

THE CENTRE OF THE REGION ENTERPRISE

The Effect of Transit Funding on Land Planning and Development

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Chapter 1 - Introduction

The Research Triangle Park was founded in 1959 as an economic development tool to slow the brain drain from the state of North Carolina by creating research opportunities for graduates of the three major universities nearby, North Carolina State University, Duke University, and the University of North Carolina at Chapel Hill. It was located in the hinterland between Raleigh, Durham, and Chapel Hill near Raleigh-Durham International Airport and was the only sizeable activity in the area for over three decades. The Research Triangle Park's success as a knowledge cluster has meant that it is largely in competition with similar research and technological agglomerations nationwide. Furthermore, the Triangle region of North Carolina is in competition with metropolitan areas much larger and more established than itself. Increasingly, the labour force that firms likely to locate in knowledge clusters attract have become more discerning in their location decisions, rating the region's quality of life as high or higher than the quality of the job they are being offered. As a result, firms are now considering local urban amenities when making their own location decisions. The Triangle region of North Carolina has always been at a disadvantage in this regard vis-à-vis its peer group. However, the Research Triangle is one of the best research and technology clusters in the world and needs to be able to attract new firms to the campus to remain successful for another 50 years.

To this end, the Triangle J Council of Governments and the Research Triangle Foundation initiated a study of the area around the Research Triangle Park which was published in 2002. The project, known as the Centre of the Region Enterprise (CORE), sought to exhibit cooperative relationships between local governments, regional organisations, and private sector firms that drive future development to strengthen the existing linkages in the area while creating a coherent development pattern in the long term. Much had changed in the Triangle area since 2002 and the calls for greater convenience and accessibility for RTP employees had gotten louder. In 2005, a second study was launched to identify the changes to the CORE since the publication of the original plan to determine how the participating municipalities could support and encourage the growth in the Research Triangle

region. The original CORE area was 60 square miles but had been expanded in 2005 to over 100 square miles to include the rapidly expanding areas in southern Durham County and eastern Chatham County.

Multiple clients exist for this project and will use it in different ways. Such an analysis will prove valuable to the Research Triangle Foundation as both a marketing and long-range planning tool. RTF has the responsibility to recruit research and development firms to the Park. Increasingly, these target firms are voicing their concerns about the quality of life of the region in which they choose to locate because the labour force is becoming more particular about issues of proximity to amenities and traffic congestion. RTF can use this project to determine where development opportunities exist inside the CORE region and cooperate with local planners and developers to design development nodes, similar to the original CORE study in 2002, and market these special planning districts to current and potential employers as obvious growth opportunities in which, early investment is prudent.

The Triangle J Council of Governments will use this project to facilitate long-term planning across its jurisdiction and introduce coherence to the process of planning for infrastructure, transportation, and green spaces. Local governments in the Triangle region will also benefit significantly from this study. Currently, the seven municipalities that comprise the CORE region are disjointed in their planning and growth strategies. Some of these municipalities have quite adversarial relationships stemming from parochial competitive interests. The CORE area plan endeavours to concentrate development activity in a cohesive and sustainable fashion around the Research Triangle Park and the economic clusters it helped spawn, while respecting the desire of each constituent municipality to grow and prosper. Inter-jurisdictional cooperation is likely the only method to achieve this common goal across the entirety of the region. Employers currently in the region or interested in relocating to the Triangle have expressed interest in a development database to aid their own long-term corporate planning processes. With the help of the CORE project database, firms may determine the long-term viability of the Triangle as an attractive location for the employees they want to recruit.

Issues

The CORE planning process began with public discussion sessions and focus groups to identify those issues most pertinent to the residents, employees, and other stakeholders in the Research Triangle Region. The public feedback sessions also identified several principles to which CORE develop would adhere to satisfy public concerns.

Jobs/Housing Imbalance

Currently, the CORE area is primarily an employment centre with few housing options. According to the Triangle J Council of Governments, the daytime population in the CORE area is ten times the number of permanent residents (TJCOG 2002). The oversupply of employment relative to residences and services requires CORE area employees live in the surrounding municipalities and drive to complete a large proportion of their trips throughout the area resulting in heavily congested roadways during peak travel hours. Moreover, the commuter cohort vacates the CORE area each day which leaves it desolate and devoid of service amenities for existing residents. Currently, the CORE area lacks the after-hours vibrancy that many employees look for when making location decisions.

Housing Shortage

About 100,000 people work in the CORE area, roughly 40,000 in the Research Triangle Park, and nearly all of them commute to work because of the severe lack of housing options around RTP (TJCOG 2002). The Research Triangle Foundation, the entity that owns and operates RTP, can do little to alleviate the local housing shortage on the RTP campus because strict covenants are written into all deeds within the park restricting the land uses within RTP to research and related uses. The park-like design of RTP is yet another barrier to the creation of local housing options. Each parcel is required to maintain large setbacks and wide open spaces to maintain the Park's character which discourages pedestrian behaviour.

Congested Transportation Network

As the municipalities surrounding RTP continue to develop suburban communities in formerly rural areas, the road network serving the Park becomes more congested. Despite evidence that road-widening projects exacerbate traffic congestion; the North Carolina Department of Transportation is engaged in numerous projects to add capacity to the Triangle's road network. Interstate 40, the major thoroughfare through the Triangle region was widened in 2004 yet is projected to be widened further in the next 25 years according to the most recent State Improvement Plan from the NCDOT (TJCOG 2002). Other major thoroughfares are expected to receive major improvements such as road widening, realignment, and new construction.

Limited Transportation Options

The CORE area and the Triangle region in general, offer limited transportation alternatives to driving. The CORE area's dispersed development pattern, featuring buildings surrounded by large parking lots, cul-de-sac communities, and large auto-oriented shopping centres precludes the region's transit providers from offering a convenient, efficient, and extensive service. TTA and DATA operate buses throughout the CORE area but are rarely the first commuting option for employees in the region. The level of service for each system is too low to entice drivers to utilise alternate modes of transportation on a regular basis. Currently, the CORE lacks the critical mass required to support transit use. However, the Triangle Region is expected to increase in population by 900,000 by 2025 (TJCOG 2002). The development activity induced by their arrival can be planned around transit-oriented principles such as density and mixed uses. Transit options will be feasible if future planning and development interests exercise foresight in accommodating transportation alternatives beyond the automobile.

Quality of Life

Both individuals and firms often cite the Triangle's high quality of life as a major determinant in the decision to relocate to the area. Existing residents in the area are keen to retain the attractive qualities of the Triangle while encouraging economic development. However,

permissive planning regulations and mutually uncooperative municipal governments have kept the land prices in the area low, providing no incentives for newcomers to develop efficiently. Such rampant expansion onto virgin lands is likely to exacerbate the region's traffic congestion problem. Many Triangle residents are concerned about the economic success of the region ruining the familiar and personal aspects of life there and negatively impact future development prospects.

Local Identity

The CORE study is part of an effort to create a local identity for the area immediately around Research Triangle Park. Currently, the CORE region includes RTP and a loose amalgam of office parks, residential subdivisions, shopping centres, and rural properties, straddling seven municipal jurisdictions, two metropolitan planning organisations, and incorporating the Raleigh-Durham International Airport. Most residents identify themselves by their municipal jurisdiction and not by their relationship to RTP or the CORE area. The area's small population and the lack of services and amenities are partially responsible for the CORE area's failure to engender the type of civic identity that helps give places a vibrant sense of community. The CORE's employee population is often socially invested in other locations closer to their residences to which, the CORE is subordinate.

Inter-jurisdictional Cooperation

The decision-making process in the CORE area is restricted by several layers of bureaucracy caused by the area's location and composition. The CORE area extends from Chatham County, through Durham County and into Wake County on its eastern side. The area also encompasses the Cities of Durham and Raleigh and the Towns of Morrisville and Cary as well as the Research Triangle Park and the Raleigh-Durham International Airport. Each entity possesses significant planning authority within their respective jurisdictions which can greatly impact its neighbouring entities. Large-scale initiatives such as the CORE plan require the input and cooperation of each of these stakeholders which can involve complicated processes of schedule management, database conversion, and various preparatory tasks before the

organisations are coordinated. Inter-jurisdictional cooperation is critical to prevent one entity from undermining the progress of the others.

Principles

The CORE plan was developed around eight principles which pervaded all of the planning and development policies therein. These principles include, Smart Growth, Walkability, Affordability, Open Space, Integrated Transportation, Civic Identity, Mixed-Use Activity Centres, and Collective Benefits.

The CORE area of the Research Triangle region developed under the suburban model of separated uses and sprawled development. This paradigm achieved success in the region prior to the 1990s. Today however, employers and their employees require a different urban spatial structure to support their changing lifestyles. In order to compete with other knowledge clusters nationwide, the CORE plan designated several new neighbourhoods as smart growth centres where environmentally or culturally significant areas would be conserved while development is clustered on eminently suitable land. Open space conservation mechanisms are prominently featured throughout the document. The CORE plan's Green Infrastructure section identifies opportunities in the area to create an open space network connecting Umstead State Park, Lake Crabtree, municipal greenways, and numerous stream buffers.

In order to change the suburban paradigm developed in the CORE area over the years, the new communities were designed to provide residents, visitors, and employees viable alternatives to driving private automobiles. As a result, pedestrian and bicycle accessibility and rail, bus, and automobile modal connections were major components guiding the CORE area's planning and design phases. The multifaceted and interconnected transportation network envisioned by the CORE plan intended to connect the CORE to all parts of the region and provide seamless alternatives to challenge the automobile's primacy in the area. CORE planners have expressed the desire to maintain access to the new communities across the socioeconomic spectrum despite the high demand for new mixed-use communities and their subsequent high prices.

The CORE plan identified the lack of civic identity in the region as a problem that negatively impacts the Research Triangle's competitive position against other knowledge clusters. Civic Identity is an attribute that cannot be created or planned but its nascent elements can be supported and allowed to grow. The CORE plan itself was the first step in recasting a formerly rural region into a cohesive community defined by a relationship the Research Triangle Park and organised around the TTA regional rail datum.

Original Plan

Neighbourhoods, as defined by the CORE plan, are residential areas roughly half a mile in diameter based on the five-minute walk time radius. Mixed-use, pedestrian-friendly, and compact neighbourhoods were designed to be the basic components of CORE communities, clusters of which, were intended to form larger urban geographies.

Activity Centres were designed to feature a clustered mix of uses, such as residential, commercial, office, retail, educational, and other use catering to nearby residents as well as outside populations. As regional activity nodes, Activity Centres were designed to accommodate large numbers of people therefore, they were required to facilitate multimodal transportation circulation. The activity centres identified by the CORE plan include the Triangle Metro Centre, Brier Creek Village Centre, the Shiloh Neighbourhood Centre, Stirrup Iron Creek Centre, Lowe's Grove Neighbourhood Centre, and the Historic Carpenter Rural Neighbourhood Centre.

The Triangle Metro Centre was designed to be a transit-oriented development that also functioned as the TTA's primary multimodal facility. Adjacent to the southern portion of the Research Triangle Park, the Triangle Metro Centre was intended to be the CORE's downtown rivalling the scale of both downtown Raleigh or Durham which, connects the TTA regional rail network to the Park.

According to the original design, the area within a quarter-mile of the Metro Centre rail station will be three to four storey buildings housing retail, commercial, and office space as well as residential units. Beyond the quarter-mile boundary is a less-intensive district that is

predominantly compactly developed residential areas primarily marketed to CORE area employees. The housing types in this section of the Metro Centre district include townhouse, condominiums, and apartment blocks. Narrow-lot single family homes were planned at the outer edge of the station area.

The site for the Brier Creek Village Centre is located to the east of Aviation Parkway and south of the Brier Creek Parkway in western Wake County. The original development project for the site was a regional mall that was made impractical by the opening of a similar facility in the Southpoint section of Durham. The Brier Creek Village Centre is centred on a station for the proposed CORE Transit Loop and featuring two large anchor retail facilities. Other uses were planned to inhabit the station area such as small offices and a hotel. The district's street grid and mixed use blocks were intended to distinguish Brier Creek Village Centre from similarly sized regional malls. The village centre was designed to be surrounded by townhouse communities on both sides.

The Shiloh Neighbourhood Centre is currently a historic rural village in north Morrisville. Much of the area is characterised by planned transportation facilities. A TTA station is planned for the centre of the Shiloh area. Shiloh is bounded by the Interstate 540 project which is currently under construction, the planned McCrimmon Parkway extension, and the planned Evans Road connector. The Shiloh plan endeavoured to create a multimodal transit facility and mixed-use district while maintaining the historic character of the area. Shiloh's use mix included retail and office space near the centrally located rail facility as well as medium density residential zones. A single-family, traditionally designed neighbourhood was designed to abut the southern tip of RTP on Shiloh's western edge.

The Stirrup Iron Creek Area is in Durham County just to the west of Brier Creek Village Centre. Currently, the area is bounded by T.W. Alexander Drive and Airport Parkway while Page Road and Globe Road pass through the area providing regional access. The Stirrup Iron Creek district lacks a robust transportation network and as an unincorporated section of Durham County, it currently lacks access to public utilities.

The Stirrup Iron Creek Centre was designed around a CORE Transit Loop station like Brier Creek Village and planned to complement the nearby Brier Creek Village Centre by predominantly featuring residential properties. Mixed-use buildings were planned to cluster around the Transit Loop station while large employment centres and office parks ring the area. The residential ring around the Transit Loop station was planned to feature a large variety of residential units to appeal to the CORE's workforce.

The Lowe's Grove Neighbourhood Centre site is located on the corner of NC 54 and Alston Ave in Durham. Lowe's Grove was intended to be an integral element of the Interstate 40/NC 54 corridor as well as a station on the planned transit line to Chapel Hill. The site is only 16 acres and entirely enclosed by existing uses.

Currently, the RTP Service Centre is the only property within the Research Triangle Park that is not restricted to research-related uses. As a result, the RTP Service Area is the only commercial development in the Park and features a hotel, several drive-in banks, and the TTA bus interchange facility. Under the CORE plan, the RTP Service Centre will be redeveloped as an office and retail facility that also functions as a multimodal transit facility and the official gateway to the Research Triangle Park.

Districts, unlike Activity Centres, are large single-use properties that cannot be woven into the urban fabric of the CORE because of the nature of their land uses. Only two districts were identified within the CORE, the Research Triangle Park and the Raleigh-Durham International Airport.

Hypothesis

The CORE plan relies heavily on leveraging the appeal of the proposed TTA Regional Rail system to entice residents to choose to live in medium-density transit villages rather than moving to the vast suburban tier of the Research Triangle region. The TTA Regional Rail Network failed to receive federal funding to construct the transit system which severely damaged the CORE area's design premise. The TTA however, failed to achieve funding approval for very specific reason. They could not prove that the demand for their rail network

would be sufficiently high to justify the government's large subsidy, despite the future benefits of CORE station-area planning and transit-oriented development. Therefore, ridership and funding are the two major issues jeopardising the CORE's future success.

The following analysis examines the modest successes attributable to the optimism surrounding the TTA Regional Rail Line and the original CORE plan and how the recent failure is likely to affect near-term development activity. Moreover, the analysis will outline the TTA's experiences with the federal funding approval process to determine precisely how it failed to justify the federal subsidy that the CORE area needed to remain viable. Finally, several lessons from around the world will be explored to determine the best method for transit to be financed and marketed to the Research Triangle region. These examples include public-private joint development implemented in the Washington DC area, transit-property development cross-subsidies employed in Hong Kong and greyfield redevelopment which is responsible for creating community assets from underused malls throughout North America.

Chapter 2 – Spatial Issues

Methods

The GIS analysis the CORE area is limited to Wake County, which was done for several reasons. First, Wake County is a popular location for employees in the CORE area to live. Over 60% of the area's workforce lives in Wake County (TJCOG 2002). Secondly, Wake County is larger and more developed than Durham and Chatham Counties and therefore serves as the bellwether for the entire region. Finally, of the three counties in the CORE area, Wake County was the most cooperative entity and kept the most complete records. Further study may incorporate Durham and Chatham Counties to determine the full impacts of changes to the CORE plan.

The CORE area was investigated through three time periods which include the period prior to the publication of the CORE plan in 2002, the period between the CORE plan's publication and today, and existing conditions with the intent to determine if the CORE plan provided the impetus for the planning and development communities to alter the suburban development paradigm in the area and grow more compactly. Further study may determine the severity of the impact of the Triangle Transit Authority's failure to achieve approval for its regional commuter rail line. While the status of the transit facility had always been in question, it was effectively killed by the beginning of 2006.

Significant Coverages

CORE Parcels

The CORE Parcels layer was created by selecting all parcels from Wake County parcel coverage within the 2005 CORE boundary and exporting the selected parcels to a new coverage. The CORE Parcels layer represents the base level of analysis for the CORE area. All of the attributes used in the GIS analysis are linked to individual parcels. Some indicators were created by aggregating the parcel data based on these attributes (See Appendix II).

Generalised Category Summary

The Generalised Category attribute was based on Wake County and CAMPO's Generalised Future Land Uses Profiles which were created for the purpose of school district modelling in

2005. Each of Wake County's 100 land uses was assigned the generalised code that best fit the stated use. Each parcel was then re-evaluated as an error-checking measure to determine the suitability of the generalised code based on the actual use of each parcel. The parcel layer was summarised using ArcGIS by Generalised Category to conduct further analyses.

The Generalised Category attributes simplifies Wake County's land use designations into an intuitive set of uses to aid its conveyance to the public at large and to facilitate translation of uses between neighbouring counties (See Appendix II). The Generalised Category summary enables the investigation of multiple indicators within the CORE based on each parcel's land use.

Neighbourhood Summary

The Neighbourhood Summary features a largely subjective attribute called Neighbourhood which is the amalgamation of Wake County and Town of Cary data regarding site plans, subdivisions, planned development districts, activity centres, and master developments. Creating the Neighbourhood attribute was an iterative process involving the reconciliation of the differences between the various geographical identifiers and assigning the logical neighbourhood name based on location.

The Neighbourhood Summary simplifies several different types of parcel clusters into an easily identifiable and logical designation. The major benefit of the Neighbourhood attribute is its amalgamation of various projects and phases of the same development into a single development class. These neighbourhoods are summarised to allow further analyses to be completed (See Appendix II).

Significant Indicators

Acreage by Land Use

The Acreage by Land Use indicator is used to track the aggregate amount of land allocated to individual CORE land uses in Wake County. The indicator was derived from the parcel-level summary. ArcGIS summed the values in the acreage attribute during the aggregation process, to create the total amount of land under each land use.

Percentage Area by Land Use

The Percentage Area by Land Use indicator also tracks the amount of land allocated to a particular use. This indicator charts the percentage share of Wake County's CORE area designated to each use. The aggregated acreage for each land use was divided by the total acreage encompassed within Wake County's CORE area to create the indicator.

Non-residential Floor Area Ratio by Land Use

The Non-residential FAR will track the ratio of non-residential floor area to parcel size based on the land use designation of each parcel. This indicator was created by first converting the aggregated acreage allocated to each land use to square feet by multiplying land use acreage by 43,560. Next, select only the parcels that possess a non-residential generalised category. Finally, each aggregated floor area figure was divided by the calculated square footage to calculate non-residential FAR.

Residential Units by Land Use

The Residential Units indicator will track the number of residential units located in Wake County's CORE area based on each parcel's land use. The Residential Units by Land Use indicator was created by first selecting only those parcels with a residential generalised category code. Wake County provides data on the number of units on each parcel. During the land use aggregation process, the residential units are summed and placed in a new column.

Developments of Regional Significance

The Developments of Regional Significance Index was created in 2005 by John Hodges-Copple of the Triangle J Council of Governments to quantify the relative impact that activity centres have on their surrounding communities. According to the DRS Index, a development is regionally significant if it is larger than 500 residential units or 250,000 non-residential square feet such that:

$$DRS_Index = \frac{dwelling_units}{500} + \frac{non-res_floor_area}{250,000}$$

The DRS Index was created by dividing the number of dwelling units in each aggregated neighbourhood record by 500 and adding that figure to its non-residential square footage

divided by 250,000. The result was entered into new column. DRS values of 1.0 or greater are considered regionally significant.

Findings – Explanation of Results

Land Use Summary

According to the parcel-level analysis of the CORE area in Wake County, increased DRS scores indicate increased scale of growth in the area while simultaneously increasing density signifies the concentration of that growth on less land area. The CORE planning process may be deemed successful at this intermediate stage if densities had increased. Therefore, the parcels developed between 2002 and 2006 are of primary importance.

Table 1 summarises the land uses in Wake County's CORE area prior to the official publication of the CORE plan in 2002. As expected, residential uses predominate, accounting for 7,087 parcels on 7,230 acres. Residential units totalled 12,443; therefore the residential density was 1.72 units per acre. Industrial uses were the next most-numerous category totalling 167 parcels followed by 111 office parcels. The industrial sector claimed nearly nine million square feet of space in 2002 while the office market accounted for about six million square feet.

Pre-2002 CORE Land Uses (Wake County)							
Generalised Category Code	Parcel Count	Acreage	Hotel Rooms	Non-Res Sq. Ft.	Residential Units	Res. Density	Non-Res. FAR
AUTO SERVICES	11	34.00	-	99,110	-	-	0.06693
AVIATION	2	4,638.34	-	2,741,673	-	-	0.01357
COMMERCIAL	1	1.22	-	6,313	-	-	0.11909
COMMUNITY SERVICES	7	23.64	-	72,038	-	-	0.06996
EDUCATION	6	134.99	-	496,122	-	-	0.08437
ENTERTAINMENT	14	118.42	-	99,718	-	-	0.01933
GOVERNMENT	4	7.52	-	25,977	-	-	0.07926
GREEN SPACE	4	88.30	-	131,441	-	-	0.03417
HOTEL	14	61.84	1,812	-	-	-	-
INDUSTRIAL	167	1,064.91	-	8,981,767	-	-	0.19362
MEDICAL	4	8.30	-	37,093	-	-	0.10256
NATURAL AREA	3	883.22	-	8,198	-	-	0.00021
OFFICE	111	885.19	-	6,065,032	-	-	0.15729
RECREATION	7	24.87	-	7,150	-	-	0.00660
RESIDENTIAL	7,087	7,230.20	-	-	12,443	1.72098	-
RESTAURANT	17	28.55	-	145,524	-	-	0.11700
RETAIL	40	204.37	-	1,237,930	-	-	0.13905
RTP	13	396.26	-	3,902,988	-	-	0.22611
SPECIAL	12	77.07	-	162,790	-	-	0.04849
Total	7,524	15,911.23	1,812	24,220,864	12,443		

Table 1 - CORE Land Uses Before 2002

Table 2 represents the conditions in the CORE since 2002. Between 2002 and 2006, Wake County's CORE area added 2,325 residential units on only 525 acres at a density of 5.2 units per acres, roughly three times the pre-CORE residential density. Only four new industrial parcels were developed in this period adding only 125,000 square feet of space. The new

industrial space was however built to a higher floor-area ratio than the pre-CORE average. Office space consumed 58 acres across seven newly developed parcels, adding over 420,000 square feet. The growth in office space developed at a nearly identical density to the pre-existing office stock. Retail facilities in the Wake County segment of the CORE increased significantly in the four-year period. The retail sector increased its parcel count by 30% and added 414,000 square feet in space, which was also denser than its pre-CORE condition. Restaurant parcels and allocated floor area grew by well over 50%.

Post 2002 CORE Land Uses (Wake County)								
Generalised Category Code	Parcel Count	Acreage	Hotel Rooms	Non-Res Sq. Ft.	Residential Units	Res. Density	Non-Res. FAR	
AUTO SERVICES	1	1.14	-	6,621	-	-	0.13360	
AVIATION	-	-	-	-	-	-	-	
COMMERCIAL	-	-	-	-	-	-	-	
COMMUNITY SERVICES	2	2.88	-	18,572	-	-	0.14824	
EDUCATION	3	72.20	-	269,181	-	-	0.08559	
ENTERTAINMENT	1	34.85	-	2,540	-	-	0.00167	
GOVERNMENT	-	-	-	-	-	-	-	
GREEN SPACE	1	4.00	-	14,044	-	-	0.08062	
HOTEL	1	3.07	74	-	-	-	-	
INDUSTRIAL	4	10.95	-	125,602	-	-	0.26329	
MEDICAL	1	0.91	-	7,722	-	-	0.19506	
NATURAL AREA	-	-	-	-	-	-	-	
OFFICE	7	59.71	-	421,527	-	-	0.16205	
RECREATION	3	5.23	-	2,311	-	-	0.01015	
RESIDENTIAL	2,325	524.79	-	-	2,727	5.19641	-	
RESTAURANT	10	41.58	-	78,688	-	-	0.04344	
RETAIL	12	55.40	-	414,463	-	-	0.17173	
RTP	-	-	-	-	-	-	-	
SPECIAL	1	38.08	-	36,659	-	-	0.02210	
Total	2,372	854.78	74	1,397,930	2,727			

Table 2 - CORE Land Uses Between 2002 and 2006

Table 3 illustrates the current condition of Wake County's segment of the CORE. Despite the improvements over the last four years, the CORE region remains a sparsely developed area compared to other major urban centres. Residential density remains below two units per acre and no FAR score exceeds 0.15. Additionally, the CORE area is a geographically small component of the Research Triangle region. Any progress within the special planning area can be easily negated by suburban expansion outside of the CORE area, especially in southern Wake County and the rapidly expanding municipalities including Holly Springs, Apex, and Fuquay-Varina. The separation of uses still exists in the CORE area as well. The highly regionally significant developments are located at the CORE's periphery, except for the Research Triangle Park itself (See Appendix I). High DRS projects cluster in a rough arc near the CORE's south-eastern boundary with the town of Cary. There is a wide swath of regionally insignificant projects immediately adjacent to the park. Though such developments are planned, the Park still lacks any nearby urban centres. Neither are these trends urban nor

are they transit-supportive which would have seriously diminished the effectiveness of the proposed TTA rail line.

Current CORE Land Uses (Wake County)							
Generalised Category Code	Parcel Count	Acreage	Hotel Rooms	Non-Res Sq. Ft.	Residential Units	Res. Density	Non-Res. FAR
AUTO SERVICES	12	35.13	-	105,731	-	-	0.06909
AVIATION	2	4,638.34	-	2,741,673	-	-	0.01357
COMMERCIAL	1	1.22	-	6,313	-	-	0.11909
COMMUNITY SERVICES	9	26.52	-	90,610	-	-	0.07845
EDUCATION	9	207.18	-	765,303	-	-	0.08480
ENTERTAINMENT	15	153.27	-	102,258	-	-	0.01532
GOVERNMENT	4	7.52	-	25,977	-	-	0.07926
GREEN SPACE	483	1,286.21	-	145,485	-	-	0.00260
HOTEL	15	64.91	1,886	-	-	-	-
INDUSTRIAL	172	1,121.88	-	9,526,095	-	-	0.19493
MEDICAL	5	9.21	-	44,815	-	-	0.11169
NATURAL AREA	12	1,089.54	-	8,198	-	-	0.00017
OFFICE	118	944.90	-	6,486,559	-	-	0.15759
RECREATION	10	30.09	-	9,461	-	-	0.00722
RESIDENTIAL	9,419	7,831.22	-	-	15,178	1.938	-
RESTAURANT	27	70.14	-	224,212	-	-	0.07339
RETAIL	52	259.78	-	1,652,393	-	-	0.14602
RTP	33	1,646.26	-	3,902,988	-	-	0.05443
SPECIAL	13	115.16	-	199,449	-	-	0.03976
UTILITY	1	0.02	-	-	-	-	-
VACANT	3,595	10,222.81	-	10,533	-	-	0.00002
Total	14,007	29,761.31	1,886	26,048,053	15,178		

Table 3 - Current CORE Land Uses

Neighbourhood Summary

Seventeen of the 76 neighbourhoods in CORE – Wake County are considered regionally significant with DRS scores greater than 1.0 (See Appendix I). Another three neighbourhoods scored between 0.898 and 1.000. Outside of this range, the DRS scores dropped precipitously. Many of the most regionally significant neighbourhoods in the region are in fact large office parks with few or no residential units. 10 of the 17 regionally significant neighbourhoods had no residential units while only three regionally significant neighbourhoods had less than 100,000 square feet of non-residential space. A single regionally significant neighbourhood possesses a residential density greater than four units per acre. These trends suggest that regionally significant protects are built on very large tracts which may be a result of zoning regulations rather than market preference or the developers' prerogative. The trends also suggest that the housing market is being satiated by development in other areas of the Triangle, preventing residential concentration in the CORE.

Any benefits currently attributable to the CORE planning area are slight at best. The prevailing development pattern remains fundamentally unchanged despite the success some developers have had marketing new and more urban styles of development in the Triangle,. The CORE still lacks urban districts or a unified sense of place and still lags its competitors in

urban vitality which is attributable in large part to transportation infrastructure investments that create and reinforce the suburban development paradigm. The CORE planners recognised the clear relationship between transportation options and land use patterns and fully integrated the proposed TTA Rail Line into the CORE's plan. Further study should include an assessment of future development as well to identify the impact of new development on the region. The tight relationship between the CORE and the TTA Rail Line made the initiative mutually dependent. Failure to realise one program would seriously jeopardise the other, as happened in 2006 when the TTA failed to receive federal funding to construct its commuter rail line placing.

Chapter 3 - Failure of TTA Regional Rail

Overview

The Research Triangle region of North Carolina is defined by Orange, Durham, and Wake Counties, and their environs in the Carolina Piedmont. The area is home to Research Triangle Park, a major employment centre, and economic generator for the state. Within the Triangle, there are a constellation of small cities and towns that host a widely dispersed population and employment base. Raleigh, Durham, Cary, and Chapel Hill are the major centres in the Triangle region and have all experienced rapid growth in the last 25 years. The peculiarity of the Triangle's geography has prevented any one area from claiming primacy in the region which makes meeting the transportation needs of the residents more difficult.

The population of the Triangle is expected to grow by almost 1 million in the next 20 years. Urban expansion in the Triangle is occurring laterally at an alarmingly high rate. As sprawl envelopes formerly rural areas, local roads strain to cope with the newly elevated demand. NCDOT widens these rural byways to alleviate the problem only to encourage more traffic-inducing growth. This pattern is repeating itself throughout the breadth of the Triangle region.

The Triangle Transit Authority is charged with the duty of providing regional transit solutions that effectively knit together the urban fabric of the Triangle, giving commuters transportation options. After assessing the Triangle's recent growth and its growth potential in future years, the TTA determined that the region needed a higher-order transportation network to maintain its competitiveness with regards to other similar metropolitan areas in the state as well as nationwide. The TTA Regional Rail proposal was intended to signify the Triangle's arrival as a major metropolitan area of national renown. Instead, it has been mired in politics and setbacks. Its survival is very much uncertain as the Federal Transit Administration debates the project's worthiness to receive federal funding.

TTA Regional Rail Plan

The TTA Regional Rail system began as 16-station, 35-mile long commuter rail line connecting Durham, RTP, Cary, and Raleigh. Even Morrisville planned a station district in its downtown in anticipation of a future TTA station being located there. The original plan would have commenced service near the Duke University Medical Centre and terminated at Spring Forest in North Raleigh. Due to financial considerations, the original alignment has been shortened on its western end to the Ninth Street Station and three stations in North Raleigh have been removed from Phase I. Phase II would include the stations in the original alignment that were removed from the most recent revision of the plan. Phase III included fixed guideway service between the rail trunk and Chapel Hill and a spur to Raleigh-Durham International Airport. Phase I of the TTA Regional Rail system is expected to carry 14,000 passengers daily at its opening and up to 22,000 by 2025 (Siceloff 2005).

In 1994, TTA estimated the cost of the rail line to be just over \$100 million. In 2005 however, that figure has increased to \$759 million. One of the many incorrect assumptions made by the TTA regarding the feasibility of the Regional Rail project was the willingness of the railroads to concede to them track on which commuter rail service would operate. Instead, the railroads maximised their superior negotiating position to squeeze TTA into an uncomfortable and expensive position, given their lack of an acceptable alternative (Curliss 2005).

Despite the rail corridor in question being significantly under-utilised, the rail companies required TTA to build its own dual-track lines in their right-of-way while maintaining 25 feet of separation from the existing freight lines. TTA proposed 15 feet of separation to which, the railroad companies replied with a 26 ft. requirement. This inflated the cost of the project by \$170 million. The railroad companies then mandated that the TTA commuter rail cars be crashworthy with regards to the freight cars despite 26 feet of separation. The added size and weight of the cars increased costs by \$33 million. TTA must also pay \$2.6 million to improve a completely unused rail spur to a GE property that they had marked for removal to accommodate its own tracks. The rail companies argued that GE could start using the spur at

any point so it was in their interest to maintain its functionality. The final insult levied by the railroad companies, Norfolk Southern in particular, against the TTA was the requirement that TTA employ 20 flaggers during construction to “oversee safety procedures” at a cost of \$6.2 million (Curliss 2005). NCDOT, at the behest of former Governor Jim Hunt, maintained that TTA Regional Rail system not interfere with the alignment of a proposed high-speed rail link between Charlotte and Washington, DC. TTA bought 52 acres of land for the right-of-way for the North Raleigh extension of the commuter rail line for which, they set aside \$16 million. The land had an appraised value of \$9 million but TTA eventually paid \$24.5 million.

Under current financial calculations, TTA expects the federal government to fund 60% of the project’s cost with New Starts funds. The local investment emphasises the minimisation of the tax burden on Triangle residents by levying a 5% tax on rental cars and a \$5 registration fee in Wake, Durham, and Orange Counties. Other cities like Charlotte, Dallas, Phoenix, Denver, and St. Louis have increased sales taxes to fund their rail systems to show a tangible local commitment to transit that the Triangle currently lacks. Other cities also boast large downtowns with a vibrant base of CBD employees. Portland has a downtown employee population of 83,000 and St. Louis has 90,000. Meanwhile, RTP is the largest employment hub on the Regional Rail line at 38,000 followed by Downtown Raleigh at 27,000, Duke University at 23,000, and Downtown Durham at 13,700.

Critics of raising taxes claim that the TTA Regional Rail Network fails to reach enough of the hot real estate markets throughout the region to justify its construction. These comments largely miss the point of the funding and service provision issue. The rail line is intended to be the datum around which future development in the Triangle may be oriented as the region attempts to organise itself into a single cohesive are. Although future phases of the TTA network reflect the desire to service the outlying portions of the Triangle that are experiencing very rapid growth, the Regional Rail network was not intended to facilitate sprawl. Furthermore, it is because of the very lack of a dependable funding stream, like a dedicated sales tax increase, that the TTA must slash its proposal to a mere sliver of its original transportation plan. The propensity for the Triangle to grow at its margins has made

it the least dense major urban area with a rail project on the table (Martinez 2005). This fact is used as the justification for the rail system's rejection but could just as easily be looked at as the region acting early to prevent Atlanta-style traffic and sprawl before it becomes a major problem in the Triangle.

Other critics challenge the success of the TTA Region Rail system based on its relationship with parking. Many employers in the region have plentiful cheap or free parking onsite. Despite this fact, TTA expects riders to park at rail stations and ride to work. TTA has only planned for a total 2,000 across its 12-station system (Martinez 2005). The TTA Regional Rail network in its current stripped-down configuration does not seem like an attractive alternative to single-occupancy driving. Lack of funding has necessitated the elimination of several potentially lucrative areas such as the Duke University Medical Centre and the Capital Boulevard corridor to North Raleigh.

Project	Location	Cost	Start Date
Davis Drive	RTP	\$36 Million	2006
US 401	Northern Wake County	\$91 Million	2008
NC 55	Durham	\$20 Million	2009
Interstate 85	Orange County	\$52 Million	2012
Interstate 540	Apex	\$120 Million	2012

Table 4 - Recently Approved Road Projects

Transit-Oriented Development in the Triangle

There is very little transit-oriented development in the Triangle presently, relative to the overall development activity in the region. This is partially due to a lack of regional coordination of growth strategies and a failure to adequately plan for the future. Much of the growth in the Triangle that has been touted as transit-oriented or New Urbanist has in fact borne closer resemblance to repackaged sprawl. TTA Regional Rail represents an attempt to organise development in the Triangle around itself as a meandering axis, creating a connective element and introducing coherence between the disparate communities of the Triangle, similar to I-40 in southern Durham, RTP, and western Wake County. David King, the deputy state transportation secretary, believes that TTA Regional Rail can be the catalyst that

generates development while facilitating the compact form which benefits the municipalities by reducing the cost to provide public utilities.

Free or cheap parking throughout the Triangle area poses a major problem for Regional Rail's acceptance here. TTA has failed to coordinate parking provision at key sites along the Regional Rail route. The American Tobacco Historic District is comprised of residential, retail, and office uses adjacent to the Durham Bulls Baseball Stadium in Durham and would have been an ideal option for station-area development along the Regional Rail line. Instead, the American Tobacco Historic District received a heavily subsidised parking deck onsite without even considering TTA Regional Rail as an option for those who travelled to and from the area. Similar situations are played out all over the Triangle from parking validation in downtown Raleigh to vast seas of surface lots in RTP.

TTA would like to mitigate the single-occupancy commute by providing park-and-ride lots around its stations. However, they will only build 2,000 total spaces with the largest being 440 spaces in size. 2,000 park-and-ride spaces across the entire network will be woefully inadequate to satisfy the expected demand for parking spaces given the 14,000 average daily riders predicted by TTA.

FTA Evaluation Process

Under the Transportation Equity Act for the 21st Century (TEA-21), the Federal Transit Administration was authorised to disburse funds to facilitate the construction of locally planned transportation projects under a program called New Starts. The funding is allocated to local transportation agencies in the form of contracts known as Full Funding Grant Agreements (FFGA). FFGAs are formal documents that detail the projects' scope, cost, and the timeline to which the project will adhere while outlining the precise role and funding level the federal government can be expected to maintain. New Starts projects that meet all of FTA's submission requirements are granted an FFGA to proceed with the capital investment.

New Starts projects are evaluated by the Federal Transit Administration in three phases:

Phase I – Alternatives Analysis

During Phase I of New Starts project development, local officials identify and analyse several transportation options under their purview. These alternatives might include changes to the transportation mode or route alignment, as well as the option of not building the system at all. Local participation is necessary to agree on a solution that is satisfactory to the local constituencies and can be duly adopted into the long-range transportation plan by the Metropolitan Planning Organisation.

Phase II – Preliminary Engineering

The Preliminary Engineering Phase requires the local officials to improve their design as well as solidify the best alternative to their desired outcome. Engineers and consultants are then employed to complete the National Environmental Policy Act (NEPA) process while others refine the project's financial statement to secure sources of local funding. Federal interest in a project increases with the value of the local contribution, thus increasing the probability of federal approval of New Starts funding.

Phase III – Final Design

The Final Design Phase is intended to provide final construction and development plans, as the project is expected to be built. At this point, all of the project's financial details must also be outlined for FTA review.

The Federal Transit Administration has also outlined a detailed process of project justification to be conducted throughout the project evaluation process. FTA evaluates projects based on six summary criteria and multiple detailed measures and indicators. The indicators and summary criteria are rated on a five-tier scale: High, Medium-High, Medium, Medium-Low, and Low.

Criteria	Measure(s)
Mobility Improvements	Hours of Transportation System User Benefits
	Low-Income Households Served
	Employment Near Stations
Environmental Benefits	Change in Regional Pollutant Emissions
	Change in Regional Energy Consumption
	EPA Air Quality Designation
Operating Efficiencies	Operating Cost per Passenger Mile
Cost Effectiveness	Incremental Cost per Hour of Transportation System User Benefit
Transit Supportive Land Use and Future Patterns	Existing Land Use
	Transit Supportive Plans and Policies
	Performance and Impacts of Policies
	Other Land Use Considerations
Other Factors	Project benefits not reflected by other New Starts criteria

Table 5 - Project Justification Criteria (FTA 2005)

The Federal Transit Administration aggregates the summary criteria into two simplified categories, Finance and Project Justification, to make its final decision. The rating scheme for the final two criteria has only three distinctions, listed below.

Highly Recommended - medium-high for both finance and project justification

Recommended - medium for both finance and project justification

Not Recommended - below medium in both finance and justification.

After TTA had completed the long bureaucratic process to win federal funding approval, the FTA changed their rules, by raising the cost-effectiveness threshold for New Starts projects from Medium-Low to Medium. The TTA Regional Rail system was never designed to meet the new requirement and was not offered a concession based on its proximity to the completion of the approval process. Jennifer Dorn, of the Federal Transit Administration, claims that the TTA's ridership estimates were unjustifiably high. She also claimed that despite the land use benefits TTA claims its rail system will have in the Triangle, the project will continue to be evaluated based on costs per rider and cost per hour saved in travel time.

However, systems in states with influential and supportive senators received concessions from FTA that grandfathered their Medium-Low approval threshold. John Warner of Virginia has helped Northern Virginia's VRE, Barbara Boxer and Dianne Feinstein have assisted systems in California receive funding, and Ron Wyden of Oregon has done the same for his

state. Senator Elizabeth Dole, when given the opportunity to do the same for her state, was reluctant to criticise her protégé Jennifer Dorn and is only willing to quietly support the TTA project. She admonished TTA for its inability to meet Dorn's figures and supported the FTA official because she has personal knowledge of her intelligence and competence.

The TTA has expressed exasperation at the FTA's adherence to unforgiving numerical ratios rather than qualitative improvements to Triangle residents' quality of life. All projects, including TTA's Regional Rail System, must return a cost-effectiveness value of less than \$22 for each hour of travel time saved to receive a Medium grade and a recommendation for New Starts funding. Incidentally, Charlotte's new light rail line achieved full federal funding with a cost-effectiveness score of \$24.60 just before the rules changed, while TTA's project was conceived and proposed at much the same time period but cannot now receive funding at the Medium-Low level (FTA 2005). At issue is TTA's forecast of 14,000 daily riders at the inception of its rail network. This figure is vigorously disputed by the FTA as being too high. Similar commuter rail systems in larger metropolitan areas have not achieved this figure after years of operation though light rail lines have done better.

Commuter Rail Systems	Light Rail Systems
Dallas-Fort Worth – 7,300	Denver – 33,000
Miami – Fort Lauderdale – 9,700	St. Louis – 40,000
Northern Virginia – 15,000	Portland – 90,000

Table 6 - New Rail Systems

TTA's financial proposal requires the largest percentage of federal funding allowed by the FTA. TTA expects the New Starts program to pay for 60% of the project's cost. Federal regulators are more likely to approve projects with a higher level of local financial commitment. The Triangle funds TTA with a \$5 automobile registration fee within the three main counties in the region as well as a 5% tax on rental cars. Meanwhile, Charlotte, Denver, Dallas, Phoenix, and St. Louis have instituted a sales tax increase to fund their transit systems which is a far more reliable revenue stream than the Triangle's model.

The American Public Transit Association has publicly opposed the changes in the New Starts funding formula by calling them arbitrary and injurious to regions that have taken steps to

reduce VMT and average trip lengths before seeking funding. APTA argues that the new threshold was awkwardly instituted without firm empirical reasons or industry consultation, which severely impacts those projects that have already been planned. Furthermore, the change to cost-effectiveness formula ignores or discounts other quantitative and qualitative benefits of the transit projects and over emphasises the projects' cost. Additionally, the cost-effectiveness thresholds are not adjusted for inflation each year whereas; the FTA requires each transit system to inflate its costs annually, making successful attainment marginally more difficult each year.

William Millar, President of APTA, suggests several changes to the FTA's decision-making process that would make the funding process fairer to the transit industry:

- 1) Adjust the cost effectiveness rating thresholds to reflect the impact of inflation, potentially on a regional basis
- 2) Permit the use of a 2030 planning horizon
- 3) Adjust annualised capital costs to reflect standard cost categories and useful life assumptions
- 4) Permit the use of modal constants in travel forecasting to reflect demonstrated consumer preferences
- 5) Exclude soft costs from cost-effectiveness calculation

The TTA Regional Rail Line had the potential to catalyse the urbanisation of the CORE. The failure of the TTA to demonstrate satisfactorily high ridership to justify the system's cost to the federal government reduces that attractiveness of the CORE area and thus reduces the feasibility of the CORE plan. The CORE's planners and proponents need to create a solution to provide high quality and convenient transit in the Research Triangle. Several innovative schemes have been successfully attempted in cities around the world and may provide examples from which, the Triangle may draw to plan its own network in the future.

Chapter 4 - Alternative Planning Paradigms

Increased Local Contribution

Much of the federal opposition to the TTA Regional Rail network can be attributed to the high funding proportion requested by TTA in its proposal. TTA expects FTA to pay for 60% of the costs to develop the rail system, the highest proportion of expenses FTA is allowed to disburse. This fact, coupled with TTA's inability to meet FTA's financial standards, makes a poor case for local support of the Regional Rail system. The Federal Transportation Administration, much like any lender or benefactor, reacts more favourably to the beneficiary as the beneficiary assumes greater financial risk. In other words, FTA would be more inclined to approve funding the Regional Rail system if TTA agreed to pay a higher percentage of the project's cost or demonstrate reliable local funding sources.

Under the current proposal, TTA will provide local funding from a 5% tax on local rental cars and a \$5 automobile registration fee in Wake, Durham, and Orange Counties. The Federal Transit Administration regards these sources as relatively unreliable compared to the financing schemes employed in other cities to fund their transit projects. Charlotte, Phoenix, Denver, Dallas, and St. Louis have all instituted a small sales tax increase, the revenues of which are devoted to funding local transportation projects. Charlotte's light rail system was designed during the same period as the TTA Regional Rail system and received the same Medium-Low cost-effectiveness score as TTA. However, Charlotte's system was approved because this crucial difference in project financing that made it a more salient plan than TTA Regional Rail.

TTA might have to follow the example of other metropolitan regions that want transit and create a special tax to fund it. Triangle lawmakers will argue that there is no public desire for increased taxes to fund a rail network that doesn't service the entire region and is not currently an urgent necessity. They would be incorrect to make this claim as action before necessities become urgent is the very definition of planning. Furthermore, Charlotte, Phoenix, and Dallas were able to pass the sales tax increase to fund transit and are no less fiscally conservative than the Triangle. The \$0.05 sales tax increase has not proven to be injurious to

the economic vitality of Charlotte as it attempts to position itself as rival to the Triangle, locally, and Atlanta, regionally (Siceloff 2005).

Barebones Rail System

A different solution is being tried in Tennessee on a line connecting downtown Nashville with the suburb of Lebanon. The \$40 million system sacrifices level of service to keep costs low. With an expected daily ridership of 1,500, its expectations are equally low. Their 11 cars were purchased from Chicago at \$1 each and run on existing track serving only six stations (Martinez 2005).

The barebones model is one that TTA is currently moving toward. In an effort to reduce cost to achieve the necessary cost-effectiveness ratio, TTA redesigned the system with shorter platforms and single-car operation rather than dual-car trains. TTA should avoid the barebones option if it is serious about providing a competitive alternative to driving in the Triangle. Given the growth pattern in the Triangle and its abundance of parking, an unattractive and inefficient transit system will carry the same stigma transit has been burden with for decades as a mode choice of last resort. Such a system will not attract choice riders and thus, become a failure. Level of service matters greatly to the individual in modal choice and should be regarded as highly as customer service in commercial operations.

Bus Rapid Transit

Bus Rapid Transit is quickly gaining popularity and is a less-expensive and comparably fast alternative to rail transit. BRT networks are comprised of dedicated bus lanes separated from main traffic routes. Fares are collected at mini-stations before riders enter the bus to shorten dwell times. BRT systems offer the added flexibility of diverting from dedicated trunk lines to serve outlying neighbourhoods and can be rerouted as needed. Occasionally, BRT systems operate single or double-articulated buses to increase capacity to compete with rail.

Some critics of the TTA Regional Rail System have argued that it should be redesigned as a cheaper BRT system that operates primarily on HOV lanes on I-40. These suggestions are wildly inappropriate given the original intention of the Regional Rail project. Firstly, HOV lanes

on I-40 are required to add lanes rather than use existing lanes thanks to the trucking industry's significant clout. As a result, preliminary HOV solutions on I-40 are tremendously complicated and expensive, well over \$1 billion. Secondly, the entire reason BRT systems work well is because local land use codes have supported or mandated high density development immediately adjacent to the BRT trunk line. The world's best example of this phenomenon is Curitiba's hybrid-linear urban spatial structure. Placing a BRT system on I-40 removes it from all development, providing neither time savings nor the impetus for dense development.

Public-Private Joint Development

The Washington Metropolitan Area Transit Authority (WMATA) operates the rail and bus transit networks in the Capitol area, which includes the District of Columbia, Virginia's Arlington County, Fairfax County, and City of Alexandria, and Maryland's Montgomery County and Prince George's County. The Metrorail service is Washington's heavy rail transit network opened in 1976. The network includes 84 stations across 103 track miles and a daily ridership of 500,000. From its inception, WMATA recognised the need for it to capitalise on the value their transit service adds to their property. In 1976, WMATA engaged in a public-private joint development scheme to generate funds to operate the transit network. Joint development is defined as "any formal, legally binding arrangement between a public entity and a private individual or organisation that involves either private-sector sharing of capital or operating costs, in mutual recognition of the enhanced real estate development potential or higher land values created by the siting of a public transit facility (Cervero 2004)."

Whereas between 1,000 and 1,200 acres of WMATA's property was designated as having joint development potential in the early 1990s, only 300 to 400 acres remain (McNeal). Twenty-seven of WMATA's forty approved projects have been completed leaving 16 sites available for joint development projects. According to the Centre for Transportation Excellence, 40 percent of the Washington DC metropolitan region's office space was constructed within walking distance to a WMATA Metrorail in the 1980s. According to the

Urban Land Institute, the Metrorail contributed \$15 billion in additional economic development in the 1980s, a figure likely to be closer to \$20 billion today.

WMATA's record of successful joint development projects belies their passive negotiating position between itself and the WMATA's constituent communities. Several mitigating factors have prevented WMATA's joint development strategy from enjoying similar levels of success across the metropolitan region which, include neighbourhood opposition, difficult land acquisition, conservative lending practices, and insufficient support from local governments. Many observers, including officials representing the District of Columbia recognise the Metrorail's potential to positively affect community liveability, diverse transportation options, housing stock variety, employment access, traffic congestion, air pollution, and crime rates and have stated that these opportunities be taken seriously by all of the stakeholders involved in WMATA's joint development projects.

Traditionally, WMATA's passive role in station area planning deferred land uses decisions affecting WMATA-owned property to municipal urban planning departments (McNeal). This relationship between transit agencies and municipal governments is common according to the Federal Transit Administration. The FTA presumes that many transit agencies feel their involvement in local planning issues to be inappropriate and intrusive (USDOT, FTA, "Innovative Financing"). Despite WMATA's ability to directly engage in property development, they are hindered by the reliance on local land use policy decisions and budgeting practices that only fund planning within its own sites rather than entire station areas.

Much like the Triangle Transit Authority's failed rail transit proposal, Washington's Metrorail system suffers from flawed station location decision based on cost-cutting measures. The decision by both transit agencies to utilise existing rail rights-of-way often placed transit lines away from population centres or easily developable land. As a result, parking lots replaced pedestrian facilities as the main mode of conveyance of transit riders to the stations. Some municipalities in the Washington DC metropolitan area have instead decided to capitalise on the Metrorail's potential for growth and development. Arlington, Virginia's Rosslyn-Ballston

corridor on WMATA's Orange Line has been an example of highly successful joint development strategies built to take full advantage of the transit resource.

Joint Development Policies

The Washington Metropolitan Area Transit Authority specified four primary goals for its joint development program. First, WMATA's involvement in joint development endeavours to promote transit-oriented development by supporting projects that adhere to the major tenets of smart growth. Acceptable projects would cluster land uses around station areas, provide the opportunity to obtain goods and services in the station districts, and foster high-quality multimodal access to each station. Secondly, WMATA intends to increase Metrorail ridership by encouraging residential and commercial development on property adjacent to Metro station. Moreover, joint development is intended to create a revenue stream for WMATA. Finally, joint development intends to provide a return on the investments made by the local municipalities by increasing the property tax base.

WMATA identifies several parties as stakeholders in the joint development process including, the WMATA Board of Directors, WMATA Chief Executive Officer, municipal governments, the development community, and the public at-large. The WMATA Board of Directors is responsible for project and developer approval as well as overseeing the entirety of the joint development program. The CEO must execute the general vision and minor directives of the Board of Directors. The local municipalities in the WMATA area partner with the transit agency to discuss planning issues affecting the Metrorail station districts and development activity therein. The municipalities function as a conduit between the development community and WMATA by finding firms and organisations willing to develop the sites identified by WMATA in the Joint Development Work Program. The municipalities then participate in each step of the evaluation and approval process while maintaining a liaison between themselves and WMATA. The development community is required to collaborate with the local municipality and other interested stakeholders before approaching WMATA. Successful proposals will be subjected to a public hearing after which, WMATA will help to expedite the final stages of the approval process. Finally, the public at-large is compelled to

review development proposals at several public forums to gauge community support for the project and to offer constructive suggestions for improvement prior to final approvals.

The joint development process generally progresses in three major steps. First, the Annual Joint Development Work Program is prepared which, includes a list of all of the projects that were approved for marketing by the local municipality. The next step is Board approval of the Work Program which authorises the CEO to set the funding level for the project. Finally, WMATA publishes a Solicitation Document which requests proposals from developers interested in the project.

WMATA primarily finds developers interested in engaging in joint developments by advertising joint development opportunities in widely circulated print media. WMATA prefers to lease their property on a long-term basis rather than offer it for sale, though they entertain all proposals. They also favourably evaluate projects that include disadvantaged business enterprises and improve economic or technical efficiency. The submitted proposals are initially evaluated to determine adherence to the original specifications of the RFP. If significant changes are required to the proposals, each developer will be notified. Next, WMATA removes from the competition any proposal deemed inferior. The remaining proposals are analysed and evaluated further after which, the developers are individually interviewed to improve or elucidate any unclear aspects of the proposals. WMATA's land management division then rates each development team and recommends the highest rated team to the Board of Directors for approval. After Board approval, the proposal is presented during the WMATA Compact, a forum for public comment. Unsolicited proposals are handled slightly differently. WMATA publicises the receipt of any unsolicited proposal to encourage other developers to submit proposals and initiate competition. The proposals are then evaluated with the winner being sent to the Board for approval.

Rosslyn-Ballston Metro Corridor

Arlington, Virginia's Rosslyn-Ballston Metro Corridor has often been referred to as the most successful transit-oriented development corridor in the United States. Arlington is

conveniently located near Washington D.C. on the west bank of the Potomac River. The 1,000 acre, five-station area incorporates Rosslyn, Court House, Clarendon, Virginia Square, and Ballston Orange Line Metrorail stations. Each station area consists of a high density core surrounded by traditional neighbourhoods replete with neighbourhood character. The station areas are defined by a bulls-eye pattern of development where a 1,000-foot radius around each Metrorail station defines the inner core and a 1,600-foot radius circle defines the edge of the station area. Distributed throughout the corridor are 21 million square feet of office, retail, and commercial space, 3,000 hotel rooms, and 25,000 residential units. Combined with the nearby Jefferson Davis Corridor between the Pentagon and National Airport, Arlington County boasts 26 percent of its 200,000 residents living in a transit corridor which represents only 8 percent of the county's land area (Cervero 2004). In total, the Rosslyn-Ballston Metro corridor encompasses roughly 60 million square feet of current and future developed space (Tumlin 2005).

Today, 40 percent of the residents of the Rosslyn-Ballston corridor commute to work by transit which is twice the rate of Arlington's non-corridor population (Cervero). Ridership and non-residential floor space are highly correlated according to Cervero's estimates which claim an increase of 50 riders for every 100,000 square feet of non-residential floor space added to the corridor. Arlington County facilitated this outcome by amending its zoning regulations to allow high-density mixed-use development by right which removed much of the regulatory risk associated with developing mixed-use projects. According to Nelson\Nygaard Consultants, the Rosslyn-Ballston corridor increased in residents, employment, office space, commercial space, community amenities, and entertainment facilities as a result of the corridor plan (Tumlin 2005). None of the stations in the corridor feature park-and-ride lots. Instead, there are shared parking structures near each station and a multimodal design throughout the station areas accommodating pedestrian, bicycle, and bus access to each station.

Rosslyn Station

Rosslyn is the closest of the five corridor stations to the District of Columbia and features a significant amount of development spillover from Washington. The station area contains high-density residential, office, and hotel facilities built to high architectural design standards. The station area's zoning regulations encourage such high density as well as transit-oriented development. Rosslyn's inner core is zoned to allow office and hotel developments to have a 3.8 Floor Area Ratio (FAR). This density increases to a 4.8 FAR if the project includes residential units. Under special circumstances, developers are allowed to build up to a 10 FAR in the core of the station area. The station area's outer ring is zoned to allow residential developments to achieve a 3.24 FAR with office and hotel projects maintaining a 3.8 to 4.8 maximum FAR. In total, over 18 million square feet of developed space has been built in the 236 acre station area which equates to a 1.78 FAR for the entire district (Fairfax County DPZ 2005).

Court House Station

Court House station is immediately west of Rosslyn and is the location of Arlington County's government facilities. The Government offices are located at the centre of Court House's 198-acre station area surrounded by high density residential and office space zoned to a FAR between 3.8 and 4.8. Medium density residential zones between 16 and 72 dwelling units per acre exist Outside of the 1000-foot inner core of the station area. The Court House Metro station area also features special zoning areas intended to retain some residential character and affordability in the area. These mechanisms include Coordinated Preservation and Development Districts and Special Affordable Housing Protection Districts (Fairfax County DPZ 2005). The Court House Metro station area managed to maintain residential as the predominant land use while preserving an overall FAR of 1.45, total floor area over 12.5 million square feet, and featuring a rich variety of housing options.

Clarendon Station

The policies governing the 171-acre Clarendon Metro station area establish and reinforce a gradual transition between the highly intense inner core and the residential fringe. The

Clarendon Revitalisation District concentrates development along Wilson Boulevard which bisects the area and restricts height and bulk. Outside of the 1000-foot radius, medium density mixed-use developments give way to special transitional districts such as Commercial Townhouse Districts and Special Coordinated Mixed-Use Districts intended to facilitate interaction between the urban station area and the fringe suburban tier. As a result, Clarendon's overall FAR of 0.6 is significantly less dense than the station areas closer to Washington DC as is its total of 4.5 million square feet of development (Fairfax County DPZ 2005).

Virginia Square Station

The Virginia Square Metro station area is home to large institutional facilities like George Mason University. Like Clarendon, the Virginia Square Metro station area is linearly arranged along Wilson Boulevard and centred on the metro station. The 1000-foot core is zoned for high density mixed development up to a 3.24 FAR. Both sides of the high density corridor are zoned as Special Coordinated Mixed-Use districts to transition between urban and suburban usage patterns, similar to the Clarendon Metro Station Area. The north side has provisions to allow the institutions in the area to expand to a higher density that the base zoning regulations allow. The 143-acre station area encompasses 6.3 million square feet of developed space and has a FAR of 1.02 (Fairfax County DPZ 2005).

Ballston Station

The Ballston Metro station area is the largest along the Rosslyn-Ballston Metro Corridor at 275 acres and one of the most densely developed at a 1.41 FAR. In total, 17 million square feet of developed space exist in the Ballston Metro station area. Ballston area development is most dense at the intersection of Wilson Boulevard and Glebe Road, the location of the Ballston Common Mall, extending from there to form a "bowtie" pattern (Fairfax County DPZ 2005). The 1000-foot radius is populated with high-density office and hotel uses surrounded by medium-density residential zones to transition between the high intensity station area core and the suburban periphery. A Coordinated Mixed-Use District near the Metro station allows

mixed-use density to reach 6.0 FAR. Slightly more than half of the floor area in the Ballston Metro station area is devoted to residential uses but over 60% of developed land is residential. This signifies a steep taper from urban to suburban districts on the station area's fringe.

Transit/Development Cross-Subsidisation

Cross-subsidisation, one method of value capture, is the process by which a firm passes profits from one of its divisions to another to finance expenditures that the recipient would have been unable to afford otherwise. Cross-subsidies and value capture are powerful tools that planners can use to finance public infrastructure improvements by harnessing the private sector's momentum. These tools acutely apply to the interconnection between transit accessibility and real estate development whereby the success of each component validates the other. Successful real estate projects of a compatible type can justify the provision of transit services. The transit services, in turn, increase the inherent value of the land on which nearby development is built. Properly implemented, cross-subsidies could capture the real estate development value created by the transit service in the area to pay for its construction.

MTR Transit Services

The Mass Transit Railway Corporation operates a rail network comprised of 53 stations and 56.5 route miles, carrying 2.4 million passengers a day throughout the Hong Kong Special Administrative Region (MTRC 2006). MTR is one of the busiest and most profitable rail transit systems in the world, honours largely attributable to its innovative business practices and integrative planning and development strategies. The network is subdivided into seven lines and 14 transfer stations which provide easy connectivity throughout the network. The seven lines in the MTR network are Kwun Tong, Tsuen Wan, Island, Tung Chung, Tseung Kwan O, Airport Express, and Disneyland Resort Lines.

The MTR system is operational for 19 hours every day and can accommodate a maximum of between 28 and 34 trains per hour during peak periods. The trains achieve this level of efficiency to automated control systems that regulate speed, braking force, headways,

coasting speeds, signalling, and scheduling from a central control facility. Today, MTR operates 88.4 percent of its 1,050 rail cars during peak ridership periods (MTRC 2006).

MTRC's transit division, unlike most transit agencies, is a profitable entity despite its low fares, which are approximately USD 0.96, and its high level-of-service. Annual fare revenue is USD 800 million and operating profit from transit and related services is USD 616 million in 2004. MTRC was privatised in 2000 and has expanded to apply its expertise internationally by investing in several European and Chinese transit projects including Shenzhen Line 4 and Beijing Line 4.

MTR Business Model

The Mass Transit Railway Corporation, founded in 1975 by the government of Hong Kong built and operated the first heavy rail metro transit system in the territory. MTRC currently operates under an innovative and highly successful business model that utilises property development to finance transit expansion and operation. Since MTRC business model is self-financing, it is hindered by the time-consuming process of raising money from public sources for infrastructure improvements as the majority of transit systems are required to do. This financial independence from government-guaranteed debt is aided by prudent financial management that still requires rail projects to be profitable while maintaining a high level-of-service, timely equipment upgrades, and sensible infrastructure improvements. MTRC has been so successful at its business model that in 2000, the company was listed on the Hong Kong and London Stock Exchanges. MTRC's vertically integrated business structure also extends into shopping centres, property brokerage, property management, smart cards, and overseas investments.

The rail/property paradigm requires a full recognition and understanding of the price appreciation of property attributable to transit. Hong Kong is not the first transit system to cross-subsidise its transit operations with profits from property development but it is arguably the most successful entity to engage in the practice. Despite the requirement to produce profitable transit operations, MTRC understands that rail transit is a low-margin business that is also extremely capital intensive, making profitable reinvestment in a timely manner very

difficult to achieve. The two issues that become immediately clear to any transit agency pondering the construction of a new rail line are how to pay for the construction of the new line and how to encourage riders to utilise the service.

MTRC addressed both problems simultaneously through its understanding of the transit premium inherent to property values. MTRC took advantage of Hong Kong's highly restrained and highly lucrative property market by developing a portfolio of high density projects adjacent to many of their stations to both create the origins and destinations that induce transit ridership and reinvest the profits thrown off by these developments into its transit division.

The first step in the financing of a new transit project under MTRC's cross-subsidisation business model is a payment from the property division to the transit division to cover the gap between realised transit earnings and the expected transit earnings. Next, suitable properties are located near the proposed stations during the planning and approval process for the transit project. The selected property is then sold to MTRC at a premium under Hong Kong's version of eminent domain. The newly acquired land is proffered to MTRC's development partners who are responsible for all of the costs of developing the property. The profits from the property development are divided amongst the development team. Despite the size and complexity of MTRC's development projects, the value added to them by their investment in transit makes their ventures lucrative and generally low-risk.

MTRC's business model provides significant benefits all of its major stakeholders. The Hong Kong Government owns 76.1 percent of MTRC and benefits in several ways by investing in MTRC. Firstly, its expenditures on MTRC are equity investments rather than subsidies and therefore carry the expectation of returns in the near future. MTRC increases the value of the government's investment through IPO proceeds, periodic cash dividends, and market capitalisation. Additionally, the land premium charged to MTRC is paid directly to the government and added to their bottom line. Finally, the government benefits from having a high-quality transit network in its jurisdiction through the increase in property tax revenue

generated by the appreciation in land values nearby the new properties. Currently, property development accounts for nearly half of MTRC's earnings before interest, taxes, depreciation, and amortisation.

The general public also benefits from MTRC's financial innovation. Transit consumers enjoy the high level-of-service transit system that timely reinvestment affords them, creating one of the world's best transit systems. Transit consumers are also afforded low fares and high convenience. The property cross-subsidy removes the pressure to increase fares to meet the fare-recovery requirements of government financiers, as is the case with many transit agencies around the world. Moreover, integrated transit and property development provides an opportunity for urban planners to craft high quality communities, facilitate urban expansion, and engage in healthy and effective urban renewal. Finally, Hong Kong's residents benefit from the regional sub-centres created by MTRC's development activity through the territory. According to MTRC, there were 17 new nuclei constructed between the 1980s and the present day, with many more under construction or in planning.

The investment community is very fond of MTRC's business model and capital easy to acquire for MTRC. Investors are pleased with the company's steady appreciation, high bond rating, diversified portfolio, and stable cash flow. MTRC does not carry very much debt either, boasting a debt-to-equity ratio of 47.8 percent in 2004 and total debt outstanding valued at USD 3.9 billion. Since its privatisation in 2000, MTRC has outperformed the Hong Kong Stock Exchange by 10.4 percent per year in return to shareholder basis (Asian Development Bank).

MTR Property Development

Airport Railway

	Hong Kong	Kowloon	Olympic	Tsing Yi	Tung Chung
Site Acreage	14.11	33.46	39.59	13.34	53.62
Residential GFA	-	6,544,792	5,308,288	2,644,715	10,074,135
Residential Units	-	5,866	7,146	3,500	12,448
Office GFA	2,736,101	2,494,858	1,194,804	-	161,460
Towers	2	1	4	-	1
Retail GFA	640,027	890,721	683,514	496,974	602,784
Shopping Centres	1	1	2	1	1
Hotel GFA	1,100,619	1,802,669	0	0	236,808
Hotel Rooms	1,000+	2230 - 2490	-	-	364
Total GFA	4,476,748	11,733,040	7,186,606	3,141,689	11,075,187
Phases	1	7	3	1	3

Table 7 - Airport Railway Development Summary (MTRC 2005)

MTRC's Airport Railway property division encompasses the development projects associated with the Airport Express Line connecting downtown Hong Kong to Chek Lap Kok International Airport on Lantau Island. Like many of the development projects in Hong Kong, these station-area site plans are very large and complex. The five developments associated with MTRC's Airport Railway include Hong Kong Station/International Financial Centre, Kowloon Station/Union Square, Olympic Station, Tsing Yi Station, and Tung Chung Station.

HONG KONG STATION

Hong Kong Station is located on the waterfront in downtown Hong Kong facing Hong Kong Harbour. The Hong Kong Station development area is commercially known as the International Financial Centre (IFC) and located directly above the MTR transit hub which provides transportation connections to Chek Lap Kok Airport, Kowloon Peninsula across the harbour, and the Mid-Levels district and its residential population. Its 14 acre site is home to almost 4.5 million square feet of all purpose space. The uses within the IFC development are split between two office buildings, a large mall, and twin hotel towers (MTRC 2005).

One International Financial Centre was completed in 1998 and is the smaller of the two office buildings at over and 700,000 square feet of office space spread across 38 stories. Two IFC is the project's flagship property standing 88 stories tall and housing nearly two million square feet of office space. The IFC Mall consists of two multilevel shopping arcades totalling 640,000 square feet of retail floor space. Finally, the IFC Hotel Complex is an ultra-luxury 1,000-room property managed by Four Seasons (MTRC 2005).

Master Plan - Hong Kong Station

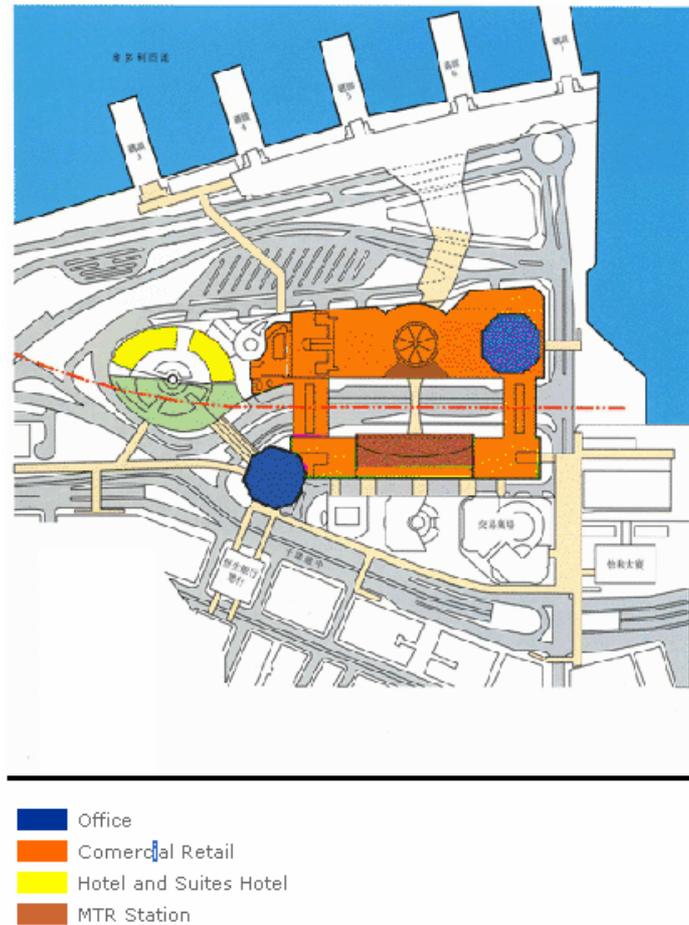


Figure 1 - Hong Kong Station Master Plan - (MTRC 2005)

KOWLOON

Kowloon Station is one of Hong Kong's vital transportation centres, providing connections to MTRC rail service throughout Hong Kong, KCRC rail services between Hong Kong and Mainland China, and various buses, shuttles, and taxi services that provide transportation throughout the region. The Kowloon Station district, also known as Union Square, is a landmark property that is just across the harbour from Hong Kong's central business district, on the north side of Hong Kong Harbour. Union Square combines several different uses on a single 33-acre site, including residential units, retail centres, office space, and hotel accommodations. The 18 towers comprising the Union Square development are responsible for 11.7 million square feet of gross floor area (MTRC 2005).

Packages 1-4, which include The Waterfront, Sorrento, The Arch and The Harbourside, have already been completed and are occupied. All four of the completed packages are high-end

residential complexes. The Waterfront includes 1,288 units across six towers and a parking structure housing 1,332 spaces. Sorrento has 2,126 luxury units throughout five towers sitting atop a 1,270-space parking structure. The Arch boasts over a million square feet of residential space above 412 parking spaces. Finally, The Harbourside is a three-tower complex housing 1,122 residential units above 864 parking spaces (MTRC 2005). The Harbourside's units are significantly larger on average than those in Union Square's other residential packages.

Packages five, six, and seven are still under construction but will include 891,000 square feet of high-end retail space, 2.5 million square feet of office space, 780,000 square feet of serviced apartments, a 1.0 million square foot hotel, 230,000 square feet of residential space, and an 11,000 square foot kindergarten (MTRC 2005). Packages 5-7 include the flagship property in this development, The Landmark Tower, which at 102 stories will be the tallest in Hong Kong.

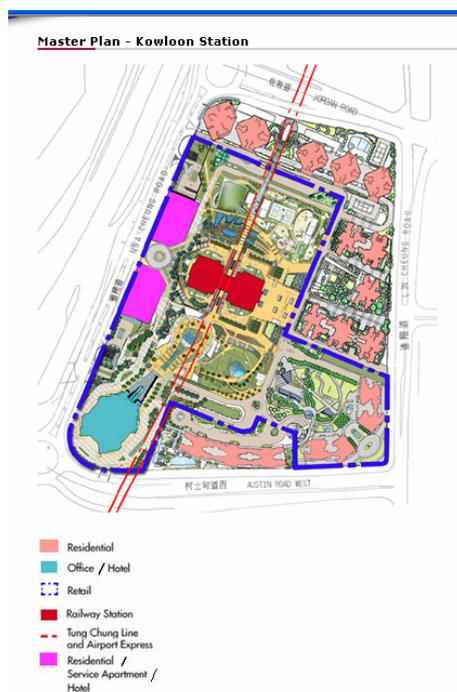


Figure 2 - Kowloon Station Master Plan (MTRC 2005)

OLYMPIC STATION

The Olympic Station development area is a new urban centre located atop 40 acres of reclaimed land on the west side of Kowloon Peninsula. The entire project is divided into four

sites with two on either side of the MTRC rail line and Olympic Station. The four sites are connected by an elaborate system of pedestrian paths and bridges. The total floor area housed on the Olympic Station development area is nearly seven million square feet. Its uses include a mix of 6,776 residences, over a million square feet of office space, nearly 700,000 square feet of retail facilities, and a modestly-sized kindergarten. 23 of the 27 towers on the property are residential while the remaining four are office buildings. The retail space is divided between two podiums, on either side of the MTRC station.

Package One of the Olympic Station development included the HSBC Centre, a three-tower complex housing 900,000 square feet of office space and a 20,000 square foot retail centre. Also included is the 300,000 square foot Bank of China Centre, the 140,000 square foot Olympian City One mall, and The Island Harbourview residential complex consisting of 9 towers and 2,314 units (MTRC 2005). Package Two includes the Park Avenue residential complex consisting of 1,624 units in five towers, the Central Park residential complex consisting of 1,312 units in four towers, and Olympian City Two mall with over 520,000 square feet of high-end retail space. Package Three is commercially known as the Harbour Green residential complex and has yet to be completed. Upon completion, it will contain 1,514 units and a 12,000 square foot kindergarten facility on site.



Figure 3 - Olympic Station Master Plan (MTRC 2005)

TSING YI STATION

Tsing Yi station is located on Tsing Yi Island midway between Hong Kong and Chek Lap Kok Airport. The Tsing Yi Station development area is the smallest along the Airport Railway. Its mix of uses is only residential and retail on a 13 acre site. The 12 residential towers in the Tierra Verde complex house 3,500 units, which sit above the 500,000 square foot mall known as Maritime Square and its 900-space parking facility.

Master Plan - Tsing Yi Station

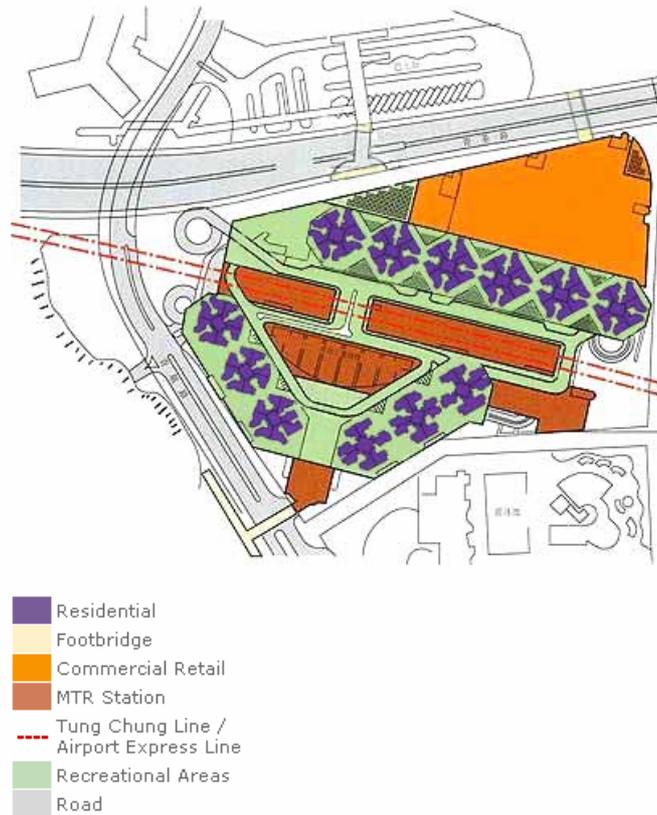


Figure 4 - Tsing Yi Station Master Plan (MTRC 2005)

TUNG CHUNG STATION

Tung Chung Station is at the centre of Tung Chung New Town, the community created in conjunction with the development of Chek Lap Kok airport. It is located on Lantau Island, just south of the airport on a 54 acre site which represents the largest development associated with the Airport Railway. Tung Chung, like many of the other properties developed by MTRC, is mixed use, but offers a greater variety of residential options than the other developments along the Airport Railway. The Tung Chung development houses over 11 million square feet of all-purpose space. The space is divided into 32 residential towers, several low-rise residential blocks, and houses, as well as a 160,000 square foot office tower, 600,000 square feet of retail space, a 364-room hotel, 4 kindergartens, and 3,800 parking spaces (MTRC 2005). Such a massive development is intended to alleviate some of the pressure on the Hong Kong real estate market by drawing some of the demand for space to the territory's periphery.

Package One consists of two residential complexes, Tung Chung Crescent (eight towers, 2,158 units) and Seaview Crescent (four towers, 1,536 units), and a mixed block called Citygate which includes 460,000 square feet of retail space, 160,000 square feet of office space, and a million square foot hotel. Package Two, commercially known as Coastal Skyline, is a 3,384-unit residential development that consists of seven towers, six mid-rise blocks, and 41 single family houses. Package Three, known as Caribbean Coast, gives Tung Chung its characteristic crescent shape. Its 13 residential towers are arranged in an arc around smaller residential blocks and open space. In total, Caribbean Coast houses 5,430 residential units.

Master Plan - Tung Chung Station

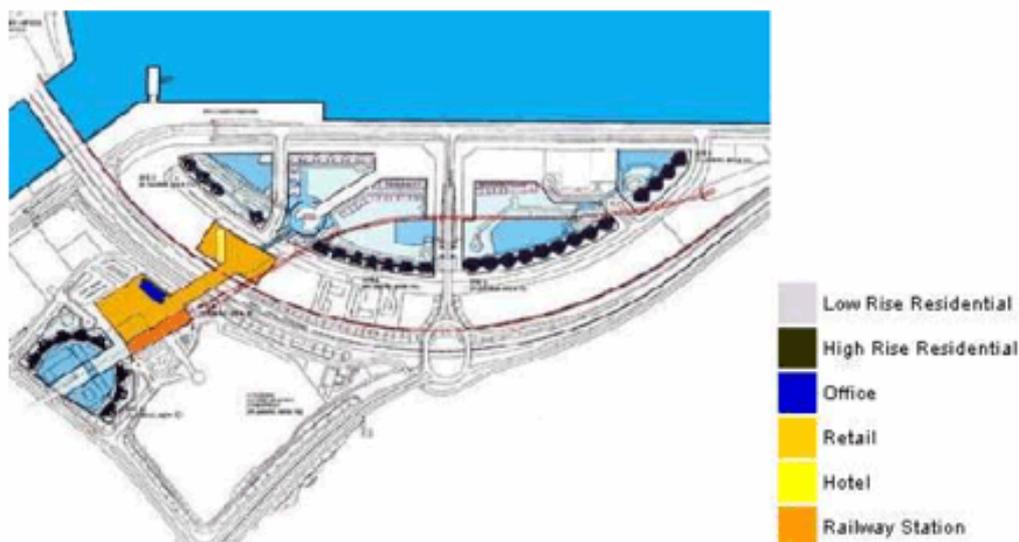


Figure 5 - Tung Chung Station Master Plan (MTRC 2005)

Tseung Kwan O

With the opening of the Tseung Kwan O line in 2002, MTRC was granted a golden opportunity to develop lucrative new station districts on the east side of the Kowloon Peninsula, formerly known as Junk Bay. MTRC is currently developing four station areas in accordance with their strategy to use their rail infrastructure to capitalise the adjacent land to its highest and best use and finance the cost of the initial expansion with the property development proceeds. The four station districts include Tiu Keng Leng, Tseung Kwan O, Hang Hau, all of which are currently under construction, and the massive "Area 86" new town which is still in the planning stages. Currently, only about 6 percent of the Tseung Kwan O portfolio has been delivered to the market.

	Site Area	Residential GFA	Residential Units	Towers	Retail GFA	Office GFA
Tiu Keng Leng	8.01	2,550,691	3,772	9	180,835	0
Tseung Kwan O	13.71	1,193,997	1,862	4	812,833	1,110,091
Hang Hau	4.45	1,492,450	2,130	6	37,674	0
Area 86	80.75	17,360,179	21,500	50	538,200	0
Total	106.92	22,597,317	29,264	69	1,569,542	1,110,091

Table 8 - Tseung Kwan O Development Summary (MTRC 2005)

Urban Lines

The developments along the core lines in the MTR system, known as the Urban Lines, represent some of the property developments in the MTRC portfolio. The Urban Lines development properties are subdivided into residential and commercial developments, denoting each property's dominant use. However, other uses are present and make up significant segments of their respective developments.

RESIDENTIAL DEVELOPMENTS

	Structures	Residential Units	Retail GFA (sq.ft.)	Institutional & Community GFA (sq. ft.)	Parking Spaces
Telford Gardens	41	4,992	561,569	9,784	723
Luk Yeung Sun Chuen	17	4,000	167,359	145,981	651
New Kwai Fong Garden	5	1,264	48,266	5,813	126
Fortress Metro Tower	4	757	73,098	0	114
Kornhill	32	6,648	1,121,286	103,765	1,168
Kornhill Gardens	10	2,180	0	0	0
Hongway Garden	2	412	27,384	0	0
Perfect Mount Garden	5	760	12,045	213,450	0
Southorn Garden	1	480	28,482	440,441	12
Heng Fa Chuen	48	6,504	287,851	210,572	849
Felicity Garden	4	732	0	144,087	0
Choi Hung Station Development	1	316	25,834	40,187	504
Total	170	29,045	2,353,174	1,314,080	4,147

Table 9 - Urban Line Residential Development Summary (MTRC 2005)

COMMERCIAL DEVELOPMENTS

	Office GFA (sq.ft.)	Retail GFA (sq.ft.)	Parking Spaces
Admiralty Centre	778,130	194,979	0
World-wide House	358,592	76,866	0
Fairmont House	224,817	0	0
Telford Plaza I	0	561,569	270
Telford Plaza II	0	334,007	188
Seng Tower	286,699	0	25
Luk Yeung Galleria	0	167,359	0
Paradise Mall	0	287,851	415
Total	1,648,238	1,622,631	898

Table 10 - Urban Line Commercial Development Summary (MTRC 2005)

Greyfield Redevelopment

According to the concerns raised by some members of the Triangle area business community, the CORE region suffers from a lack of a sense of place that puts the firms located there at a competitive disadvantage when attempting to attract highly prized employees. In fact, the region around the Research Triangle Park is a mottled combination of suburban and rural uses with the peculiar distinction of being located in the centre of the metropolitan region rather than at its periphery. The Research Triangle Foundation (RTF) and the Triangle J Council of Governments (TJCOG) launched the CORE study to address the private sector's concerns about the future competitiveness of North Carolina's Research Triangle Region.

One of the principle tenets of the 2002 CORE plan was to cluster development in pre-defined activity clusters to create the sense of place that is lacking in that part of the Triangle. The CORE plan however, is heavily reliant upon greenfield development to make up the bulk of the activity centres. Meanwhile, suburban-style growth continues to consume greenfield sites in the CORE area and throughout the Research Triangle Region such that, the creation of fine-grained, integrated urban neighbourhoods surrounding the Research Triangle Park becomes less likely.

The suburban development paradigm is notorious for creating an oversupply of retail space as municipalities compete with each other for sales tax revenue by applying commercial zoning designations to large tracts of land on arterial roads hoping to attract development activity. As a result, many vacant and under-utilised malls and strip shopping centres exist throughout the country since shifting market forces rendered them infeasible. These

underperforming properties are known as greyfield sites and can often be found in prime locations throughout the nation's metropolitan regions as around them over the years. Given that the functional life for a suburban shopping centre is about 20 years, greyfield can become symbols of blight and disinvestment at the centre of once-vibrant communities. Currently, the Research Triangle Region contains a large number of greenfield sites that are likely to be developed in the near future, yet the momentum to adhere to the CORE's design and development standards has been slow. Therefore, the Triangle will likely need to consider an infill redevelopment strategy as part of future iterations of the CORE development plan as highly desirable sites are consumed by suburban-style development.

The urban planning community can aid infill development by removing the barriers currently in place that hinder greyfield redevelopment. Apart from removing impediments, local governments need also to introduce incentives to develop greyfields (Chilton). These incentives need to be carefully crafted to ensure a desirable outcome and to minimise unintended consequences. The zoning regulations that currently increase the cost to redevelop greyfield sites include minimums for setbacks, open space, parking spaces, and landscaping. Planners could also shorten the approvals process for greyfield projects to make them more competitive with greenfield development. A lengthy bureaucratic process increases the time required to develop greyfields and thus, increases their cost and renders them less feasible.

Many zoning regulations address a different development paradigm than that which greyfield redevelopment exists by reducing the amount of space that can be built on the property and preventing it from achieving its highest and best use. New zoning regulations need to be developed to facilitate increased greyfield development activity. Currently, developers operate under the assumption that zoning regulations separate uses, making mixed-use greyfield redevelopment unattractive. As a result, the development community has created thousands of auto-centric communities. Most of these communities lack traditional town centres and have shopping centres in their place. More intelligent zoning practices can encourage developers to convert these centrally located greyfield sites to functionally integrated town

centres while simultaneously attaining multiple objectives such as preventing blight, redeveloping derelict properties, and introducing a physical sense of place to suburban communities.

The communities interested in greyfield redevelopment must recognise that these projects are complex and require a highly skilled and nuanced approach to each facet of their planning and development. Public participation is of primary importance to the success of a greyfield project. Small communities often fear extensive alterations to their environs and the resultant influx of newcomers. Open public dialogue can help to reduce the reactionary opposition that large projects are likely to encounter. Secondly, all of the stakeholders in the greyfield project need to share a singular objective. Negotiating terms of engagement is the preferred option for municipalities to address competing interests though they should not be reluctant to using eminent domain when necessary. Moreover, the various public-sector entities involved should agree on how to accommodate greyfield development as well as what type of contribution they can make to the redevelopment project. Public contributions often come in the form of parking structures, street improvements, or other public amenities. Local knowledge is another crucial element to the successful execution of greyfield redevelopment. Each project carries with it a unique set of peculiarities that cannot be easily assumed based on comparable properties. Each project must be evaluated in the proper context which also extends to the project's tenant mix and management team.

Lakewood, Colorado

Lakewood, Colorado is home to the highly successful and often referenced greyfield redevelopment project that transformed the defunct 1.4 square foot Villa Italia mall into the Belmar community which contains 2,400 residential units, 1 million square feet of retail space, 1 million square feet of office space, 250 hotel rooms, four acres of green space, and 9,000 parking spaces at completion. The Villa Italia mall opened in 1966 in an unincorporated area on the western fringe of Denver's metropolitan region (Swope 2002). Residential neighbourhoods quickly grew to surround the Villa Italia mall. Those neighbourhoods later incorporated to found the town of Lakewood in 1969. Lakewood thrived for over 30 years

with Villa Italia at its centre, culturally and geographically, becoming the fourth largest city in the state of Colorado with 150,000 residents. As suburban sprawl forged past Lakewood, newer, larger, and more convenient were built on the new fringes of Denver's metropolitan region. Villa Italia had lost its competitive advantages and appeared old, undersized, and poorly located in relation to comparable properties. In 2000, Villa Italia's anchor stores began to close. That year Dillard's vacated their space and J.C. Penney and Montgomery Ward left the following year.

Lakewood however, when faced with the demise of its foremost attraction, had the foresight to proactively address the future of the city by planning the future use of the Villa Italia mall. Continuum Partners LLC purchased the Villa site in 1999 and began construction on their \$500 million project in 2001 to redevelop the 104-acre site into Lakewood's new downtown district (Swope 2002). The first challenge Continuum confronted was a complicated site control process. They needed to consolidate Villa's 140 tenant leases to neutralise the veto powers written into each of them. Next, Continuum faced a challenge in creating a viable tenant mix for the new development after Villa's decline discouraged retailers from locating in the area. Lakewood's government demonstrated its support for the project by diverting the new sales tax revenues to finance a parking structure, parks, and the new street grid throughout the Belmar site.

Currently, Belmar contains a 90,000 square foot multipurpose events centre, 185,000 square feet of office space, and condominiums, apartments, and townhouses totalling 700 units. At present, 60 percent of the projected retail space has been completed as well as 25 percent of projected office space and 15 percent of residential units. Continuum expects to achieve final build-out by 2007-2008.

Chapter 5 - Recommendations

Accessibility applies to all forms of transportation and is an integral component of the location decision-making process. Each category of real estate development has its own optimal accessibility profile for which property values increase as the ideal conditions are met. Transportation accessibility includes distance to the facility as well as its level-of-service, its implicit and explicit costs to use, required travel time, and several other criteria which may influence an individual's mode choice.

In urban areas transit accessibility depends largely on distance to transit facilities because increased density and elevated land values often indirectly discourage automobile travel. In suburban areas, however, transit accessibility is a function of time, level-of-service, and travel costs as transit is forced to compete against the comfort and convenience of the private automobile. The CORE area around the Research Triangle Park in central North Carolina is clearly the latter. The Triangle Transit Authority had the responsibility to build and operate a regional rail line between Raleigh and Durham, which would have also served the Research Triangle Park, with the expected aid of large Federal Transit Administration subsidies and precarious assumptions about ridership levels in the future. The TTA found itself in a suboptimal position when its grantor, the FTA, required it to increase the cost-effectiveness of the regional rail line. TTA subverted its own goals by repeatedly reducing the project's level-of-service to lower costs. This decline in level-of-service also reduces the expectations of an already sceptical public and is unlikely to induce significant travel behaviour variations in an auto-centric region, barring any major changes. Therefore, the TTA should explore an alternative funding strategy like cross-subsidisation, which affords them enough capital to build a proper transit system and the clout to make decisions about how it should be operated. Hong Kong's experience in building and managing rail transit services financed by property development is the archetypical case of cross-subsidisation from which the TTA may learn valuable lessons about building and financing rail transit facilities.

The Triangle Transit Authority has a difficult task ahead of it if the agency wishes to perform a relevant role in shaping the transportation portfolio of the Triangle region in the coming

years. Currently, TTA is risking the future the Regional Rail project, and the characteristics of the Triangle's growth pattern on basic issues. If TTA cannot qualify for New Starts funding for its Regional Rail plan, it must seriously consider implementing a sales tax increase to pay for the project. Additionally, the scope of the project should be returned to the original 16 stations and 35-mile length. TTA should also make intelligent investments to increase the system's level of service at a low cost. Longer trains, shorter headways, and ample park-and-ride facilities will help attract choice riders to the system. If TTA's long term land-use and transportation vision is adequately sound then Triangle residents should be expected to assume a marginal burden to facilitate its realisation.

Foster Cooperative Municipal Relationships

TTA must maintain closer cooperation between itself and municipal governments to institute zoning regulations, land use plans, and transportation infrastructure that does not undermine the transit network. No transit solution will succeed without supportive land-use policies in place to facilitate transit usage. This way, the Triangle region may accommodate the large amount of growth predicted to occur in the area while maintaining the high quality of life that is attracting many of the newcomers.

Renegotiate Unfavourable Agreements

TTA should then work very hard to renegotiate its contracts with the rail companies and develop reasonable alternatives or introduce a mediator to the negotiations. The previous agreements were negotiated on poor terms and in bad faith. The railroad companies are taking advantage of an organisation whose mission is to further the public good. At an impasse, a mediator should be utilised to reach a mutually acceptable agreement that is fair to both parties. Without taking these measures, the Triangle Transit Authority has handicapped its ability to provide transit for the residents that need and want it, jeopardises the future acceptance of any transit in the Triangle region, and consigned the Triangle's future to one of traffic and sprawl much like the other major metropolises of the South-eastern United States.

Employ Multiple Creative Strategies

The primary problem with the CORE plan was the TTA's complacency in its funding and development strategies. The TTA had relied on federal New Starts funding for the commuter rail line and did not seriously consider many contingencies. Likewise, the TTA believed that the development community would fully realise the value a commuter rail line would add to their properties. Instead, all of the entities involved should have taken more creative measures to fully capitalise on their investments. First, the TTA, the development community and CORE planners should emulate Hong Kong's property development business model to fund transit capital and operating expenses. The local municipalities can contribute to this effort by amending their regulations to facilitate higher density mixed-use development. They must also create cooperative agreements rather than acting in competitive self-interest with regards to allocation of services, firm location, financial contributions, and numerous other issues. TJCOG could function as the intermediary between each individual municipality, TTA, and the development community because of their ability to grasp the big picture of regional cooperation in the Research Triangle. This strategy addresses both of the TTA Regional Rail plan's major shortfalls, ridership and cost.

The Hong Kong strategy would create demand for the rail service at each station while harnessing the value created by proximal location to high level-of-service transit resources and reinvesting the proceeds into the transit system. This reduces the amount of money the TTA needs to borrow, spreads the sources of funds throughout a broad community of investors, and creates a favourable opinion among creditors. Local governmental contribution can be more easily justified politically as an investment carrying the expectation of returns rather than a subsidy to cover operational shortfalls. High density is crucial to the success of the Hong Kong model. The value added to property near transit declines precipitously with increased distance from the facility.

In addition to the property development business model, the CORE constituent municipalities can aid the TTA rail line and the CORE at large, by engaging in joint development strategies that created truly urban districts in and around TTA station areas. Similar to WMATA's

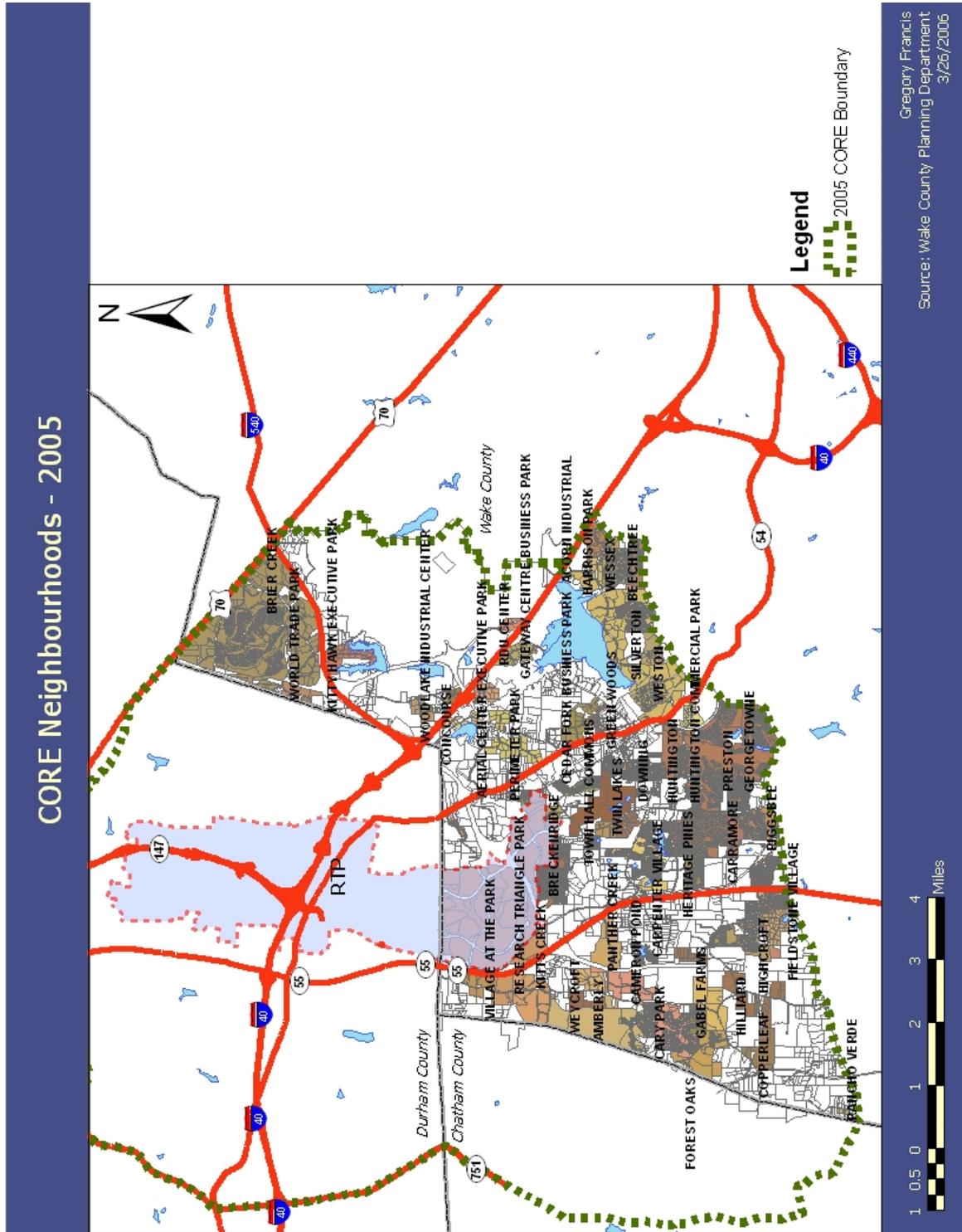
successful model, the CORE's municipal governments can buy land around station areas and lease it to developers interested in high density transit-oriented development. The funds from the ground leases can help to fund further municipal investments into transit/property ventures.

The third strategy includes urbanising the suburbs through greyfield redevelopment. The shiny new shopping centres being built throughout the CORE area are likely to be desolate in 20 years, at the current rate of suburbanisation. Therefore, many newly created communities will lose favour with their residents once their once-vibrant retail facility, which functioned as a town centre, ends its productive life. Municipal governments must be eminently proactive to address these opportunities before the sites become greyfields by amending zoning regulations to be more permissive of urban development such as allowing density and mixed uses on former retail sites. In the CORE, these areas can be converted into new town centres to serve the communities that will certainly grow around them. They will also likely not be in TTA station areas so will not contribute to their urban character but can be transit villages for bus networks complementary to the TTA rail line.

Many low-density residential communities can retain the small-town character and quality of life that is attractive to many homebuyers despite the above suggestions since the development intensity should be designed to taper with increased distance from transit facilities. However, the expressed intention of the CORE planning initiative was to urbanise the centre of the Research Triangle Region. Nuanced planning is required to achieve both goals, as can be seen in Arlington, Virginia. The adoption of a clustering strategy of development that encourages development near transit station areas and discourages sprawling into the rural tier can meet the requirements of both rural and urban interests. The TTA, the development community, and the planning community need to view transit as part of a system of multiple moving parts that includes development and policy where their decisions on one issue cannot ignore the other issues at hand. Growth management that takes full advantage of the synergies between these facets achieves multiple goals and creates maximum benefit.

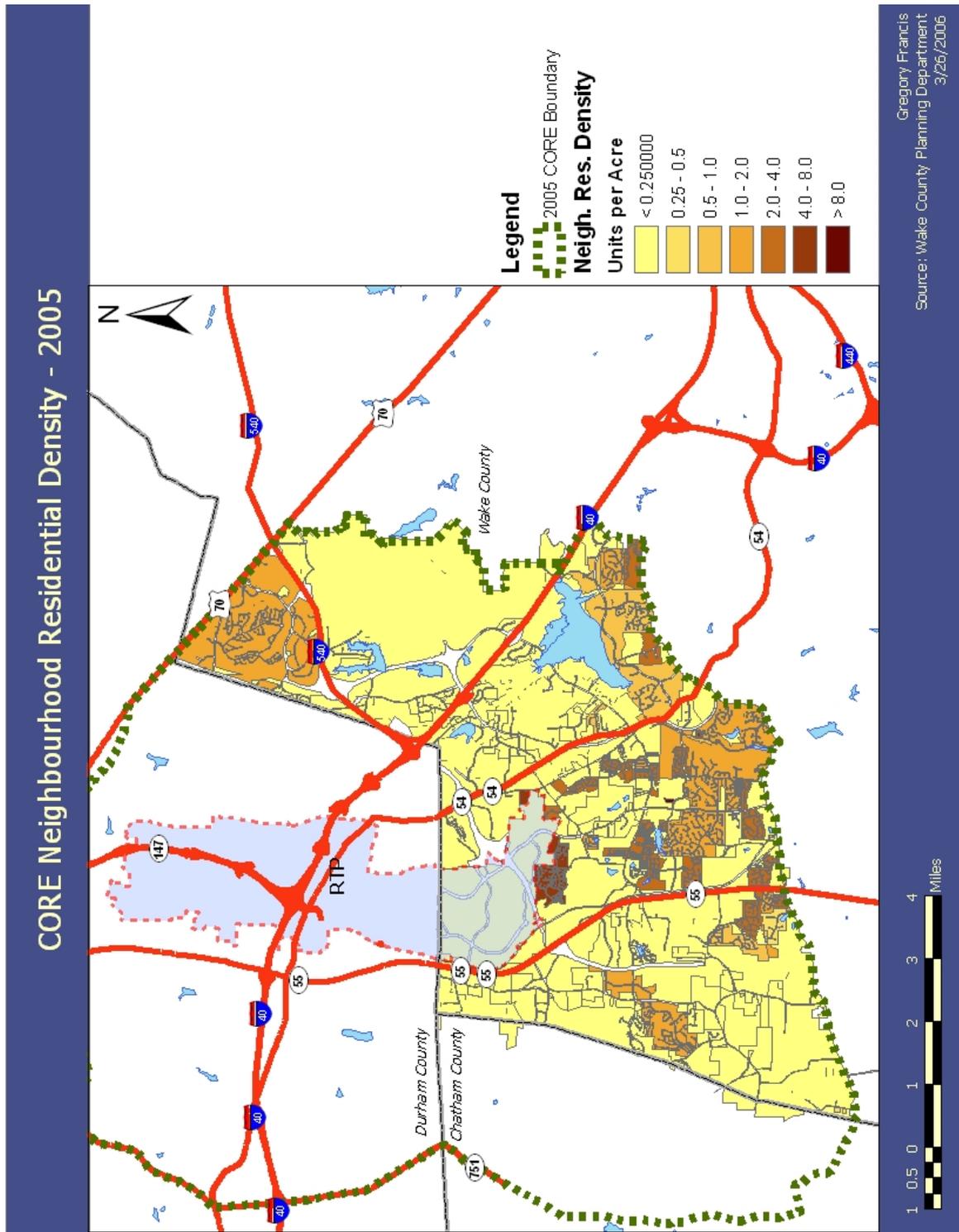
Appendix I - Maps

CORE Neighbourhoods at the end of 2005.

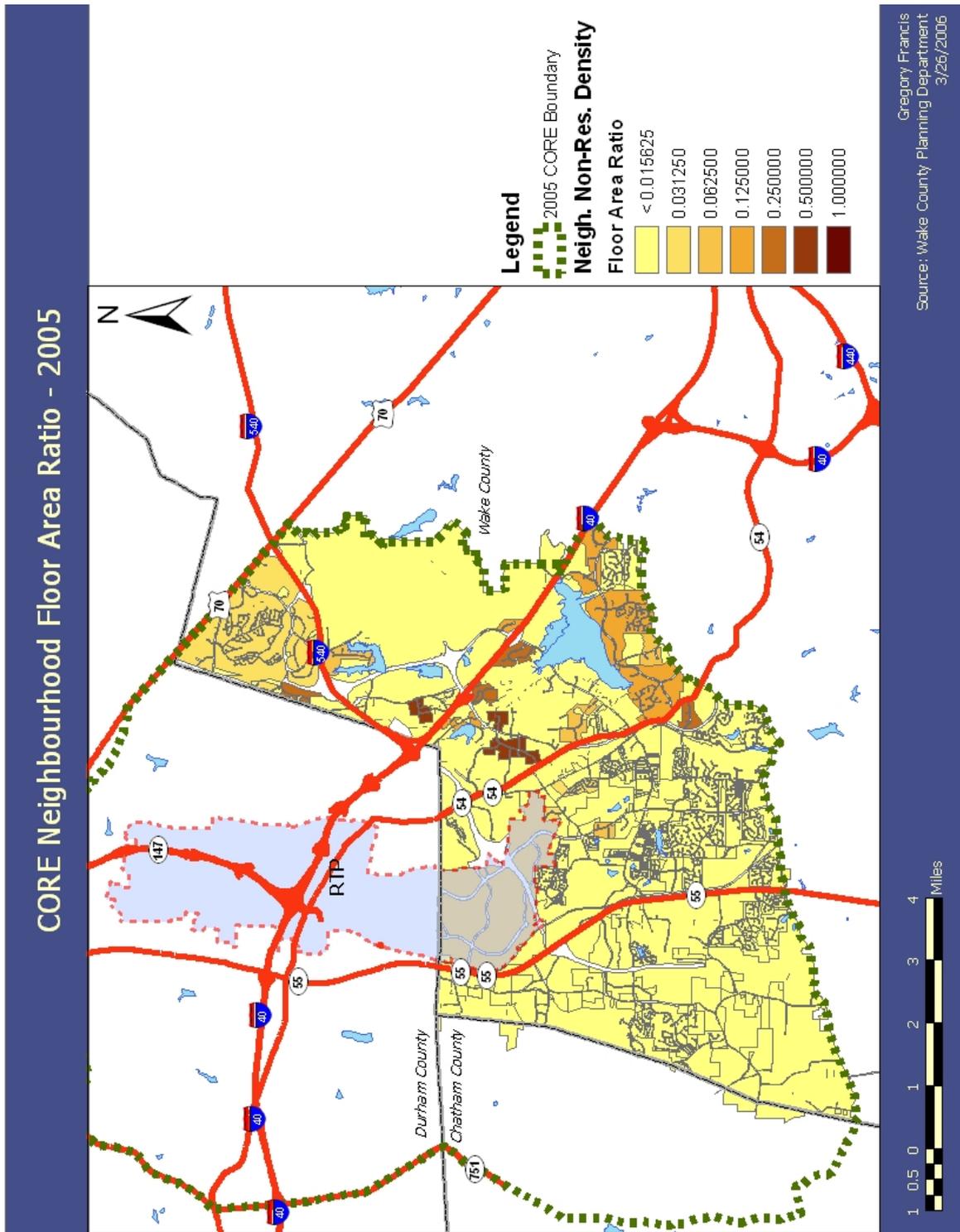


Gregory Francis
 Source: Wake County Planning Department
 3/26/2006

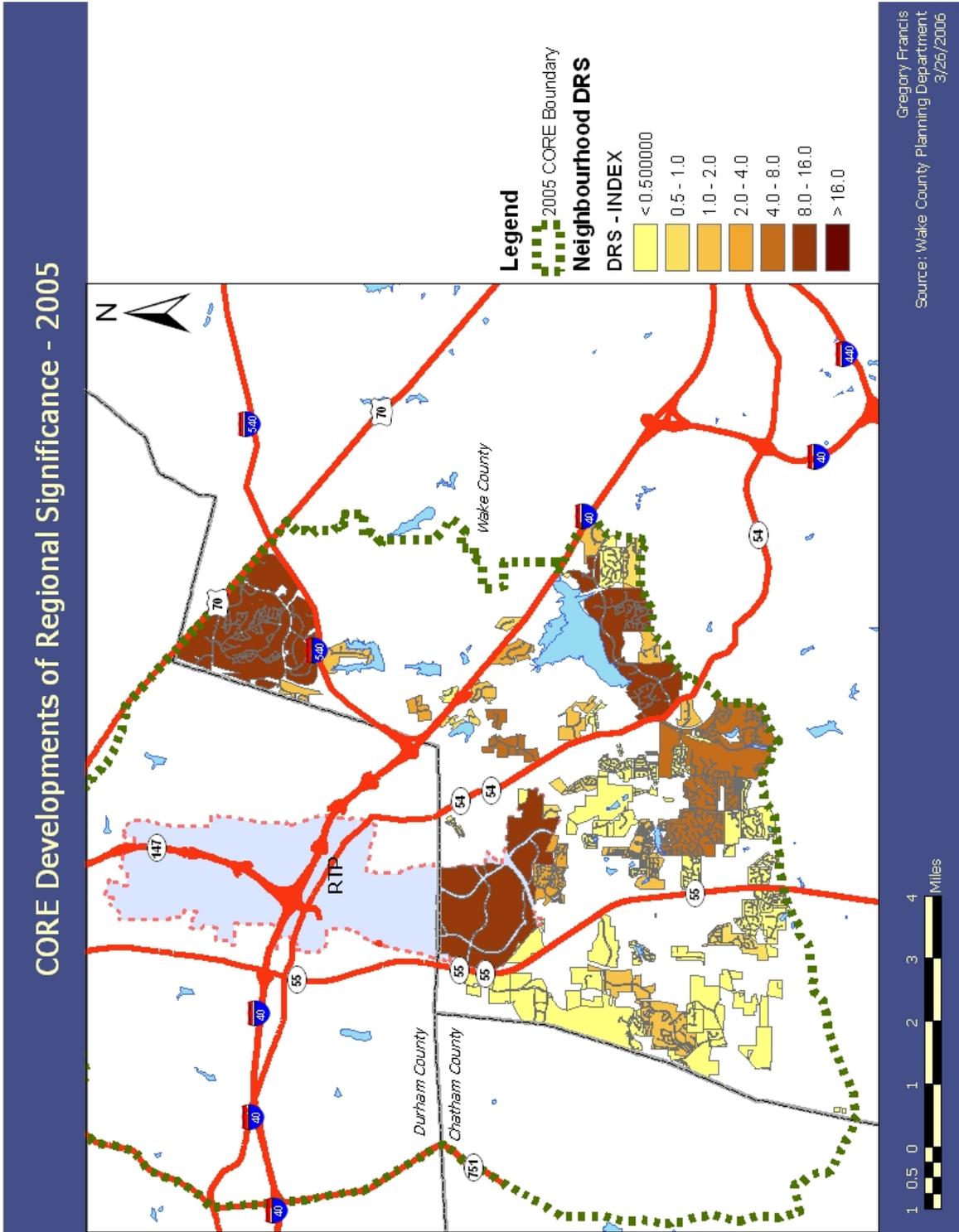
CORE Residential Density - 2005



CORE Non-Residential Floor Area Ratio



CORE Development of Regional Significance Index - 2005



Appendix II - Tables

CORE Parcels Attributes

CORE Parcels Attributes	
Attribute	Description
FID	Unique identifier
Shape	Shape of the coverage
COUNTY_ID	County name
OWNER	Property owner
PARCEL_ID	Parcel ID number
PIN	Tax identification number
LAND_USE	Land use code
LANDUSE_DE	Land use description
GenCode	Generalised land use code
PROPDESC	Property description
SUB_ID	Subdivision identification number
SUB_DESC	Subdivision name
UNITS	Units
HEATED AREA	Floor Area
LAND_VALUE	Assessed land value
BLDG_VALUE	Assessed building value
TOTAL_VALUE	Total assessed value
SALE_PRICE	Recent transaction price
YEAR_BUILT	Year built
SITE_ADDR1	Site address field
SITE_ADDR2	Site address field
SITE_ADDR3	Site address field
SITE_ADDR4	Site address field
SITE_ADDR5	Site address field
SITE_MISC	Miscellaneous site information
ZONING	Zoning code
LAND_CLASS	Land use classification
TOTSTRUCTS	Structure onsite
PARCELS_ID	Parcel ID number
COUNTYID	County ID number
OBJECTID	Unique identifier
NEIGHBORHD	Generalised neighbourhood name
ACRES	Parcel size
HOTEL_ROOM	Number of hotel rooms
NONRESSOFT	Non-residential floor area
RES_UNITS	Residential units

Wake County Land Uses

Wake County Land Uses		
Type Use	Description	Generalised Category
00	Vacant	Vacant
01	One Family	Residential
02	Two Family	Residential
03	Three Family	Residential
04	Four Family	Residential
05	Multi-Family	Residential
06	Residential w/ Bus. Use	Residential
07	Garden Apt.	Residential
08	Townhouse Apartment	Residential
09	Elevator Apartment	Residential
10	Rooming House	Residential
11	Bank Buildings	Retail
12	Drive-In only Banks	Retail
14	Bowling Alley	Entertainment
16	Day Care	Community Services
17	Club House	Entertainment\Recreation
18	Bath House	Entertainment\Recreation
19	Sales and Service	Auto Services
20	Service Garage	Auto Services
21	Parking Deck	Auto Services
22	Oil & Lube	Auto Services
23	Car Wash	Auto Services
24	Wand Car Wash	Auto Services
25	Service Station	Auto Services
27	Other/Booth	Auto Services
28	Hotel/Motel w/ Full Facilities	Hotel
29	Hotel/Motel w/ Limited Facilities	Hotel
30	Motel - Ext. Stay	Hotel
31	Hotel High Rise	Hotel
32	Hotel/Motel - Ind.	Hotel
34	Typical Office	Office
35	Ofc./Rtl/Res Conv.	Office
36	Medical Types	Medical
37	Office/Apt.	Office
38	Office Bldg. - HR	Office
39	Restaurant	Restaurant
40	Fast Food	Restaurant
41	Plain Drive-In	Restaurant
42	Store Type Bldg.	Restaurant
43	Bar/Club	Entertainment
44	Cafeteria	Restaurant
46	Food Mart	Retail
47	Sgl. Tenant	Retail
48	Multi-Tenant	Retail
49	Supermarket	Retail
50	Discount Store	Retail
51	Department Store	Retail
52	Bulk Retail	Retail
53	Mall	Retail
54	Community Ctr.	Retail
55	Neighborhood Ctr.	Retail
56	Junior Anchor	Retail
57	Stores w/ Apts.	Retail
58	Stores w/ Offices	Retail
59	Stores w/Offices & Apts.	Retail
60	Junior Dept. Store	Retail
62	Airport Terminal	Aviation
63	Vet Clinic	Medical
64	Clinic	Medical
65	Club	Entertainment
66	Church	Special
67	Dormitory	Residential
68	Fire Station	Government
69	Gymnasium	Entertainment
70	Hospital	Medical
71	Library	Education
72	Mobile Home	Residential
73	Municipal Bldg.	Government
74	Nursing Home	Senior
75	Funeral Home	Special
76	Retirement Home	Senior
77	School	Education
78	Theatre	Entertainment
79	Lt. Manufacturing	Industrial
80	Manufacturing	Industrial
81	Pharm. Plant	Industrial
82	Prefab Whse.	Industrial
83	Warehouse	Industrial
84	Bulk Dist. Whse.	Industrial
85	Flex Whse.	Industrial
86	Mini-Whse.	Industrial
87	Bottling Plant	Industrial
88	Chemical Plant	Industrial
89	Biological Plant	Industrial
90	R & D	Industrial
91	Hangar	Aviation
92	Power House	Utility
94	Telephone Exch.	Utility
95	Truck Terminal	Industrial
96	Laboratory	Industrial
98	Laundry	Industrial
99		Aviation

CORE Neighbourhoods

CORE Neighbourhoods		
ACORN INDUSTRIAL	GREEN WOODS	RIDGEFIELD FARMS
ADDISON PARK	GROVES AT MORRISVILLE	RIDGEMONT
AERIAL CENTER EXECUTIVE PARK	HADLEY PLACE	RIGGSBEE
AIRPORT GATEWAY	HAMLET IN THE PARK	RIGGSBEE FARM
AMBERLY	HARRISON PARK	SAVANNAH
BEECHTREE	HERITAGE PINES	SILVERTON
BERKELEY	HIGHCROFT	SOMERSET
BRECKENRIDGE	HILLIARD	SOUTHBRIDGE
BRIER CREEK	HUNTINGTON	STONEWATER
CAMERON POND	HUNTINGTON COMMERCIAL PARK	THE ARBORETUM
CARPENTER PARK	HUNTINGTON PARK	THE GREENS
CARPENTER VILLAGE	HUNTINGTON WOODS	THE OVERLOOK
CARRAMORE	INDIAN WELLS	THE RESERVE
CARY CORPORATE CENTER	KELTON II	TOWN HALL COMMONS
CARY PARK	KITTS CREEK	TWIN LAKES
CEDAR FORK BUSINESS PARK	KITTY HAWK EXECUTIVE PARK	VILLAGE AT THE PARK
CONCOURSE	LANDSDOWNE	WELLESLEY PROFESSIONAL PARK
COPPERLEAF	MAGNOLIA ESTATES	WESSEX
CRABTREE CROSSING	MORRIS WEST	WESTON
DOWNING	MORRISVILLE HEIGHTS	WEXFORD
FAIRWOODS	PANTHER CREEK	WEYCROFT
FIELDSTONE VILLAGE	PERIMETER PARK	WHITE OAK ESTATES
FOREST OAKS	PRESTON	WOODLAKE INDUSTRIAL CENTER
GABEL FARMS	RANCHO VERDE	WORLD TRADE PARK
GATEWAY CENTRE BUSINESS PARK	RDU CENTER	
GEORGETOWNE	RESEARCH TRIANGLE PARK	

Neighbourhood Summary Attributes

Neighbourhood Summary Attributes	
Attribute	Description
FID	Unique identifier
Shape	Shape of the coverage
NEIGHBORHD	Generalised neighbourhood name
LOTCOUNT	parcels in each neighbourhood
SUM_ACRES	Size of neighbourhood
SUM_NONRES	Total non-residential floor area
SUM_RES	total residential units
SUM_HOTEL	total hotel rooms
DRS_INDEX	Development of Regional Significance Index
NONRES_FAR	Non-residential Floor Area Ratio
RES_DENSIT	Residential Density

CORE Neighbourhood Analysis

NEIGHBORHOOD	Parcel Count	Acreage	Floor Area	Hotel Rooms	Non-Res Sq. Ft.	Res. Units	DRS Index
	1,862	18,351.02	15,453,544	517	10,993,834	3,409	50.793
ACORN INDUSTRIAL	3	6.94	-	-	-	-	0.000
ADDISON PARK	40	9.56	-	-	-	-	0.000
AERIAL CENTER EXECUTIVE PARK	17	59.89	667,347	378	449,526	-	1.798
AIRPORT GATEWAY	8	27.94	123,185	168	8,250	-	0.033
AMBERLY	262	524.18	-	-	-	-	0.000
BEECHTREE	270	120.00	595,036	-	-	449	0.898
BERKELEY	55	17.79	165,101	-	-	55	0.110
BRECKENRIDGE	1,159	191.57	2,207,239	-	4,518	1,099	2.216
BRIER CREEK	1,473	1,649.50	4,963,505	-	1,164,415	2,294	9.246
CAMERON POND	142	44.50	-	-	-	-	0.000
CARPENTER PARK	170	29.79	153,789	-	-	93	0.186
CARPENTER VILLAGE	759	227.63	1,697,722	-	33,439	846	1.826
CARRAMORE	50	101.33	12,850	-	-	6	0.012
CARY CORPORATE CENTER	11	45.17	117,546	-	117,546	-	0.470
CARY PARK	818	462.88	1,613,835	-	3,641	580	1.175
CEDAR FORK BUSINESS PARK	19	124.37	305,299	-	305,299	-	1.221
CONCOURSE	24	48.87	335,698	225	237,419	-	0.950
COPPERLEAF	6	139.52	2,206	-	-	1	0.002
CRABTREE CROSSING	13	14.15	60,139	-	-	10	0.020
DOWNING	387	70.40	354,125	-	493	201	0.404
FAIRWOODS	14	4.91	30,544	-	-	14	0.028
FIELDSTONE VILLAGE	111	58.25	199,490	-	-	104	0.208
FOREST OAKS	58	204.27	10,901	-	-	6	0.012
GABEL FARMS	5	189.95	2,839	-	-	1	0.002
GATEWAY CENTRE BUSINESS PARK	20	88.97	511,067	-	511,067	-	2.044
GEORGETOWNE	74	25.28	208,576	-	-	73	0.146
GREEN WOODS	51	33.19	37,423	-	-	24	0.048
GROVES AT MORRISVILLE	92	3.05	157,437	-	-	92	0.184
HADLEY PLACE	17	7.01	-	-	-	-	0.000
HAMLET IN THE PARK	138	19.28	183,428	-	-	136	0.272
HARRISON PARK	23	88.71	633,087	345	322,433	-	1.290
HERITAGE PINES	292	82.39	432,624	-	6,937	222	0.472
HIGHCROFT	308	139.41	421,276	-	83,178	105	0.543
HILLIARD	42	239.01	68,183	-	-	33	0.066
HUNTINGTON	29	6.50	39,458	-	-	25	0.050
HUNTINGTON COMMERCIAL PARK	24	64.36	370,444	-	370,444	-	1.482
HUNTINGTON PARK	50	6.00	44,232	-	-	48	0.096
HUNTINGTON WOODS	132	40.56	232,927	-	-	131	0.262
INDIAN WELLS	1	0.76	-	-	-	-	0.000
KELTON II	57	4.33	75,438	-	-	28	0.056
KITTS CREEK	73	211.79	12,022	-	-	7	0.014
KITTY HAWK EXECUTIVE PARK	30	129.60	331,247	-	327,564	1	1.312
LANDSDOWNE	87	23.77	216,269	-	-	86	0.172
MAGNOLIA ESTATES	59	16.71	-	-	-	-	0.000
MORRIS WEST	15	61.84	35,573	-	-	15	0.030
MORRISVILLE HEIGHTS	14	4.96	5,881	-	-	3	0.006
PANTHER CREEK	3	158.41	-	-	-	-	0.000
PERIMETER PARK	31	169.50	1,988,963	-	1,988,963	-	7.956
PRESTON	2,301	1,494.28	7,476,253	-	336,782	2,744	6.835
RANCHO VERDE	3	7.41	4,190	-	-	2	0.004
RDU CENTER	5	32.43	211,082	155	125,176	-	0.501
RESEARCH TRIANGLE PARK	34	1,646.43	3,902,988	-	3,902,988	-	15.612
RIDGEFIELD FARMS	12	89.81	30,014	-	-	9	0.018
RIDGEMONT	56	15.44	146,070	-	-	56	0.112
RIGGSBEE	107	62.61	2,156	-	-	1	0.002
RIGGSBEE FARM	224	86.38	708,196	-	1,200	218	0.441
SAVANNAH	115	18.41	67,676	-	-	24	0.048
SILVERTON	17	84.99	402,888	-	196,405	216	1.218
SOMERSET	121	53.13	427,382	-	735	119	0.241
SOUTHBRIDGE	64	64.33	4,049	-	-	2	0.004
STONEWATER	10	227.85	-	-	-	-	0.000
THE ARBORETUM	3	19.81	54,396	-	54,396	-	0.218
THE GREENS	1	0.11	-	-	-	-	0.000
THE OVERLOOK	4	4.27	9,517	-	-	3	0.006
THE RESERVE	244	106.61	784,752	-	1,773	238	0.483
TOWN HALL COMMONS	392	101.23	696,845	-	75,396	307	0.916
TWIN LAKES	3	292.35	2,912	-	-	2	0.004
VILLAGE AT THE PARK	7	94.97	5,135	-	-	4	0.008
WELLESLEY PROFESSIONAL PARK	9	9.44	40,292	-	40,292	-	0.161
WESSEX	209	128.76	812,044	-	3,066	202	0.416
WESTON	572	983.52	4,923,498	98	3,242,143	770	14.509
WEXFORD	101	25.76	117,930	-	772	34	0.071
WEYCROFT	3	68.87	1,270	-	-	1	0.002
WHITE OAK ESTATES	33	95.51	75,500	-	-	29	0.058
WOODLAKE INDUSTRIAL CENTER	11	57.76	793,077	-	793,077	-	3.172
WORLD TRADE PARK	13	61.70	361,962	-	361,962	-	1.448

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