB area. This helps form-based codes to maintain a uniform building frontage on the street level throughout the site and has a positive impact on creating "Public Realm" through solid building walls. Furthermore, the minimum front yard requirement of the Model Code is only 10 feet, which means residential units can be built close to the street. In the Fort McPherson site, the residential units will be built close to the local residential street with a thirty-eight-foot street right-of way, which encourages more street activity and strengthens public safety on the street.

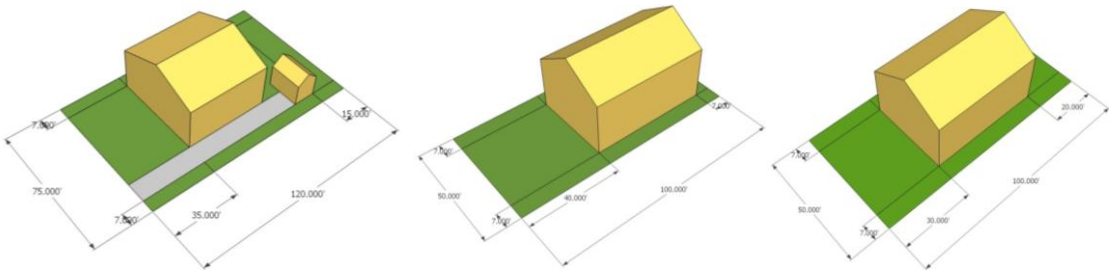

Figure 33. The Setback Requirements of Residential Districts in the Zoning Ordinance

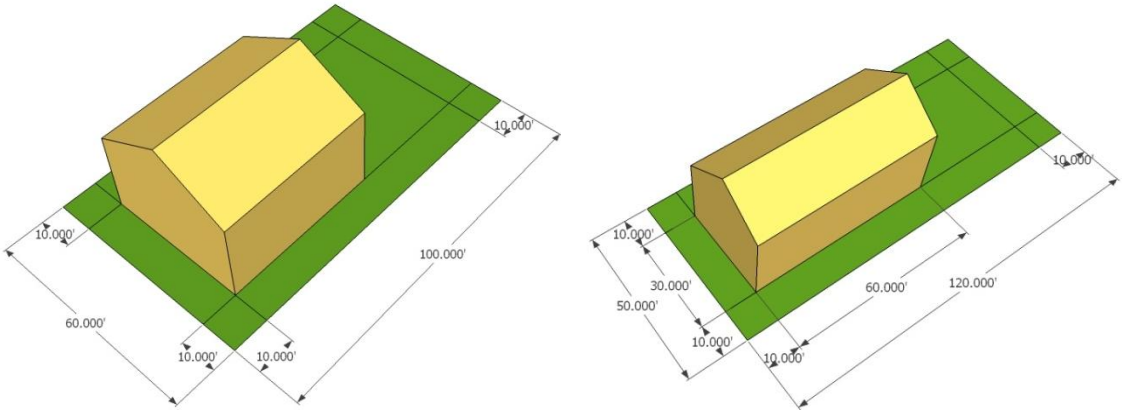

Figure 34. The Setback Requirements of Residential Districts in the Model Code

6.3.2 The Variation in Residential Lot Sizes

The City of Atlanta Zoning Ordinance provides different lot area requirements according to the zoning districts. In the Fort McPherson site, the residential lots in the R-4 districts should have at least 9,000 square feet, and lots in the other two residential districts, R-G and R-LC, should have at least 5,000 square feet. Assuming that a residential lot has a rectangular shape, the residential lot dimension in both the R-G and R-LC districts will have a fifty-foot width and a 100-foot depth, as this will be the only option that can be properly used as a residential lot. However, a residential lot in the R-4 districts can have two variations in the lot size depending on topographic conditions and subdivision regulations. Considering that Fort McPherson will have a residential lot designated as R-4 with the minimum lot area of 9,000 square feet, a lot with a ninety-foot lot width and a 100-foot lot depth or a lot with a 75-foot lot width and a 120-foot lot depth can be built in the R-4 district of Fort McPherson. Generally, a 75-foot by 120-foot residential lot is used, but the other lot size can be considered in the Fort McPherson redevelopment because some R-4 lots cannot have a 120-foot depth.

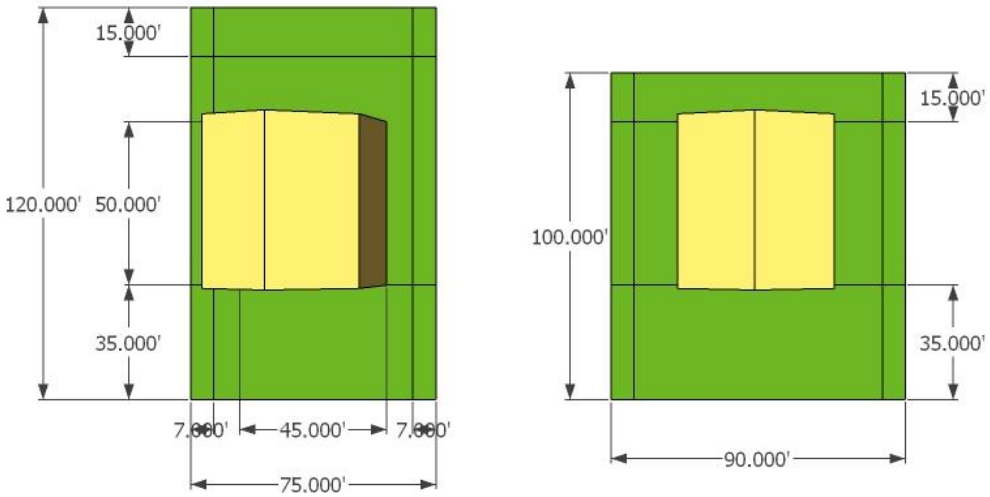

Figure 35. Lot Size Variation in the Zoning Ordinance(R-4)

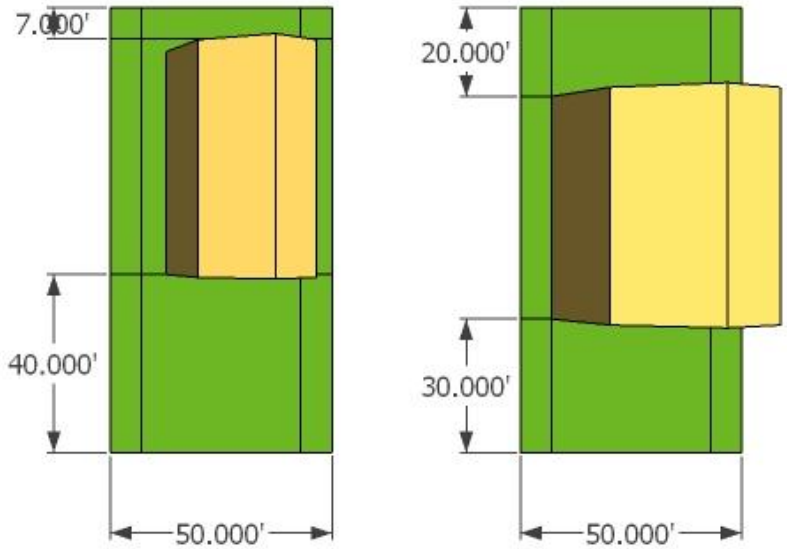

Figure 36. Lot Size Variation in the Zoning Ordinance(R-G and R-LC)

Assuming that residents build their houses by using the maximum built-out area within the lot for the best development profit, the residential building types will tend to be different depending on the lot sizes. In the R-4 district, a bungalow type of residential building can be built under the maximized residential development. In the R-G and R-LC districts, a shotgun type residential unit can be built on a residential lot under the maximized built-out conditions. However, the types of residential buildings can vary depending on how the buildable area is used.

In the Model Code, the residential lot area should have at least 6,000 square feet, which is smaller than for the R-4, but larger than the lot area for the R-G and R-LC districts. Considering the minimum lot area, the TND residential lots also have two lot types like the R-4 district – a lot with a 60-foot width and a 100-foot depth, and a lot with a 50-foot width and a 120-foot depth. Like the zoning ordinance, if residents build a two-story single-family house under the maximized residential development, a shotgun-type housing like the R-G and R-LC districts can be provided in the Fort McPherson target

site.

The Model Code also provides residential lots of more than 6,000 square feet to create a single-family housing district, like the R-4 district, but Fort McPherson will build as many residential lots as possible because the target residents living in the area will be young couples or singles working at the Employment Center. Although it is also possible to build more R-G and R-LC residential districts, the TND residential lot will provide more high-density residential development, which will provide more residential spaces. The R-4 single-family residential units can be built at the west edge of the target site, but it will be difficult to create lot sizes more than the minimum lot requirement considering that compact, high-density development is one major goal of the Fort McPherson Redevelopment Plan.

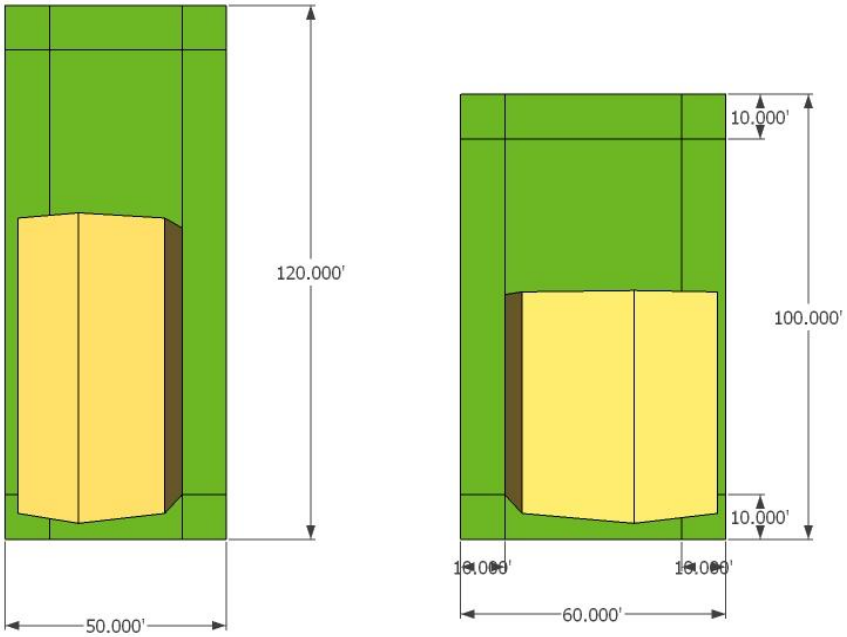

Figure 37. Lot Size Variation in the Model Code(TND Residential)

6.4 Design Optimization and Compactness

Design optimization means making the best use of the site for public good and creating more livable places, whereas compactness means creating high-density development within small areas. In the plan, compact development with optimized building design will attract suburbanites back to the urban area, and Fort McPherson will serve as a revitalized place where people can live, work, and play twenty four hours a day.

For the comparison, two indicators will be suggested. Allowable dwelling units will provide the optimized residential lot size that can also meet the maximum dwelling units per acre. The maximum floor area of office and commercial buildings will indicate how both regulations control building density and how densely buildings can be built within small lots.

6.4.1 Allowable Dwelling Units per acre

Dwelling density per acre indicates how the target site can be developed in a compact and dense way. In DCA's Model Code, the maximum residential density is defined as five to eight units per acre, which means that each residential lot area will be 6,000 square feet. Since one acre is 43,560 square feet, a residential lot with a 66-foot width and a 132-foot depth can be considered if one acre of land is totally used up to create five residential lots. However, considering the alleys and the streets, the most realistic lot size will be 60 feet wide and 120 feet deep. If eight residential units are built on one acre, the lot size will be reduced to a sixty-foot width and an eighty-foot depth,, which is less than 6,000 square feet (by 1200 square feet, 20%).

In the City of Atlanta, there are no standards for allowable dwelling density per

acre, but it can be estimated based on the lot area. In the R-4 district, the minimum lot area is 9,000 square feet, so four R-4 residential units can be built within one acre, including an alley and a street. In the R-G and the R-LC districts, eight residential units can be built within one acre. Based on this, lot layout examples will be illustrated in the following diagrams.

In Fort McPherson, both the zoning ordinance and the Model Code can develop high-density residential areas within one acre. In terms of dwelling density, the R-G and R-LC districts in the zoning ordinance will be better than the TND residential allowed in the Model Code because those districts allow for the building of more residential units within one acre while including one alley and one street within the acre. Particularly because the Fort McPherson site has many irregular residential lots, the R-G and R-LC lot dimensions will be more suitable for adjusting to irregular residential lots.

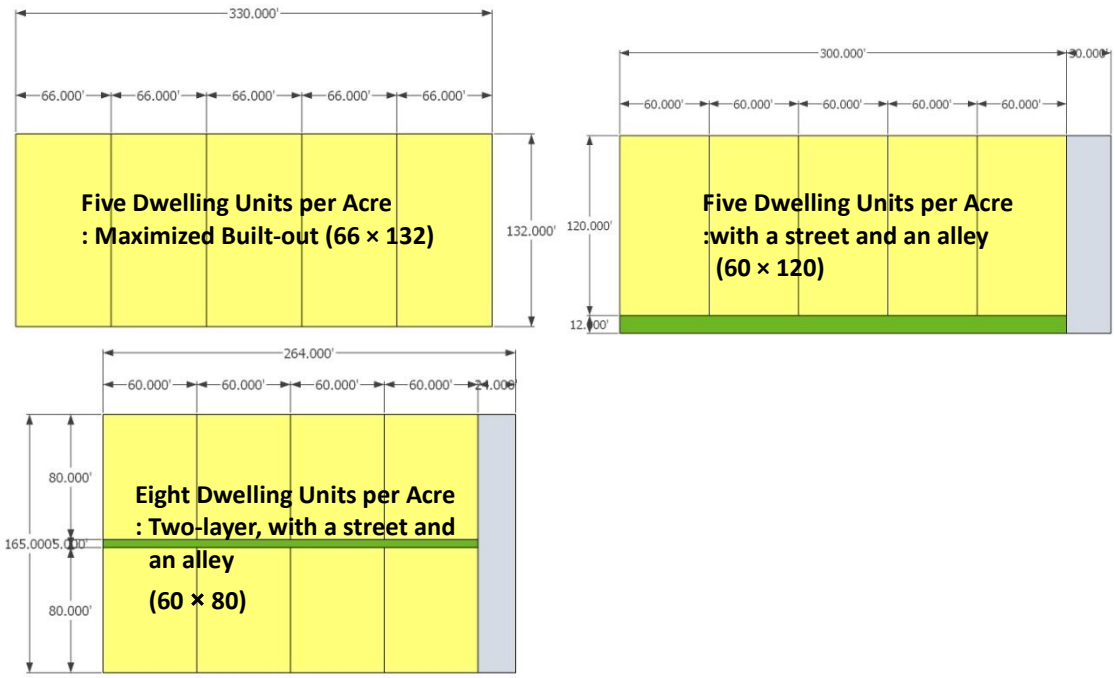

Figure 38. Exemplar Layout of Model Code's Allowable Dwelling Density

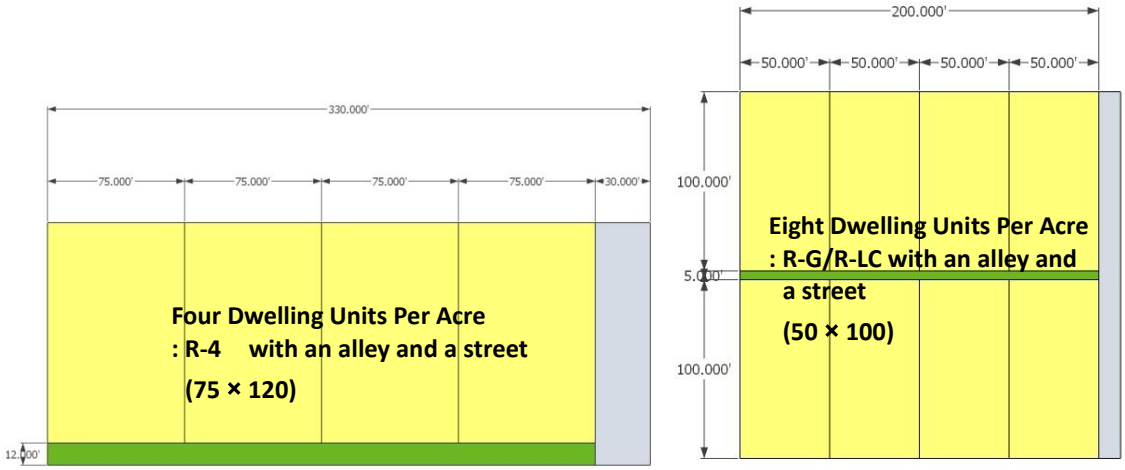

Figure 39. Exemplar Layout of Allowable Dwelling Density in the Zoning Ordinance

6.4.2 Maximum Floor Area Ratios in the Commercial and Mixed Use Buildings

Being closely related to development density in the site, the maximum floor area ratios in the commercial, office, and mixed-use buildings indicate how dense and compact the target area will be built according to both regulation systems. Based on the City of Atlanta Zoning Ordinance, the O-I zoning district will have higher density than the C-1 district. Because commercial and office buildings in the O-I district can have up to 3.0 FAR, buildings over ten stories can be built along the Fort McPherson east-west main street. Buildings in the C-1 district will have 2.0 FAR of the net lot area, which will be a lower density than that of the O-I district. Nevertheless, due to the high FARs, buildings based on the zoning ordinance will be built as high-rise buildings. However, if the maximum FAR is applied in the Fort McPherson plan, the main street will appear to people as relatively narrower than the actual dimension, causing decreased street activity and negatively impacting the street environment because there will be building shade on the ground throughout during the day. Also, there is no height limitation in the O-I and C-1 districts, so buildings can be built higher than predicted within the maximum FAR.

In the Model Code, the URB area suggests that mixed-use buildings with residential units will have 0.8 to 1.0 FAR, which means the building density will be less than that allowed in the zoning ordinance. However, if buildings with the same height in the zoning ordinance are built by using the Model Code, the building lot coverage will be smaller than it would under the zoning ordinance and thereby provide more open spaces which can be used as public spaces. This will have possibility to enrich street activities, giving people a sense of spaciousness on the main street. In addition, the Model Code defines the maximum height as ten stories, which also prevents buildings of excessive heights to the lot size and area.

As for mixed-use buildings, the O-I zoning district will have slightly more FAR than single-use buildings by 0.248. By combining with residential uses, mixed-use buildings in the zoning ordinance will provide higher or denser buildings in Fort McPherson. This will make the main street look narrower and reduce the vitality of the main street. Both O-I and C-1 districts have no limitation to the maximum lot coverage, so bigger and higher buildings will be built. The Model Code suggests lower FARs in the Employment Center district of Fort McPherson, but high-rise buildings will be built providing larger open places than the zoning ordinance would allow. In addition, since zero-lot-line development will be encouraged for compact development, the Model Code in the Fort McPherson plan will have more efficient land use. Finally, the URB district in the Model Code defines the building regulations based on the mixed-use buildings, whereas, the O-I zoning district in the zoning ordinance has mixed-use development control regulations. This also indicates that vertical mixed building use, as well as horizontal mixed uses among blocks and lots, is recommended in the Model Code rather

than the zoning ordinance. All factors considered, it is possible to say that the Model Code provides more ways of achieving mixed-use and compact development while securing open spaces for the public good.

CHAPTER 7
CONCLUSIONS

7.1 Analytic Results of the Physical Alternative Models

As an attempt to compare the conventional zoning and the form-based codes, this study proposes some general urban design categories and several detailed evaluation indicators. Based on these indicators, both regulation systems are analyzed in an actual community revitalization plan called the "Fort McPherson Redevelopment Plan".

The first hypothesis in this thesis is that it can be proven that the form-based codes provide a better built environment than does the conventional zoning and offers to prove this statement in both quantitative and qualitative ways. Through a research review on the historical context of the form-based code, it is found that form-based codes have existed throughout urban planning history and that they are is not a replacement for conventional zoning but can be a supplement to the conventional zoning in the 21st century urban planning and design. The difference between conventional zoning and form-based codes is that the latter can provide a more predictable result of the built environment by using its own components such as a regulating plan, public space standards, building form standards, and architectural standards. This also means that the form-based codes try to control building forms directly with the use of detailed design standards.

To prove the effectiveness of form-based codes, a comparison between the two regulations is carried out. After comparing and applying the standards to Fort McPherson, the following implications are drawn. First, in terms of sustainability, there is not too

much difference between the two regulation systems because both systems do not have exact standards for improving sustainability in the development site. The only difference between the two is the estimated total front, side, and back yard area that can be used as green space. Except for the R-4 district, the TND district in the Model Code allows for more possibility to provide green space within the residential lot. Through this evaluation indicator, it is found that the form-based codes improve more amenities within the residential lot and help residents enjoy their private life in their lot area. Second, in terms of connectivity, several differences are identified between the conventional zoning and the form-based codes. Analyzing the number of intersections in the Fort McPherson target area revealed that more intersections and blocks are created in the Model Code. By reducing the block width and increasing the number of intersections, the form-based codes can provide more street activities, which lead to more physical contacts among residents and improve public safety on the street. Also, in the street design standards, the form-based codes help to design streets with more mobility choices.

However, not all standards of the form-based codes are always better than the conventional zoning. In terms of providing diverse lot size and variations for creating diverse building types and mixed uses, the conventional zoning has more possibilities for variation of lot sizes because it has different lot area requirements and layout conditions according to the zoning districts. Also, based on those lot variations, building types within the residential lot can be easily identified and modified depending on the lot shape. The form-based codes also have flexibility in the lot variation, but under the maximized development conditions, the lot size variations tend to be uniform throughout the site, which makes continuous building types and frontages by solid building walls important

issues in designing the site. The form-based code has flexibility under the same lot size or area conditions, whereas the conventional zoning changes the lot requirements or site design standards suitable for the diverse building shapes or appearances. Nevertheless, development patterns based on the form-based codes encourage more mixed-use development by providing the mixed-use ratio of buildings in the URB area vertically as well as horizontally, whereas the conventional zoning have relatively limited mixed-use development controls because the conventional zoning is based on the principle of separating land and building uses for public safety, public health, and welfare. If lot variations in the conventional zoning and mixed-use development control standards in the form-based codes are combined together, more diverse development patterns will be created. Therefore, urban planners and designers should find out the way of converging design standards of conventional zoning and form-based codes in this aspect – providing more flexible lot variations while keeping the continuity of building walls for public realm and a mixed-use development pattern for vertically diverse building uses.

Finally, in terms of design optimization and compactness, the conventional zoning ordinance suggests higher FARs than do the form-based codes. By using high FARs, high-rise buildings can be built in Fort McPherson, but they also can cause a reduced a sense of spaciousness along the main street and have a negative impact on the environment along the main street even if there will be front, side, and rear setback standards. Unlike the conventional zoning, the form-based codes can provide high-rise buildings within the smaller lots than the conventional zoning, and also provide larger public spaces.

Nevertheless, unlike the first hypothesis, the form-based codes should serve as an

important contribution to the ongoing synthesis to improve development codes.. Throughout the comparison of the two regulation systems, an important point is that standards of the form-based codes were not developed apart from the conventional zoning. The components and standards of the form-based codes provide opportunities to be combined with the conventional zoning and recreated as a third regulation system. This is why DCA's Model Code attempts to use many terms mentioned in the City of Atlanta Zoning Ordinance and the City of Atlanta Comprehensive Plan.

7.2 Limits of the Thesis and Further Studies

Although this thesis proposes how to evaluate the two dominant regulation systems and tries to evaluate the two regulation systems by applying the standards to an actual development case, there are still several limits to this study. First, in comparing the two regulation systems, only the physical requirements and standards are considered to take a more quantitative approach to evaluating the impact of the systems on the actual community revitalization project. However, recently increased public participation in the plan-making process has played a critical role in establishing the plan and predicting the result of the built environment. To make a clearer analysis, comparison between the two regulation systems in terms of the public participatory plan process and public elaboration should be studied as well as evaluation of the physical standards. Second, both the conventional zoning and the form-based codes take a case-by-case approach, so evaluation of only the standards identified in the Fort McPherson Redevelopment Plan is not extensive enough. Actually, the form-based codes takes a time-testing urbanism, more case studies and evaluation based on the evaluation criteria in this thesis will be

required in the further study. Finally, in developing four general evaluation categories and their detailed indicators, there are a lot of missing points in evaluating the two regulation systems. Specifically, this thesis intentionally removed checklist-type indicators to evaluate the systems. However, checklist-type indicators can also play a major role in analyzing the impact of the conventional zoning and the form-based codes in a detailed manner. The study on developing criteria for the two regulation systems will also be a good topic for the further research on the impact of the evolution of design codes on community revitalization and ultimately urban growth in the future.

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