ABSTRACT

Title of Thesis: DESIGNING FOR THE SHRINKING CITY: RE-IMAGINGING BURKE LAKEFRONT AIRPORT IN DOWNTOWN CLEVELAND

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Like many post-industrial cities in the Midwestern United States, Cleveland is shrinking. A decline in its manufacturing-based economy in the late 20th century has led to unemployment and outmigration, eroding the quality of life and economic stability of inner city neighborhoods. Traditional planning strategies that rely heavily on growth as a means of addressing shrinking city problems have proven to be somewhat ineffective.

This thesis explores an alternative planning approach suggesting that Cleveland might successfully shrink into an archipelago of small, sustainable neighborhood islands while failed neighborhoods would be converted to productive “green belts”. This project applies this approach to the site of an under-utilized municipal airport, proposing a new design that enhances the social, economic, and environmental sustainability of Downtown Cleveland. Specifically, the design solution promotes transit-oriented development, connects existing neighborhoods to the waterfront, cleans polluted water, and re-uses dredge material to create a recreational and ecological landscape.

A SUSTAINABLE NEIGHBORHOOD IN THE SHRINKING CITY: RE-IMAGINGING BURKE LAKEFRONT AIRPORT IN DOWNTOWN CLEVELAND

By

Matthew Stuart Busa

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"Make no little plans. They have no magic to stir men's blood."

~Daniel Burnham

Chapter 1: Introduction

THE SHRINKING CITY PROBLEM

A shrinking city, as defined by the Shrinking Cities International Research Network (SCIRN), is “a densely populated urban area with a minimum population of 10,000 residents that has faced population losses in large parts for more than two years and is undergoing economic transformations with some symptoms of structural crisis (Wiechman, 2003)”. Urban shrinkage is not always a term that should be applied to an entire city or metropolitan region. In many cases, only some parts of the city may be losing population while other areas remain stable or even gain population. To understand the dynamics of the problem, one must consider population at multiple scales as it pertains to cities, parts of cities, or metropolitan regions.

The shrinking city phenomenon is not new. Throughout history, cities have lost population for many reasons, including natural and human-induced disasters, political collapses, diseases, wars, fires, agricultural crises, and low birth rates. During the collapse of the Roman Empire, the city of Rome’s population fell from 1.2 million people in 210 A.D. to just 35,000 during the Early Middle Ages (Tellier, 2009).

Today, the number of shrinking cities has reached unprecedented scale. According to one study, one in six cities worldwide was shrinking in 2006 (Pallagst, 2008). Another study concluded that since 1950, 370 cities with over 100,000 residents have declined in population by at least 10% (Oswalt & Rienets, 2007). More than 25 percent of these cities are located in the United

States (Oswalt & Reinets, 2006). Cleveland, Buffalo, Detroit, St. Louis, and Pittsburgh have lost more than half their population, while Baltimore and Philadelphia have lost nearly a third. The reasons behind population loss are not always clear cut. In the case of the American cities listed above, outmigration to suburban areas and decline of manufacturing-based economies are two reasons often cited.

Population loss can be problematic for many reasons. It causes vacant and abandoned properties to accumulate in urban neighborhoods, triggering declines in real estate values. While depressed property values make real estate more affordable, potential home buyers are often deterred by the fact that the land is likely to depreciate in value in the short term. Instead, many home buyers seek more stable markets, often located in suburbs. Vacant and abandoned properties become magnets for crime and vandalism. Metal thieves often ransack homes for valuable copper piping, aluminum siding, and household appliances. For this reason, vacancy often leads to high concentrations of poverty and crime. As fewer and fewer people inhabit an area, local businesses suffer from an eroded customer base. As a result, the shrinking neighborhood often sinks into a downward spiral of disinvestment and blight, eroding the quality of life for remaining residents.

Large metropolitan cities require vast amounts of infrastructure to support economic activity. However, shrinking cities often contain infrastructure components, such as roads, transit systems, and utilities, which were scaled to support a larger population than might exist today. Still, these systems require

funds for continued operation, maintenance, and repair. This becomes fiscally challenging for city governments that receive decreased tax revenues. City services must be provided to fewer and fewer citizens over a larger geographic distance, raising the per capita operating costs of the city. Exacerbating the problem, older infrastructure such as bridges and sewer mains, require higher rates of maintenance and replacement than when originally built. Decommissioning over-sized and under-utilized public infrastructure, such as highways, bridges, and sewer mains, is an elaborate, expensive process that requires funding streams that fiscally distressed cities often do not have. Thinly stretched budgets often result in poorly maintained infrastructure, such as streets, which negatively affects the appearance of the physical environment and thus people's perceptions of place.

In the past, American urban planners have responded to this problem by attempting revitalization efforts geared toward re-growing the city's population. This approach often focuses narrowly on the city center, addressing redevelopment in a fragmented, non-regional way. These approaches have been met with little long-term success (Pallagst et al, 2009). More recently, scholars and practitioners of the built environment have begun to re-conceptualize decline as shrinkage and have begun to explore more creative and innovative ways for cities to successfully shrink while maintaining high standards of living for remaining residents (Swope, 2006). A major barrier to planning for shrinkage will be to overcome the widespread public opinion that planning for shrinkage is pessimistic and an unhealthy acceptance of decline or defeat

(Pallagst et al, 2009). To be successful, planners must re-frame population loss as an opportunity to re-purpose vacant lands in a way that improves quality of life and creates a more livable and sustainable city.

WHY IS CLEVELAND SHRINKING?

To understand why Cleveland is shrinking, it is important to first understand its historic development. The city's growth and later its shrinkage have been powerful generators of urban form and have played a major role in shaping the social, economic, and environmental characteristics of the Cleveland we see today. The timeline in figure 1 illustrates historic local and world events have that have shaped Cleveland's evolution from port city to manufacturing city to shrinking city.

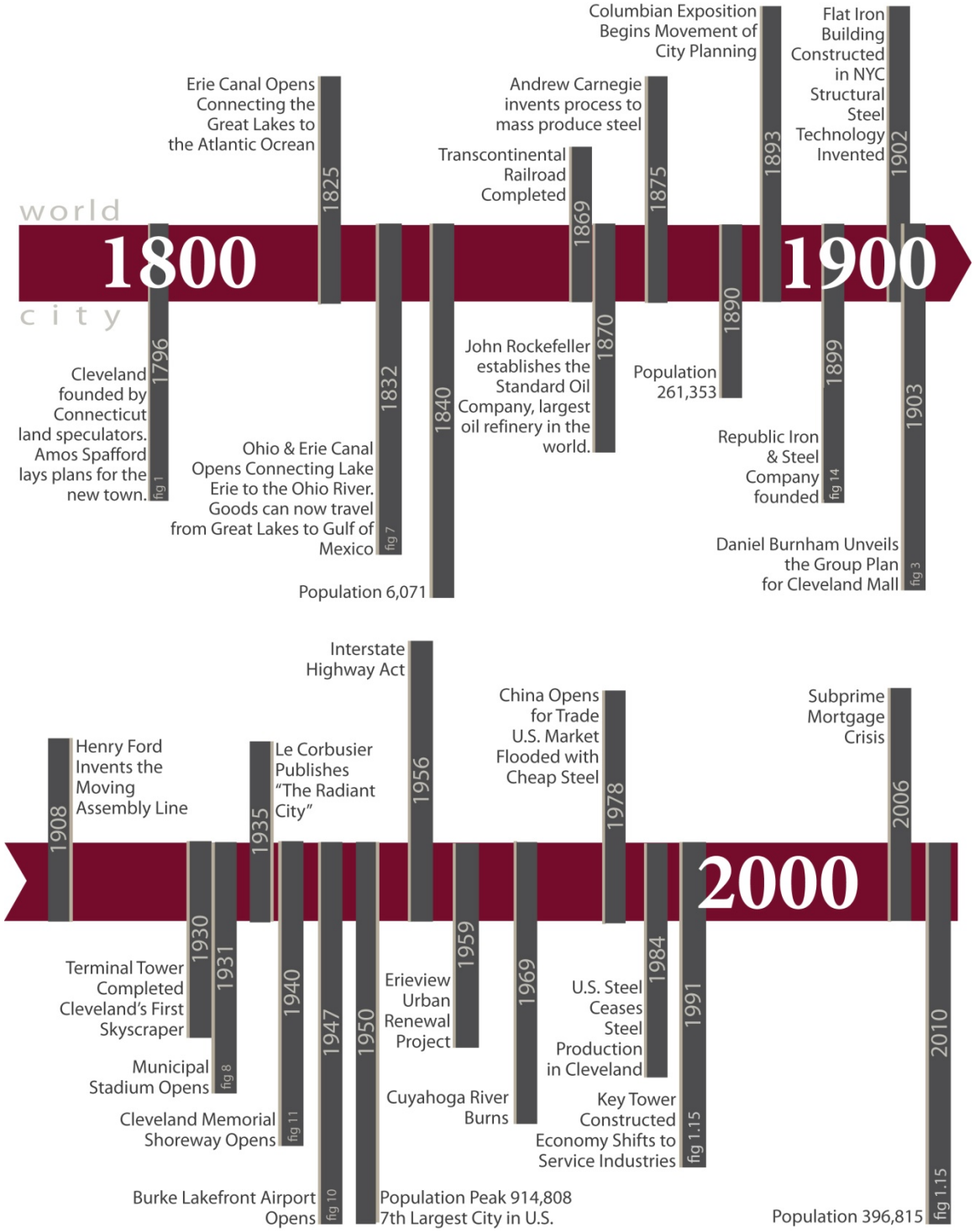


Figure 1. A Timeline of Key Events in Cleveland and World History (Busa)

Located at the mouth of the Cuyahoga River on the southern shore of Lake Erie, Cleveland began as a port city in the early 19th century. Its location made it a convenient trading post between the agricultural Midwest and the industrial Northeast. Ships carried grain and raw materials east via the Erie Canal to New York City. In return, manufactured goods were sent south via the Ohio & Erie Canal to Midwest cities in the Ohio River Valley.

By 1853, railroads connected Cleveland to Pittsburgh, New York City, Chicago, and Saint Louis. The emerging city's connectivity to rail and water routes; access to raw materials such as iron ore and coal; abundant, cheap land; a reliable food supply, and immigrant labor force made it an attractive place for industrial manufacturing. The land along the Cuyahoga River became covered with warehouses, oil tanks, lumber yards, and factories.

During the 19th and early 20th centuries, Cleveland was a compact, walkable city, with the walking distance between homes, jobs, stores, and schools limiting the reach of settlement. The homes of the wealthy stood among those of mill hands. Euclid Avenue was dubbed "Millionaire's Row", and was often touted as "the most beautiful street in America." As transportation infrastructure improved (first with trains, then streetcars, and finally automobiles), residential development spread further and further from the city center to areas with cheaper land, better air quality, and lower crime rates.

In 1920, with 796,000 residents, Cleveland was the 5th largest city in the United States and a booming industrial city. Cleveland fostered manufacturing giants such as Standard Oil (founded 1870) and Republic Steel (founded 1899)

which employed thousands of European immigrants with high-paying jobs (Miller & Wheeler, 1997). As European immigration slowed during World War I, southern African-Americans migrated to Cleveland to fill high-paying manufacturing jobs.

After World War II, large new suburban housing projects funded by federal subsidies prompted a mass exodus of the white middle class from the urban core. After the establishment of the Interstate Highway Act of 1956, new highways slashed through existing urban neighborhoods, fragmenting communities and severing the relationship between the Cleveland and its waterfront. Highways also created easy access for suburban residents to commute into the city, providing incentive for people to re-locate beyond the city limits. The suburbs siphoned off the city's tax base, causing funding shortages needed to maintain crucial services and infrastructure. Highway's made the railroad obsolete. As trucking replaced trains as a means of industrial transport, industries began relocating from inefficient multi-story buildings near the waterfront to cheaper, one-story facilities along highway arteries on the fringe of the city (Miller & Wheeler, 1997).

In the 1950s and '60s, Cleveland made attempts to revitalize its city center through urban renewal – clearing blocks of blighted neighborhoods to make way for new middle-class housing developments. This strategy, however, proved ineffective as demand for new housing did not support the supply. Meanwhile, displaced residents re-located to other areas of the city, causing disruption, crime, and homelessness to spread to new areas.

Throughout the 1960s, the city watched its heavy industries – steel, automotive products, tool & die – decline due to foreign competition and increased environmental regulations imposed by the Clean Air Act (1970) and Clean Water Act (1972). Foreign countries, especially in Asia, gained a competitive advantage as labor costs were low and environmental regulations non-existent. Poor government leadership fueled the city's fiscal problems, and in 1979, Cleveland became the first city to default on federal loans since the Depression.

Cleveland rebounded during the 1980s as strong political leadership fueled a downtown revitalization. Though manufacturing would never recover, new service industries in the fields of law, health care, and business services, emerged as new economies in Cleveland. Steel and glass office towers replaced aging factories and warehouses in the downtown core. These white collar jobs, however, did not employ Cleveland's blue-collar workforce, instead employing a more educated suburban middle class (Miller & Wheeler, 1997).

During the 1990s, planning strategies focused public investment on large, expensive public projects in Cleveland's downtown in an attempt to re-grow the city. This downtown building boom, which included construction of Society Center, Jacobs Field, Gund Arena, the Rock and Roll Hall of Fame, and Cleveland Browns Stadium, cost hundreds of millions of dollars of public money. While these projects helped to change the city's public image and attract some new businesses to downtown, it did little to enhance the city's livability at the neighborhood level. Today, Cleveland is largely a commuting city with more than

125,000 people working downtown, while only a slim population of 10,000 actually live there. While the city was making large investments in downtown building projects, urban neighborhoods continued to be neglected by planners and the population of the city continued to decline.

In 2006, the home mortgage crisis accelerated Cleveland's population decline, causing home values to plummet. The home mortgage crisis coupled with economic recession and widespread unemployment, caused many Clevelanders to default on their loans and become evicted from their houses. Vacant houses are rarely maintained, and looters raid the abandoned properties for precious metals, including copper plumbing and aluminum siding. Abandonment is causing adjacent homes to lose real estate value. With no potential buyers, many residents are left without options. With the exception of a few remaining viable neighborhoods, those who have the opportunity to sell their homes are leaving the city. As a strategy for removing the aesthetics of urban blight, the city is demolishing abandoned homes and has destroyed more than 6,000 houses since 2006. City officials expect to demolish another 20,000 over the next five years (Bull, 2012). As a result of these many factors, Cleveland's population has shrunk from 920,000 in 1950 to just 396,000 residents today (U.S. Census Bureau, 2010).

Cleveland's Historic Population

Census	Population	U.S. Rank
1840	6,071	67
1850	17,034	41
1860	43,417	21
1870	92,829	15
1880	160,146	11
1890	261,353	10
1900	381,768	7
1910	560,663	6
1920	796,841	5
1930	900,429	6
1940	878,336	6
1950	914,808	7
1960	876,050	8
1970	750,903	10
1980	573,822	18
1990	505,615	23
2000	477,472	33
2010	396,815	47

Figure 2. Cleveland's Historic Population Statistics (Data Source: U.S. Census)

RESEARCH PURPOSE & RATIONALE

Like many post-industrial cities in the developed world, Cleveland is losing population. A decline in its manufacturing-based economy in the late 20th century has led to unemployment and outmigration. Post-World War II suburban development has further eroded Cleveland's inner city neighborhoods, as middle and upper income citizens have moved outside the city limits. Since its population peak in 1950, Cleveland has lost 57% of its population. Strategies to effectively plan for shrinking cities are not well understood and are only beginning to be explored and applied by the design community. Even less is known about how to apply these strategies at the site scale.

This thesis explores the question of whether Cleveland can still maintain a high quality of life for its citizens amid continued population loss. This project will offer a critique of Cleveland's current planning strategy for addressing shrinking city issues. Through the lens of citywide and neighborhood sustainability goals, this thesis will argue that under-utilized Burke Lakefront Airport is not an appropriate land use for the downtown waterfront. Then, a design response will be presented to show how the 450-acre airport site might be re-imagined as part of a vision for a socially, economically, and environmentally sustainable downtown Cleveland.

Chapter 2: Historical Context & City Planning

THE 1796 PLAN

Cleveland was originally laid out in 1796 by Amos Stafford, who modeled the small trading village after New England towns of his native Connecticut. He located the settlement at the mouth of the Cuyahoga River where its waters empty into Lake Erie. This location made a convenient trading post between the agricultural Midwest and the industrial Northeast. The town sat on top of a seventy-foot bluff, which dropped steeply down to the lake's edge. Proximity and access to the waterfront were primary drivers of Spafford's original plan for the city and settlement stretched all the way to the water's edge (Miller & Wheeler, 1997).

The village was centered around a 10-acre public square which would become the main market area for the emerging port city. Gridded streets were oriented to provide public access to Lake Erie and the Cuyahoga River. Ontario Street was the major north-south thoroughfare connecting Public Square to the lake. Superior Street was the major east-west street connecting Public Square to shipping yards along the Cuyahoga River. Today, Public Square remains Cleveland's geographical and symbolic center.

By the mid-1800s, the city had grown far beyond the limits laid out in the original plan. A lack of city planning meant that land-use decisions were made by individuals and industry, resulting in uncoordinated land use decisions. When trains were first introduced in the 1850s, rail road companies built tracks on new land fill along the lakefront, which provided access to shipping docks near the

mouth of the Cuyahoga River (Miller & Wheeler, 1997). While this infrastructure brought economic opportunity, it also became a barrier between people and Lake Erie – a barrier that still exists today.

THE GROUP PLAN OF 1903

Chicago's Columbia Exposition in 1902 raised awareness of the need for coordinated city planning. In 1903, Cleveland hired renowned architect and urban planner, Daniel Burnham, to draft a plan to organize the city. Burnham's "Group Plan" re-organized downtown Cleveland around a green pedestrian mall, which would be surrounded by the city's important civic buildings. The mall would act as an organizing piece, connecting the city's commercial center with the Lake Erie Waterfront. The mall is flanked by civic buildings, including City Hall, Cuyahoga County Court House, the U.S. Post Office, U.S. Customs House, Board of Education Building, Cleveland Public Library, Cleveland Public Auditorium, and Federal Reserve Bank of Cleveland (Burnham et al., 1903).

A key component to Burnham's Plan was a monumental train station at the south end of the mall, which would become the city's transit hub and provide a critical connection between downtown and the lake. The station was never built. Burnham recognized that connecting the city to the Lake was critical to the city's future (Miller & Wheeler, 1997). However, today's mall never reaches the lake, instead terminating at a rail and freeway right-of-way. Transversing this transportation infrastructure is not easy for pedestrians due to poor connectivity between the city street grid and the Lake Erie waterfront.

In the early 1990s, the city's tallest office building, called Key Tower, and the Marriot Hotel were added to the Mall in an attempt to activate the mall as a public space. Today, the Mall is again undergoing large-scale change. In 2011, the city broke ground on the Cleveland Medical Mart, the nation's first permanent medical trading exposition. The main trading floor will be constructed beneath the mall, meaning the mall itself will become a green roof. The Medical Mart is intended to further Cleveland's national presence as a leader and innovator in the health care industry and become a place where educators, doctors, and businessman can come together to exchange ideas.

Figure 3. An Aerial View of Downtown Cleveland, 2010. (City of Cleveland)

Figure 4. The Rail Right-of-Way at the Terminus of Cleveland Mall in Downtown Cleveland, 2013. A small Amtrak station, seen in the lower right, sits near the location where Daniel Burnham envisioned a monumental train station that would serve as a civic landmark and pedestrian promenade to the lake. (Busa)

THE LAKE ERIE WATERFRONT

In 1920, W.A. Stinchcomb, the county surveyor, laid out the plan for Cuyahoga County's green space network. His plan depicted an emerald necklace of parks around the perimeter of the city connected by greenway boulevards. This park system created a semicircle around the city, stretching from the mouth of the Rocky River in Cleveland's western suburbs around to the Chagrin River in Cleveland's eastern suburbs. The plan, however, did not propose a park system that encompassed the Lake Erie Waterfront. As a result, the shoreline that we see today is largely inaccessible to the public. Of the city's 14 miles of shoreline, only 1.75-miles (12.5%) are open and accessible to the

public. The key public access points to the waterfront include Edgewater Park, Wendy Park, Voinovich Park, Gordon Park and the Cleveland Lakefront Nature Preserve, as shown in figure 5. The remaining 12.25-miles are either privately owned by residents or businesses, or are on publicly-owned property with no public access to the water (e.g. water treatment facilities or freeways). Cleveland's waterfront offers a startling contrast when compared to that of Chicago, which boasts 26-miles (87%) of public access along its 30-mile Lake Michigan Shoreline. Access to the waterfront is an important component urban livability and a reason why Chicago has retained vibrant urban neighborhoods while Cleveland has not.

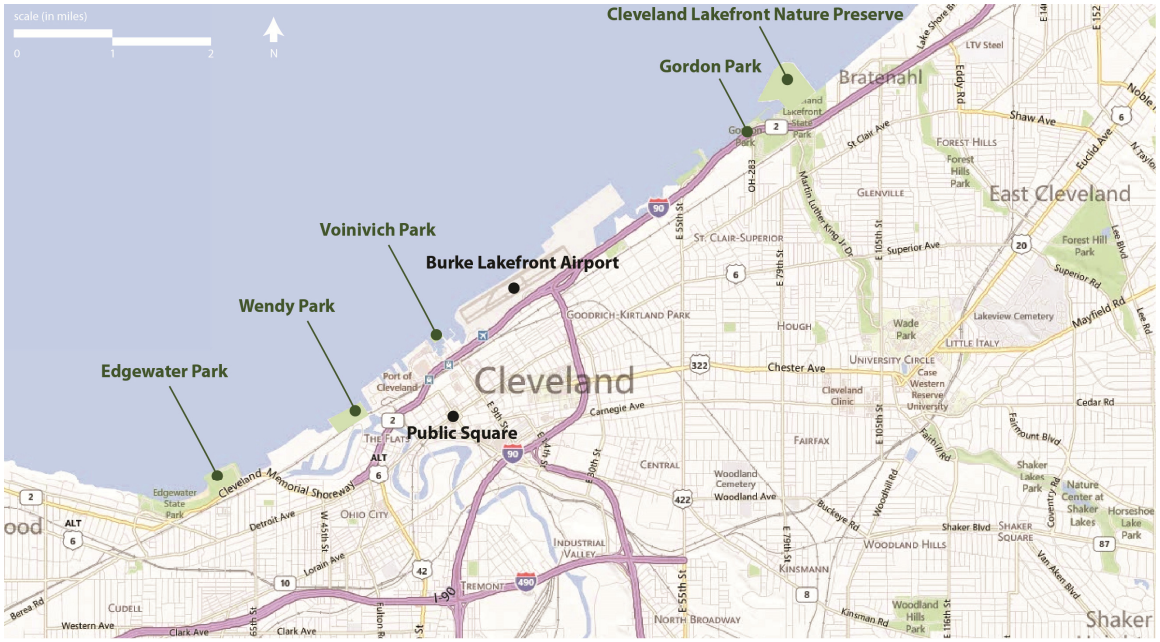


Figure 5. Map of Existing Public Access Points to Lake Erie in the City of Cleveland (Busa & Bing Maps)

Throughout its history, Cleveland's planning decisions were based on what was good for industry and the economy, but not always urban livability. The land use patterns along the waterfront reflect this mentality. From its infancy as a

port city, warehouses, mills, and small factories encompassed the mouth of the Cuyahoga River. In the mid-1800s, a railroad corridor was constructed along the waterfront so that goods could easily be transferred from ships to rail cars. In the 1930's, when automobiles were becoming commonplace in American households, land fill was piled up along the Lake Erie shoreline to create a corridor for the Cleveland Memorial Shoreway. In the 1940's, more land fill was added to create Burke Lakefront Airport, along 2-miles of Lake Erie Shoreline less than a mile from downtown. Each of these planning decisions created barriers between people and the water, with little consideration given to how people might cross them.

As the city pushed land further and further into Lake Erie, urban neighborhoods found themselves further and further from the water. The lake that was once at the bottom of the bluff was now more than a half mile away in some cases. Typically, properties adjacent to water sell for a premium compared to more inland properties (Cordes et al, 2001). But in downtown Cleveland, poor access to the waterfront has devalued many of these properties. For example, along Lakeside Avenue less than ½ mile from Public Square, what was once prime lakefront property is now a surface parking lot that charges $1.50 per day.

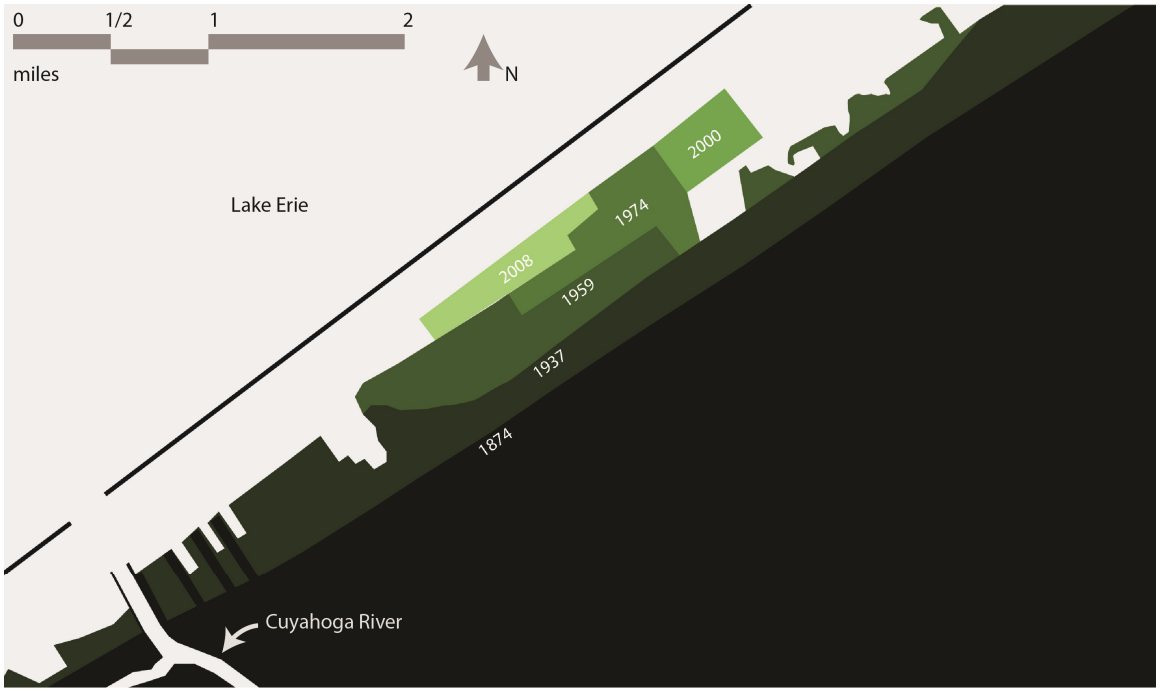


Figure 6. Map of Historic Lake Erie Shorelines in Downtown Cleveland (Busa)

In recent years, the city's planning documents have indicated a change in philosophy regarding the waterfront, recognizing the importance of connecting the city to the waterfront. During the 1990s, the city helped fund construction of the Rock & Roll Hall of Fame (1994), the Great Lakes Science Center (1996), and Cleveland Browns Stadium (1999), which are all located on along the Lake Erie shoreline. These projects have helped to re-engage the public with the waterfront. Poor connection to the street grid, however, remains problematic for vehicular and pedestrian access. Despite their attraction to tourists, these buildings remain relatively isolated from downtown, limiting their positive impact on the local business economy. In addition, the museums and sports stadium land uses are not significant tax generating properties for the city because they are either city-owned properties or non-profit organizations.

The land along the Cuyahoga River remains highly industrial. Raw materials, such as iron ore, coal, and salt are stockpiled along its banks and loaded onto large barges which transport the materials to other cities in the Great Lakes and Northeast Regions. The Cuyahoga River has a long history of environmental neglect. Prior to 1970, the river was so polluted with petrochemicals that it caught on fire at least 13 times. With the enactment of the Clean Water Act in 1972, the EPA has curbed industrial dumping and water quality has improved. Today, many fish species have returned to the river (Ohio EPA, 1999).

Where the river meets the lake, the Port of Cleveland occupies the east bank of the river, just west of Cleveland Browns Stadium. The port is a hub of commerce for the city, and is made viable by its convenient access to freight rail and the Cleveland Memorial Shoreway. In the 2000s, the city has contemplated moving the port to a new location at East 55th Street in order to free up valuable waterfront property in downtown. This move, however, carries a price tag of over $500 million. The existing port does not need to relocate for maritime purposes, as there is sufficient capacity for growth at the current location (Gruber, 2002). This move would be purely to increase public access to the water and spark real estate development. With underutilized Burke Lakefront Airport occupying a significantly larger parcel less than one mile to the east, there appears to be real estate alternatives for downtown waterfront development that would be more economically feasible.

In 2004, The Cleveland Planning Commission adopted a 50-year visioning plan for the Lake Erie Waterfront (see figures 7 and 8). The plan focused on the improvement of 5 systems: access & connections, water-related improvements, parks & open spaces, neighborhood development, and sustainability. Within the neighborhood of downtown (see figure 8), the plan envisions new mixed-use development along the water's edge, improved street connections to the existing grid, and improved public access and recreation space along the waterfront. Key to the success of this plan will be the conversion of the Cleveland Memorial Shoreway to an urban boulevard that will allow at-grade street connections with urban development and street life on both sides. This proposed change will help this street become a connector to the waterfront rather than a barrier.

Figure 7. Cleveland's Waterfront 2050 Plan (City of Cleveland)

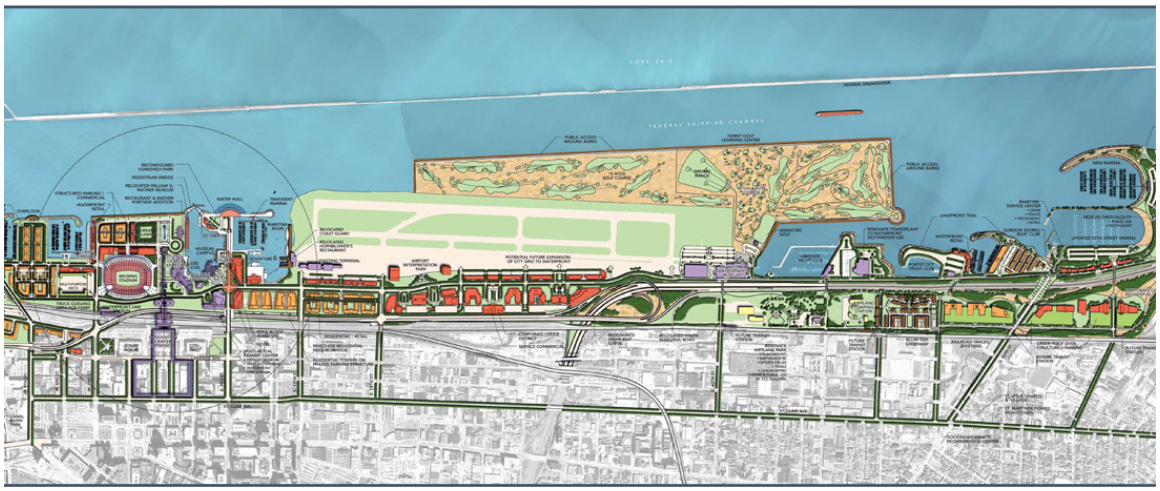


Figure 8. Cleveland's Waterfront 2050 Plan, Detail of Downtown (City of Cleveland)

In 2012, the city announced its intention to move forward with developing part of the downtown waterfront by 2020. The new development plan (see figure 9) includes commercial and retail development north of Cleveland Browns Stadium, expansion of marina and museum facilities at North Coast Harbor, and new office space adjacent to Burke Lakefront Airport. While this plan would help bring the city's density closer to the water, it fails to improve street connections to existing inland neighborhoods. This means that existing land owners will not reap the full economic and social benefits of these waterfront projects. A second weakness of this plan is that it anticipates generous new surface parking facilities along the new urban boulevard, spoiling the continuity of the streetscape.

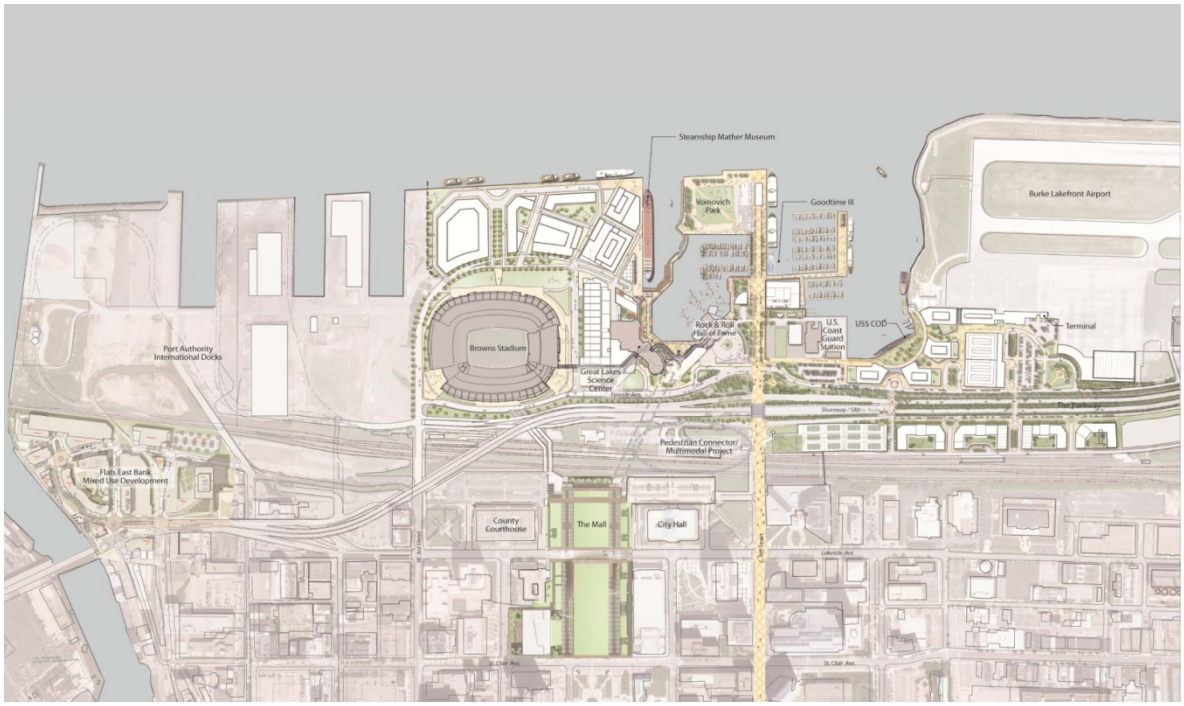


Figure 9. Cleveland's Downtown Lakefront Plan, 2012 (City of Cleveland)

Chapter 3: Planning Strategies for Shrinking Cities

CITYWIDE PLANNING STRATEGIES

Strategies for successfully designing and planning for shrinking cities are not well understood and are only beginning to be explored by academics and practitioners. As discussed in Chapter 1, there are many social and economic problems associated with population decline including decreases in real estate values, increases in poverty and crime rates, decreases in city tax revenues, and disinvestment in local economies. Only in the past few decades have scholars and practitioners begun to develop new and innovative approaches to plan for long term population loss of cities (Swope, 2006). In review of existing literature on this topic, planning strategies tend to fall into three main categories – "re-growth," "urban islands," and "de-denesification & greening." The first strategy, "re-growth," focuses on attracting new population growth as a means of solving the city's economic and social problems. The second strategy, called "urban islands," assumes the fact that population will not return to previous levels and in response attempts to maintain density and neighborhood viability by concentrating the city's population into smaller geographic areas, or islands. The third strategy, called "de-densification and greening," also assumes sustained population loss, but envisions the city decreasing its overall population density, taking on a more suburban development pattern. These strategies are discussed further below.

Re-Growth

Historically, city planners have long been geared to anticipate and plan for future growth, even in the case of cities with long, sustained periods of population loss (Swope 2006). Some experts believe that this mentality is the result of an American cultural stigma that views planning for population loss as an "acceptance of failure" and inherently "un-American" (Aeppel, 2007). As a result, the traditional planning response to shrinkage has been to plan for new growth by attempting to reign in sprawl and revitalize inner-city neighborhoods or downtowns (Pallagst, 2008).

Many shrinking cities have continued to invest in their downtowns using the "project planning model"; focusing on large-scale, capital-intensive projects such as convention centers, sports stadiums, museums, and commercial office towers (Gratz and Mintz, 1998). This approach, however, has proven to be unsuccessful in many cases as it attempts to address the problem in a fragmented, non-regional way that focuses narrowly on the city center and relies heavily on growth (Popper and Popper, 2002). Cleveland, Detroit, and Pittsburgh focused heavily on this planning model throughout the 1980s and 1990s. Cleveland invested in the construction of three new sports stadiums (Jacob's Field, Gund Arena, and Cleveland Browns Stadium) as well as two new lakefront museums (Rock & Roll Hall of Fame and Great Lakes Science Center), which cost hundreds of millions of dollars of public money. While these investments had some positive effects on the city's national image and spurred short-term private investment downtown, they did little to improve the quality of life of

existing Cleveland residents, a great majority of which reside outside of Cleveland's downtown neighborhood. In addition, these large, capital-intensive projects depleted the city's fiscal capacity to invest in projects that might have more significant long-term impacts on improving quality of life at the neighborhood level, by addressing vacant land issues or by investing in schools, transportation infrastructure, green space networks, social services, and housing.

The major cause of population loss in post-industrial cities in the United States is outmigration of urban residents to suburbs or exurbs on the periphery of the metropolitan region. This pattern of development, known as sprawl, is a major contributor to the shrinking city phenomenon. As a tool to curb sprawl, some cities have defined an urban growth boundary that circumscribes its urbanized area. The urban growth boundary mandates the area inside the boundary be used for higher density urban development and the area outside be used for lower density development. This helps to prevent agricultural areas from being developed into low density housing that siphons population away from the city center. In the United States, 146 cities of over 50,000 have created urban growth boundaries (Nelson et al., 2002). Cleveland is not one of them.

Janesville, Wisconsin has taken steps to implement an urban growth boundary to prevent sprawl and protect agricultural lands. Rural areas outside the city limits have adopted Exclusive Agricultural Zoning Guidelines, requiring minimum lot sizes of 35 acres, and permitting only agricultural structures and improvements on the land. The zoning ordinance also limits driveway lengths, size of entry signs, and height limits on telecommunication towers –

indispensable infrastructure for commercial and residential development. This zoning means that all new development in Janesville must occur within the non-agricultural center, encouraging urban densification and inhibiting sprawl. When farmers foresee possible speculation of nearby land for development, they tend to invest less in their properties, an effect known as “impermanence syndrome” (Tumber, 2012). The urban growth boundary ensures famers that their land will remain in agricultural land-use forever, and thus makes them more likely to make long-term investments in their properties. The boundary helps ensure that the agricultural lands will maintain a value that is stable and affordable because land speculation and developmental pressure are reduced.

Urban Islands

The urban islands model was first described in Oswald Mathias Unger’s 1977 concept for West Berlin, entitled “Green Urban Archipelago.” In his vision for Berlin, he suggested that shrinking cities should reduce themselves to small cities within the larger city. Urban development and public spending should be concentrated at key nodes within the existing urban footprint, allowing blighted areas between to depopulate. By clustering the population into a smaller urban footprint, the city is put in a position to better address its fiscal problems by reducing city services and right-sizing infrastructure in parts of the city that are de-populating. This enables the city to re-direct resources to more densely populated areas. The urban islands concept is similar to the urban growth boundary concept, only it occurs within the footprint of the existing city, where

many boundaries are defined at the neighborhood level rather than a single boundary at the regional level.

The urban islands approach envisions land use patterns similar to the way cities developed in the late 19th century, prior to the invention of the automobile. During this period in history, the railroad was people's primary means of transportation. As a result, development became clustered within walking distance of railroad stations. Businesses located near the neighborhood center, drawing in customers off the street as they walked to and from the transportation hub. The areas between railroad towns became green belts that were used for agriculture, recreation, or remained as natural resource lands. This development pattern meant that even though a city might encompass a large geographic area, clustered development patterns allowed cities or neighborhoods to focus public investment into small areas that served a large number of people. City planners who advocate the urban islands approach are hoping that these same land use patterns might be re-integrated into the shrinking city to create more viable neighborhoods and present opportunities to downsize or eliminate infrastructure and city services in vacated areas. Cleveland has adopted this approach to addressing its shrinking city problems, targeting investment toward its most viable neighborhoods while planning for un-development in its least viable ones.

De-Densification & Greening

In contrast to the urban islands approach, the de-densification model does not suggest concentrating development in certain areas, but rather suggests that

vacancy should be spread more evenly throughout the city, lowering its overall density. In this model, cities treat vacant land as an opportunity to solve environmental problems by creating green infrastructure that can help re-establish damaged ecosystems, clean and infiltrate stormwater runoff, improve neighborhood aesthetics, and create recreational landscapes for remaining homeowners.

A lack of strong market demand and an abundance of vacant urban land create unprecedented opportunities for cities to improve greens space networks and natural systems. Taking advantage of cheap, vacant property, shrinking cities have the chance to improve recreation, agriculture, and green infrastructure networks. Re-dedicating vacant land to productive purposes, such as these, will improve the quality of life for existing residents and help slow population loss. After examining the sales records of thousands of homes, Wachter and Gillen (2006) found that “cleaning and greening” of vacant lots can increase home values by as much as 30 percent. Planting a tree within 50 feet of a house can increase its value by about 9% (Wolf, 2007). Houses up to a quarter mile from a park increase in value by 10 percent (Crompton *et al.*, 2001). In contrast, blocks with high concentrations of unmanaged vacant lots result in 15 percent lower residential property values (Bonham & Smith, 2008).

Philadelphia is a widely cited example of a city using greening as a policy to tackle the problem of shrinkage and resulting vacant properties (Bonham and Smith, 2008). Working with residents, businesses and local organizations, Philadelphia Green, a program run by the Philadelphia Horticultural Society,

reclaims vacant urban land through greening. The focus is on individual lots which are cleared of litter, followed by grading, planting grass and a few saplings to create pocket-park-type settings. Long-term maintenance of these lots is part of the program.

Both Youngstown and Cleveland have experimented with other ways of reducing density in targeted areas. As a way to stabilize home values in blighted neighborhoods, these cities will give or sell abandoned vacant properties to adjacent homeowners as additions to their side yards. Property owners would be allowed and encouraged to use the land in creative, resourceful, and innovative ways, which would be made possible through relaxed zoning codes and land use policies (Urban Design Center of Northeast Ohio, 2005). In many cases, a larger yard creates opportunities for garden space, off-street parking, play space for children, or other amenities that add value and equity to a property. By doing this, the city is able to reduce the overall density of the area as vacant parcels are absorbed and maintained by the existing community. This transfers the financial burden of maintaining vacant properties off the city's books and helps encourage neighborhood surveillance. Surveillance is critical to stopping criminal activity and illegal dumping, often a serious problem with city-owned vacant properties.

VACANT LAND RE-USE

Cities seeking to integrate the "urban islands" or "de-densification and greening" planning approaches have begun to establish "land banks" as a tool for acquiring, holding, managing, and developing vacant land and controlling its

future use. In most cases, land banks are public authorities that work closely with city planners and politicians to guide how vacant land will be re-purposed in the future. The land bank gives the city the authority to determine which properties will be targeted for development and which ones will be held, assembled, and re-purposed to improve the city through greening.

The Genessee County Land Bank, which encompasses the shrinking city of Flint, Michigan is one of the oldest and most effective land banks in the country. Prior to its creation, the city of Flint had little control or jurisdiction over its vacant land, which were typically held by banks, Fannie Mae, The Department of Housing & Urban Development (HUD), or private entities. The land bank gave planners a powerful tool for acquiring and controlling abandoned and dilapidated buildings and vacant properties, which were chronic sources of blight and crime within city neighborhoods. The county developed programs that focused on building demolition, housing renovation, neighborhood beautification, brownfield re-development, and foreclosure prevention. Through its efforts, the Genesee County Land Bank is credited with increasing the tax base of the county by $112 million (Nowak, 2010).

Like Genessee County, both Cuyahoga County (which encompasses Cleveland) and the city of Cleveland have created land banks as a tool for acquiring and re-purposing vacant land. Within the municipality of Cleveland, the county is responsible for managing abandoned buildings and the city is responsible for managing and re-purposing vacant land. Since its incorporation in 2006, the county has demolished more than 6,000 abandoned and derelict

properties across the city of Cleveland (Bull, 2012). According to the Cleveland City Planning Commission (2013), there are more than 20,000 vacant land parcels in the city of Cleveland, and the Cleveland Land Bank holds approximately 7,500 of them.

While it is clear that the city intends vacant land within viable neighborhoods to be re-developed, it is less clear what will happen to vacant properties outside of neighborhood centers in areas are slated for un-development. The Cleveland Urban Design Collaborative and Neighborhood Progress, Inc. came together to create the *Vacant Land Pattern Book* for the city of Cleveland. This pattern book suggests a wide array of options for converting vacant land to productive uses, including urban agriculture, stormwater management, greenspace expansion, renewable energy production, remediation of contaminated brownfield sites, and site assembly for industrial use. Figure 10 illustrates the sequence of events from home foreclosure to vacant land re-use. By setting the rules of the land bank to encourage an urban island development pattern, urban planners have a powerful tool for creating a more sustainable shrinking city.

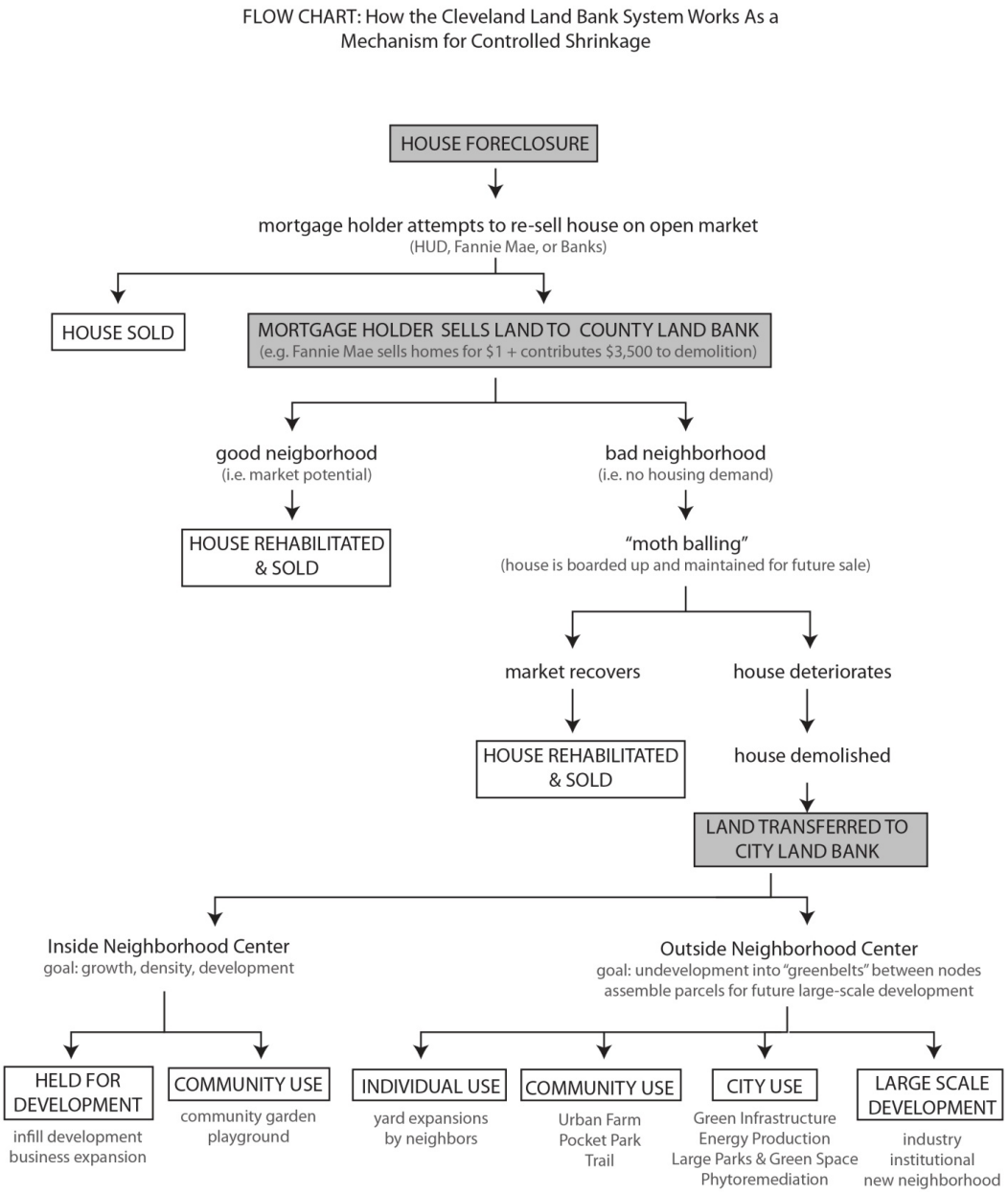


Figure 10. Flow Chart Showing Sequence of Events from Foreclosure to Vacant Land Re-Use (Busa)

Vacant land creates unprecedented opportunities to raise the quality of life of existing residents and create a more sustainable city. In densely developed cities, it can be difficult and expensive for cities to acquire and assemble properties to connect forest patches, restore damaged ecosystems, and manage

stormwater through natural systems rather than mechanized structures. Not only does vacant land have potential to improve environmental conditions, but they also have potential to improve the health and social welfare of ailing neighborhoods. Urban agriculture, community gardens, expansion of green space networks, improved recreational facilities, and outdoor gathering spaces can help raise the quality of life within ailing urban neighborhoods by improving health, nutrition, exercise, connection to nature and water, and increasing opportunities for social gathering.

As we look toward a low-carbon future, one of the limiting factors of renewable energy production that is often overlooked is the vast quantity of land required to produce it. For solar energy production, generally, it takes approximately 8-acres of land to produce 1-megawatt of electricity (Tumber, 2012). Wind power, also requires large tracts of land, with turbine spacing needing to be 6-10-times the rotor dimension (Meyers and Meneveau, 2011). Likewise, biogas (methane captured from manure) and biomass (created from organic material, usually agricultural and animal waste), also require large tracts of land for production – land that is available in the shrinking city.

Encouraging temporary uses for vacant properties is another strategy for stabilizing blighted neighborhoods. These initiatives enable local entrepreneurs to envision new uses for abandoned buildings and vacant sites, transforming them into temporary market places, farm stands, venues for extreme sports and cultural events, outdoor art installations, gardens, and urban farms. These temporary uses provide a holding strategy that activates vacant land in ways that

do not inhibit and can often facilitate a long-term, profitable use. Research in Berlin, Germany documents the economic and social benefits of these kinds of projects while making recommendations for how cities can promote these types of projects, how to decide which temporary uses are appropriate, and how to account for issues of legality and liability. These temporary uses may be effective strategies for holding the value of vacant properties within targeted development areas that are experiencing a lull in market demand.

PRECEDENT STUDIES

Pittsburgh

The city of Pittsburgh is one of the most well-known shrinking city example in the United States. Like Cleveland, Pittsburgh experienced extraordinary loss of population due to the post-industrial shift away from steel production and manufacturing. From 1940 to 2010, Pittsburgh's population fell by more than 50% from 671,659 to 305,704 (U.S. Census, 2010). Despite high levels of population loss, Pittsburgh has been successful at revitalizing its downtown by implementing a "re-growth" strategy (Pallagst, 2008).

During the decline of its manufacturing-based economies in the 1950s and 1960s, Pittsburgh and its local philanthropic foundations invested heavily in the city's universities. University of Pittsburgh, Carnegie Mellon and Duquesne University became a buoy of stability for downtown Pittsburgh. These institutions provided a foundation and driver for Pittsburgh's future economies in medicine and education (Madison, 2009).

Meanwhile the city took steps to improve the livability of downtown, demolishing dilapidated factories along the waterfront, improving access to the water and recreation through construction of Point State Park, and investing in new housing and historic preservation (Pallagst, 2008). University students provided a constant inflow of young residents that helped to build stability in mixed income neighborhoods. Unlike Cleveland, Pittsburgh was able to attract middle and upper income residents to live downtown. This helped create a reliable customer base for shops and restaurants that contribute to the vibrancy of Downtown Pittsburgh.

Despite its successes downtown, Pittsburgh's smaller, peripheral neighborhoods have continued to deteriorate and de-populate at a very high rate. In 2009, 20% of the city's land was vacant or abandoned. Perhaps distracted by its successes downtown, Pittsburgh has not formulated a comprehensive planning strategy to deal with its 28,000 vacant or abandoned parcels. Unlike other shrinking cities, Pittsburgh has not yet formed a land bank. As a result, Pittsburgh planners do not have the critical tool needed to address vacant land issues. As a result, many urban neighborhoods continue to suffer from poverty, crime, and disinvestment (Dokoupil, 2009).

In conclusion, it seems that Pittsburgh has been successful at targeting downtown in its revitalization approach by investing in local institutions, diversifying its economy, and enhancing downtown livability through housing and waterfront open space. Compared to some of its peer cities – Buffalo, Cleveland,

Detroit, Milwaukee, and St. Louis – Pittsburgh appears to be doing quite well in terms of its downtown. This has been crucial to maintaining a positive public perception of the city. Its approach, however, has been narrowly focused, failing to address shrinking city issues at the city and regional levels. As a result, maintaining its over-sized infrastructure continues to be a fiscal problem that will need to be addressed in the future. Also, until it addresses its vacant land issues, crime and blight will continue to plague many of its urban neighborhoods (Madison, 2009).

Baltimore

The city of Baltimore has taken an aggressive planning approach to dealing with its shrinking city problems. Baltimore has lost more than a third of its population since 1950, falling from 949,708 to just 620,961 in 2010 (U.S. Census, 2010). Baltimore was once a thriving port and manufacturing city, but as industry waned in the second half of the 20th century, people began leaving the city. Today, the city is confronted with 14,000 abandoned homes and more than 12,000 vacant lots (Baltimore Office of Sustainability, 2013). The city has used a mixed methods planning approach, which has included establishment of an urban growth boundary, revitalization of its downtown inner harbor neighborhood, transit-oriented development, and greening of vacant properties.

Baltimore was one of the first cities to begin addressing suburban outmigration. In 1967, landscape architect Ian McHarg helped plan and implement Baltimore County's urban growth boundary, called the "urban-rural

demarcation line." This line (see figure 20) defined the edge of the metropolitan area by determining the limits of public water and sewer infrastructure. This meant that all development outside the line would need to rely on well water and septic tanks, which effectively capped its development potential. This strategy has been extremely effective in curbing sprawl, as 90 percent of Baltimore County's population today resides inside the boundary on just 30 percent of the county's land area. The land outside the growth boundary line has been largely preserved as agricultural and resource lands (Maryland Department of Planning, 2010).

Like Pittsburgh, Baltimore has had great success in revitalizing its downtown inner harbor neighborhood. Beginning in the 1970s and 1980s, the city began tearing down rotten warehouses and piers along its waterfront and focused on creating a waterfront that could become the focal point of the city, as a site for public space, tourism, business, and housing. Public investments in award-winning parks, sports stadiums (e.g. Camden Yards),and museums (e.g. Baltimore Aquarium) were coupled with new high-rise housing and office buildings, which helped re-establish the inner harbor as a vibrant and dynamic waterfront. Resurgence spread to nearby neighborhoods like Fell's Point, which was developed into new condos, retail space, restaurants, and hotels. Like downtown Pittsburgh, the Baltimore Inner Harbor was successful in the long-term because of its ability to re-connect to its waterfront and attract middle and upper income residents back into the city. In 2009, Urban Land Institute called the

Baltimore Inner Harbor “the model for post-industrial waterfront redevelopment around the world.”

Baltimore has taken a transit-oriented development approach, targeting its investments toward new high density mixed-use neighborhoods centered around existing transit stations. Using this model, the city has been successful at revitalizing several urban neighborhoods, helping to slow population loss (Maryland Department of Planning, 2010). Still, the city continues to lose population. Baltimore’s strategy should not be considered an urban islands approach because its plan does not envision shrinking the urban footprint by un-developing its least viable areas. Its solution to vacant land appears to be more temporary in nature, planning for short-term uses that can help stabilize property values until market conditions improve and re-development can occur.

As mentioned previously, Baltimore has at least 26,000 vacant or abandoned properties. It has established a Land Resources Division with its Department of Housing and Community Development, which effectively acts as the city’s land bank. This primary purpose of this entity is to help the city assemble properties for new infill development projects. In neighborhoods where market demand is low, the city has begun encouraging temporary land uses by the community to help stabilize property values, discourage illegal dumping, prevent crime, and improve the physical and mental health of neighborhood residents. Temporary uses encouraged by the city include community gardens, art installations, and pocket parks (Baltimore Housing, 2013). These vacant land

uses are intended to be a holding strategy for vacant properties so that they can be later be re-developed under improved market conditions.

Like Cleveland, Baltimore is demolishing abandoned and dilapidated buildings at a very high rate. Unlike Cleveland, though, much of Baltimore's abandoned housing stock is row houses rather than detached houses. This makes it more difficult to demolish single units without compromising adjacent homes or disturbing neighbors. The city has pioneered a demolition protocol to mitigate ill-effects on neighborhood residents. Sometimes, residents are given the opportunity to re-locate to their choice of more viable neighborhoods in the case where an entire housing block needs to be torn down (Baltimore Housing, 2013).

In conclusion, Baltimore has a multi-dimensional planning approach to its shrinking city issues by maintaining an urban growth boundary, targeting development around transit, revitalizing the inner harbor and waterfront, and encouraging adaptive re-use of vacant land. Where Baltimore is lacking is how to plan for neighborhoods with large scale abandonment and little potential for new growth. In these areas, large areas of vacant land are unlikely to be absorbed and put back into productive use by the community. The city has not identified what areas will shrink or defined what they will become, and thus seems to be clinging to the hope of future re-growth. Baltimore does not seem to be considering permanent uses for vacant land like urban agriculture, green infrastructure, forest restoration, or renewable energy production.

Youngstown

Youngstown was the first major city in the United States to adopt a comprehensive plan that embraces shrinkage. The city, approximately half way between Cleveland and Pittsburgh, was a bustling steel town with 170,000 people in 1950. After World War II, suburbanization and closure of several large steel mills caused rapid de-population of its urban neighborhoods. Like many shrinking cities, Youngstown experienced blighted neighborhoods with dilapidated buildings, vacant and overgrown lots, high crime rates, and an aging and heavily minority population (Hollander 2009). In 2010, Youngstown had only 66,982 residents remaining (U.S. Census, 2010). Attempts to hault population loss by attracting new residents had proven highly unsuccessful. The city treasury could not keep up with infrastructure maintenance – paving and plowing roads that were designed for a population three times the size.

In 1999, innovative city planners decided to change its planning approach to embrace shrinkage through de-densification and greening. Instead of trying to re-grow to its original population, the city focused on trying to make itself as an attractive city of 60,000 to 80,000. Its large supply of vacant land would be re-distributed to existing property owners to expand their yards, effectively lowering the overall density of the city. In areas of the city that were largely vacant, Youngstown intends to remove public infrastructure like streets, sewers, telephone poles, and street lights and allow the land to re-naturalize into wild prairie, woodlands, or wetlands. Not only would this help beautify the city, but it would reduce city expenditures on infrastructure maintenance. By removing un-

necessary infrastructure, the city will be able to concentrate its investments around its remaining residents and cultural assets, which include two art museums, a symphony, and Youngstown State University (Swope, 2006).

Youngstown has an aggressive approach to reducing its overall footprint. The plan is not necessarily to densify into urban islands, but rather to stabilize in the city in a more suburban development pattern. Home-owners in less stable, less densely populated areas of the city are provided incentives of up to $50,000 to move to more populated neighborhoods so that city streets can be closed off and services such as street lighting, police coverage, and garbage pickup can be shut down in those areas. In an effort to curb foreclosure and stabilize more highly populated neighborhoods, the city has also begun a program to help finance home improvements for low-income households. According to the mayor, Youngstown is trying to market itself toward retirees and telecommuters who are seeking escape from the rat race of larger cities. Youngstown is incredibly affordable, less than an hour from two international airports, and offers beautiful natural landscapes with the cultural and social amenities of a small city (Swope, 2006).

Youngstown's plan focuses on improving quality of life of existing residents while reducing the city's overall footprint and infrastructure. This plan is a great model for how a city might gracefully shrink to a lower population while maintaining livability, and also offers guidance for addressing large-scale vacant land issues. Where the plan falls short is in its economic planning. To stabilize

the city's population at even 60,000, Youngstown must find ways to diversify its economy and build new equity around its existing assets, such as its university.

Chapter 4: The Sustainable Urban Neighborhood

Shrinking cities that utilize the 'urban islands' strategy must develop a vision for how to strengthen and stabilize existing neighborhoods centers. Enhancing social, economic and environmental sustainability within the existing urban footprint will be key the success of this strategy. Sustainable development is most widely defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987). The Congress for New Urbanism, National Center for Smart Growth, and the U.S. Green Building Council have attempted to define the core principles of sustainable development over the past several decades. Derived from the principles set forth by these organizations, the following is an outline of ten sustainable development principles that can be used to guide investment and future development within the neighborhood islands of the shrinking city.

SMART LOCATION

Because the goal of the urban islands strategy is to consolidate existing population into a smaller urban footprint, location plays a key role in determining where new investments should be made. The Cleveland Planning Commission has established criteria for identifying the location of existing neighborhood centers. These criteria include recent, market driven commercial or residential development, property values above citywide average, anticipation of future investment across multiple sectors of the economy, low vacancy rates, recent in-

migration of middle and upper class residents, and proximity to existing transportation infrastructure. Sites for new projects should be located within walking distance (1/3 mile) of these existing neighborhood centers, focusing especially on areas surrounding existing public transportation infrastructure. By prioritizing these areas, the city can capitalize on existing utility and transit infrastructure, reduce car-dependency, and help support existing businesses and institutions.

Within this targeted development area, the city should focus infill development on previously developed sites, such as grayfields (vacant or abandoned properties) and brownfields (contaminated industrial properties). Re-development of these sites has the highest potential to improve environmental conditions and human perceptions of existing neighborhoods. These sites also offer potential to re-habilitate existing buildings and structures, helping to conserve energy and resources while preserving neighborhood history and sense of place. Because industrial sites once relied on water access for the transportation of goods, many brownfields are located on urban waterfront land. These sites should be priority areas for remediation and re-development because of their potential to increase public access to the water and improve urban livability. The economic benefits of re-developing brownfield sites have been well documented. The results of eight studies across the United States showed that for every $1 of public investment in brownfield sites, $8 of total investment were brought to a project (Paull, 2008). Furthermore, brownfield re-development sites

require on average 90 percent less investment in utility infrastructure than previously undeveloped greenfield sites (Paull, 2008).

HIGH DENSITY

Populating density can be defined as the number of people living within a given geographic area. High density development is widely argued to be more sustainable than low density development because of higher efficiencies in per-capita resource use. Compact development requires less public infrastructure because fewer miles of pipes and roads need to be constructed, and services such as trash collection and police surveillance must cover a smaller geographic area. In the shrinking city, infill development within existing urban neighborhoods can take advantage of unused capacity in public services and infrastructure. This land use pattern also helps support the conservation of agricultural and resource lands because development pressure is focused inside the existing urban footprint.

Urban density is an essential feature of an economically viable public transportation system. In low density areas, people are spread out over a large geographic area. To provide service in these areas, transit systems must provide higher numbers of buses, more miles of train tracks, and larger numbers of employees than would be needed if people were clustered closer together. As people spread out, the costs of transit rises, and frequency of ridership declines. Generally, a minimum density of 8 dwelling units per acre for bus service and 50

dwelling units per acre for rail service are needed to support an economically viable transit system (Capitol Region Council of Governments, 2002).

It has been well-documented in the scientific community that higher density urban settlements have lower per capita energy use then lower density forms of settlement. New Yorkers, for example, annually generate 7.1 tons of greenhouse gases, less than 30 percent of the national average (Owen, 2009). This phenomenon occurs because New Yorkers live in smaller quarters that require less energy for heating and cooling, and because they walk and use mass transportation rather than driving. Though New York is an extreme example of urban density, small cities can still achieve levels of density that support low carbon lifestyles.

WALKABILITY

Walkable neighborhoods are areas of development that exhibit safe pedestrian environments and contain destinations that can be reached on foot. Urban design plays a major role in shaping a safe pedestrian environment. This can be achieved by creating separation between sidewalks and moving traffic by adding on-street parking and tree planting areas. Vertical elements, such as street trees, telephone poles, street lights, and parking meters placed between the sidewalk and roadway can add to the real and perceived perception of a safe walking environment. Slowing vehicular traffic and creating highly visible crosswalks can help make drivers more aware of pedestrians (Speck, 2012).

Safety is only part of the equation of designing a walkable neighborhood. People must have destinations that they can walk to within a reasonable distance. Density plays a major role in achieving this because the closer buildings are clustered together, the more destinations there will be within a given area. Mixed-use neighborhoods tend to be more walkable than single-use neighborhoods. If homes are located near jobs, retail, schools, and parks, then people have more activities and destinations within walking distance. Many cities, like Cleveland, sacrifice walkability in order to accommodate cars on surface parking lots. These areas of void within the urban neighborhood mean that destinations are spread further apart. Reducing zoning requirements for parking and encouraging transit use can help reduce car-dependence and improve walkability (Speck, 2012).

Walkable neighborhoods offer social, economic, and environmental advantages over car-oriented neighborhoods. Surveys show that creative class citizens, especially those under 30, vastly favor communities with street life - the pedestrian culture that can only come from walkability (Speck, 2012). Walkable neighborhoods also help strengthen community. A study by Sightline Institute (2006) showed that for every 10 minutes a person spends diving per day, time spent in community activities falls by 10 percent. Walking also encourages healthier lifestyles. The average resident of a walkable neighborhood weighs 6-10 pounds less than someone living in a sprawling neighborhood (Smith *et al.*, 2008).

Pedestrian-minded neighborhoods reap significant economic benefits. In the Detroit region, housing in walkable neighborhoods fetches a 40 percent price premium over similar housing in drivable suburban areas (Leinberger, 2008). In Washington, DC, office space in a walkable neighborhood leased at a 27 percent premium over otherwise equal suburban office space, and also exhibited significantly lower vacancy rates (Leinberger, 2008). Not only does it help increase real estate values, but walkability helps keep money in the local economy. Transit, trails, and streetscape projects employ 70 percent more people than if the same money were spent on highway construction, which depends more heavily on big machines and small crews (Speck, 2012).

Environmental benefits of walkability are also significant. On average, the residents of Atlanta's walkable neighborhoods drive 30 percent less than residents of car-oriented neighborhoods (Frank and Chapman, 2004). This helps reduce carbon emissions and improve air quality. Approximately 85 percent of money expended on cars and gasoline leaves the local economy, much of it going to oil-producing countries in the Middle East (Speck, 2012).

CONNECTIVITY

Connectivity refers to the ability of people to be able to move freely between destinations, including homes, jobs, shopping, entertainment, and recreation. Waterways, railroads, highways, and private properties can be significant barriers that prevent people from moving freely about the city. A well-connected city offers multiple routes of connection available to a wide array of

transportation modes. Complete streets, which support multiple transportation modes, provide corridors for pedestrians, cyclists, public transportation, and cars to travel between destinations. Complete streets encourage transportation options and help make the city car-optional. The urban street grid offers a much higher level of connectivity than does a cul-de-sac street arrangement. The grid creates connection points at every block and therefore disperses traffic among many streets, helping to reduce traffic congestion and commute times. The geometry of the street grid helps with orientation and wayfinding and its frequent intersections help with the choice and directness of route to desired destinations.

In dense urban environments, creating transportation systems that operate in three dimensions may be critical to connectivity. For example, an underground subway, ground-level vehicular street, and elevated pedestrian bridge uses three dimensional space to improve connectivity for three different modes of transportation. As described in Clarence Perry's Neighborhood Planning Unit concept, a hierarchy of streets, including primary, secondary, and tertiary streets which helps organize land uses, density, and major transit routes within the city. Primary streets, which provide regional connectivity and high levels of pedestrian traffic, naturally lend themselves to higher density development, transit stations, and retail businesses. Secondary and tertiary streets connect destinations at the neighborhood level and therefore carry less traffic, and therefore less activity and noise. These areas lend themselves more to residential land uses and neighborhood institutions (Perry, 1929).

In the shrinking city, connectivity between neighborhood islands is key to maintaining city function and access to local destinations. Shrinking cities should target street and transit improvement projects that enhance connectivity across multiple modes of transportation. In areas void of population, minor streets should be de-mapped, eliminating the financial burden of continual plowing and re-paving. Money saved should be re-invested to improve street connections between neighborhood nodes. Major connector streets should become target areas for new bike lanes, safer sidewalks, and transit improvement projects. It is important that the design of each project be site specific. Larger nodes may have large enough populations to warrant the construction of new light rail transit, whereas connections between small nodes may warrant a more appropriately scaled street treatment, such as sidewalk improvements, bike lanes, bus shelters, and street trees.

TRANSPORTATION CHOICES

Building on the idea of connectivity, transportation choices helps to create multiple means of access between destinations. For the past 50 years, most streets in the United States have been designed for the singular purpose of moving cars (Duany et al., 2010). Limiting the connections to a single mode of transportation decreases accessibility for many segments of society, including children, the elderly, the poor, and the disabled. "Complete streets" are designed to allow pedestrians, bicycles, cars, and public transportation to inhabit the same space. This helps to decrease automobile dependence and create a

more vibrant street life within the community. Public transportation hubs (which might include rail, bus, or streetcar) should be surrounded by higher density development with strong pedestrian connections to bring access to the most people.

In the shrinking city, public transportation ridership often decreases as fewer people inhabit the service area. Encouraging the remaining population to concentrate in a smaller footprint around existing neighborhood centers and transportation hubs will help provide more transportation options to the city's remaining population. As mentioned in the previous section, shrinking cities should target investments to better connect viable neighborhood centers by making complete streets that support multiple modes of transportation.

MIXED LAND USES

Mixed-use development combines residential, commercial, office, institutional, or other land uses within the same building or neighborhood. The uses can be integrated horizontally along a street or vertically within a building. Typical mixed-use buildings consist of ground floor retail with either housing or office space above. This land use integration helps activate the street level as retail businesses generate more pedestrian traffic than a residential or office ground floor.

Dense neighborhoods containing a broad mix of land uses are less car-dependent than single-use neighborhoods because people must cover shorter distances to reach daily destinations. This lowers the number of vehicle miles

traveled per person, and makes walking and cycling a more realistic transportation option. Because less time is spent commuting, quality of life is improved because people have more discretionary time that can be spent on productive or leisure activities (Speck, 2012).

Many downtowns suffer from an imbalance of land uses, weighted too heavily toward high-rise office space. A lack of housing within the neighborhood causes retail businesses along the street level to struggle, as street activity dips significantly on evenings and weekends. A balance of people living and working within the same area helps provide a broad and continuous customer base throughout the day, capable of supporting more shops, restaurants, and local businesses. With more vibrant street life, mixed-use neighborhoods have more "eyes on the street" thereby reducing crime and increasing public safety (Speck, 2012).

MIXED HOUSING TYPES

A sustainable neighborhood consists of a wide range of housing types. Healthy social networks depend on the presence of diverse age groups and income levels. When affordable housing is concentrated into single buildings and neighborhoods, such as public housing projects, these areas struggle to attract investment and tend to suffer from high levels of crime and poverty. Affordable housing works better if it is distributed throughout the city. The inclusion of diverse housing types, such as single-family homes, rowhouses, rental apartments, condominiums, and live/work buildings will naturally attract different

types of people. Life-cycle housing creates opportunities for young adults, families, and elderly people to live within the same neighborhood. People, therefore, do not need to move out and abandon their established social network when their family status or income level changes. They can simply move to a different housing type within their neighborhood. This brings long-term stability to the neighborhood (Speck, 2012).

Creating a range of housing types helps make a neighborhood more efficient. In a neighborhood of only mansions, school teachers, janitors, and grocery store clerks are priced out of the market and are forced to commute longer distances to their places of employment. Planning for different housing types makes it possible for local workers to find affordable housing within their community. It also gives families consisting of a broad range of ages and income levels the opportunity to live close to one another. These elements make for a shorter commute and an improved quality of life for all members of the community (Duany et al., 2010)

PUBLIC OPEN SPACE

Public parks and open space are key components of the sustainable neighborhood. People need opportunities to escape from the noise and congestion of the city and have opportunities to interact with nature. *The Smart Growth Manual* (Duany et al., 2010) suggest that neighborhoods should have a public gathering space at the center, consisting of a plaza, green, or square. Urban theorist Clarence Perry recommends that this space be surrounded by

neighborhood institutions such as churches, elementary schools, libraries, or recreation centers. He also recommends that 10 percent of the land within a neighborhood being dedicated to public open space (Perry, 1929). These open spaces should include pocket parks, playgrounds, dog parks, community gardens, and athletic fields. In many cases, these parks may be located around schools or in green corridors. Current planning practices focus athletic and park facilities into mega-centers that are perhaps cheaper to maintain, yet sacrifice the convenience of being accessible on foot or on bicycle (Duany et al., 2010). Parks should be accessible for people of all ages and should not require a car to reach them (Duany et al., 2010).

In most cities, public green spaces are not distributed equally throughout the city, with low income and high density neighborhoods often being under-served (De Sousa, 2003). For the past two decades, policy makers and planners in North America and Europe have taken interest in the re-development of vacant or under-used waterfront property to foster sustainable development and improve the quality of life in urban areas (Amelar, 2011). Public access to parks and water can help increase real estate values of surrounding properties. One study showed that houses up to a quarter mile from a park increase in value by 10 percent on average (Crompton, 2001).

RESOURCE CONSERVATION & ECOLOGICAL SENSITIVITY

As described in *The Smart Growth Manual* neighborhoods should be designed to minimize their impact on the environment by preserving sensitive

ecological areas, conserving resources such as water and energy, incorporating eco-friendly technologies, and using locally-sourced materials (Duany *et al.*, 2010). Sensitive ecological areas, such as riparian corridors, shorelines, and wetlands, should be mapped and preserved. In many urban settings, natural shorelines have often been replaced with hard bulkheads, which destroy fish and bird habitats. In many cases, there may have potential for shoreline and wetland restoration projects that can help repair damaged ecosystems and increase biodiversity.

Low Impact design seeks to protect water resources by reducing impervious surfaces and encouraging stormwater runoff. Rain gardens, green street bio-retention areas, green roofs, permeable pavements, and rain barrels are low impact design techniques that collect, clean, and re-use stormwater runoff. Rather than treating water as a waste product by dispelling it into storm drains, these practices create opportunities to re-use the water as a resource to irrigate landscape areas. These practices help reduce the burden on stormwater pipes and energy-intensive treatment plants, which helps cities save money (Farr, 2008). Shrinking cities have great potential to reduce the amount of stormwater runoff by using vacant land as places for collection and infiltration.

In addition to stormwater management, other eco-friendly technologies such as passive solar building design, wind turbines, and solar panels can help reduce a neighborhood's dependence on fossil fuel-based energy sources. In addition, locally-sourced materials help to reduce the carbon footprint of construction, as materials need not be transported across long distances. In

many cases, existing buildings or materials may be recycled and re-purposed within a community, helping to minimize the amount of waste that enters landfills (Farr, 2008).

SENSE OF PLACE

Outlined in the *Charter for the New Urbanism*, Neighborhoods should be designed to create a distinct sense of place. To build neighborhood identity, architecture and landscape design should grow out of an understanding of local climate, topography, history, and building practice. Civic buildings and public spaces should be placed in prominent locations to reinforce community identity and the culture of democracy. These places deserve distinctive form that can serve as identifying landmarks of the neighborhood (Congress for the New Urbanism, 2001). Building materials, plant selections, civic art, and architectural form should re-enforce the values, history, culture, and future of the people and place. Preservation and restoration of historic structures and landscapes should be encouraged to link places to past times and activities.

Chapter 5: Methods

SITE SELECTION: BURKE LAKEFRONT AIRPORT

WHY THIS SITE?

Burke Lakefront Airport sits on 450-acres on the Lake Erie Waterfront on the edge of downtown Cleveland. This site was chosen as the focus of this investigation for several reasons. Firstly, the site is situated on the edge of Cleveland's largest urban island (Downtown), as identified by city planners. The western portion of the site is located within the area targeted for development, while the eastern portion of the site is located outside it on land destined to become part of the "green belt". This site, therefore, offers the opportunity to investigate both vacant land issues and how to improve existing neighborhoods to make them more sustainable and economically viable. Secondly, the airport site is a barrier to public access of the Lake Erie Waterfront. It occupies more than 2-miles of shoreline and prevents people from interacting with one of the world's largest sources of fresh water – a city asset that has few public access points and has strong potential to improve urban livability. Thirdly, the airport loses money each year and is vastly under-utilized. Closing the airport will help save the city money. Fourthly, the prominent size and location of the site on the Downtown Waterfront makes it a familiar place for most Clevelanders - a place that can be easily identified and comprehended by a broad public audience.

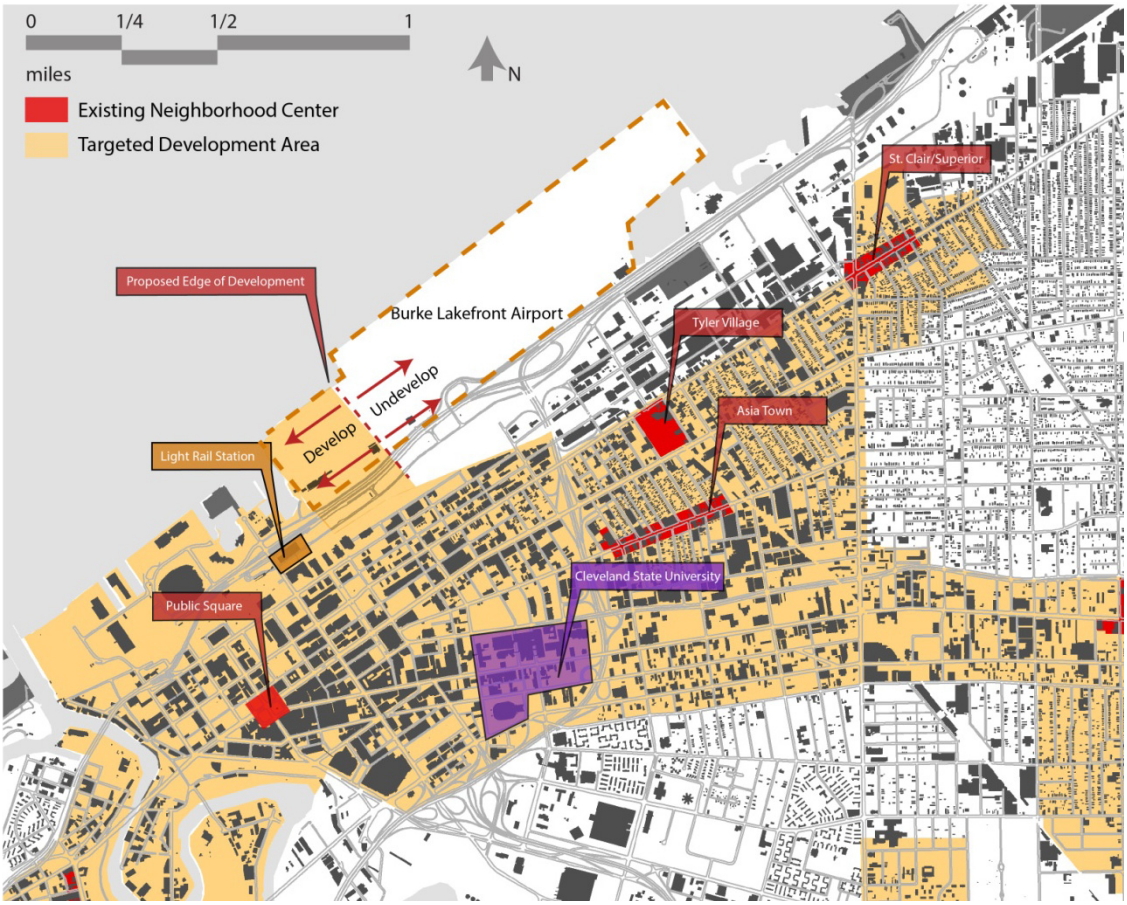


Figure 11. Burke Lakefront Airport Vicinity Map with Neighborhood Centers and Targeted Development Areas (Busa & City of Cleveland GIS)

BENEFITS OF CLOSING BURKE LAKEFRONT AIRPORT

Burke Lakefront Airport opened in 1947 when Cleveland was at its peak in population (914,000). It was built entirely on land fill that was created from dredge material harvested from Cleveland Harbor and the Cuyahoga River, pushing the Cleveland shoreline out into Lake Erie. Burke was constructed as the first municipally-owned airport in the United States, aimed to attract and promote private aviation and recreational flying. The airport supported a small

amount of commercial air traffic in the 1970s and 1980s, but has not had a single commercial flight since 1990. Today, Burke's traffic is made up of single engine recreational aircraft and private jet charters used for business purposes, flight training, leisure flying, and a very small amount of military operations.

The question of whether to close the airport has been on the table of public discussion for years. A strong argument can be made that the airport is not an asset to the city, detracting from the quality of life and economic vitality of Cleveland. Burke's flight operations have been steadily declining over the past decade. Since 2000, the number of takeoffs and landings at Burke has declined by 30 percent, from 101,321 to 69,231. In recent years, the airport's income has covered only about half of its expenses, with annual deficits running between $1 million to $1.4 million a year. The deficit, however, is not paid directly by the city's general fund, but by the users of Cleveland Hopkins International Airport. All of Burke's maintenance, operation, and administrative expenses, as well as rentals, charges, landing fees, use charges, and concession revenues, are all included in the calculation of airline rates at Cleveland Hopkins. So rather than Burke's losses being shouldered by the city, it falls on the shoulders of airline customers, disadvantaging Cleveland Hopkins in its competitiveness in the global airline industry.

The evidence seems to show that Burke has lost its reason for being. Those stakeholders who want Burke to remain open argue that corporate and private flights support local business activity, and that losing the airport would hurt business. This argument, however, seems unfounded. Cuyahoga County's

two other airports, Cleveland Hopkins International Airport (16 miles southwest of Burke) and Cuyahoga County Airport (13 miles east of Burke), handle a great majority of private jet aviation in Cleveland. Only 4 jet aircraft are based at Burke, whereas Cuyahoga County Airport houses 81 jets. Burke Lakefront Airport primarily supports single-engine and duel-engine propeller planes, and it is unlikely that these types of aircraft are supporting much business activity in the city. These types of planes are typically used for flight school activities and recreational flying, not business. The other two airports in the county are conveniently located within 16 miles of downtown, with Cleveland Hopkins International being linked by the city's rail transit system. For this reason, it is likely that Burke Aiport's closure would not significantly harm business if it were to close.

Burke may have made economic sense during a time when Cleveland was growing in population and industries were booming, but today Cleveland is a shrinking city. The population, now 396,000, is just a fraction of the size it was when Burke was built. All three of the County's airports have steadily declined in use over the past several decades. The whole system is vastly under-utilized. While Burke operates at just 31 percent of capacity, Cuyahoga County Airport operates at 34 percent and Hopkins at 31 percent. Cuyahoga County Airport and Cleveland Hopkins International can easily handle displaced airplane traffic if Burke were to close. If Burke's flights were to be re-distributed to the other two airports, the county airport system would still only be operating at 42%.

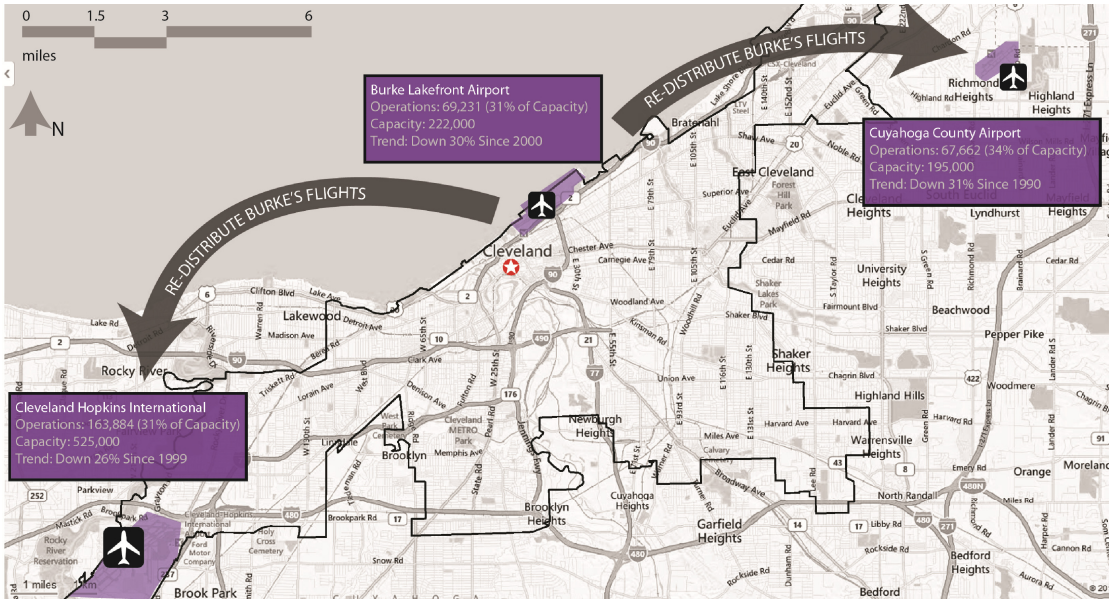


Figure 12. Cuyahoga County Airport System Map Showing Under-Utilization of Existing Airport Infrastructure (Busa & Bing Maps) (Data Source: Federal Aviation Administration)

As an airport, this site contributes little to the quality of life of most vicinity residents. Burke is located in a prime location along 2-miles of the Lake Erie Waterfront and is walkable to downtown. The Federal Aviation Administration (FAA) requires that the site be fenced for safety reasons, preventing public access to the water. As mentioned previously, Cleveland has only 1.75-miles of public access along its Lake Erie Shoreline. Changing the land use of the property to allow public access to the water would more than double the amount of access to the lake. In addition, this land, which has little economic or real estate value as an airport, has great potential to spark new economic development along the downtown waterfront.

IDENTIFYING CLEVELAND'S URBAN ISLANDS

The first step in this analysis was to determine the location of Cleveland's urban islands – assessing what parts of the city should be developed and which should be un-developed. Existing population density, recent population growth patterns, existing transportation infrastructure, and vacancy rates all enter into this equation. This section will analyze this data and illustrate the process of delineating a new footprint of the city.

Perhaps the most important factor in determining the target investment areas is to assess where the most densely inhabited areas are within the city limits. In figure 13, the dark purple areas are the places with the highest population density. The lightest purple and white areas indicate portions of the city with few or no residents living there. These may be industrial areas or neighborhoods that have experienced heavy population loss. Notice that the population density in downtown Cleveland is not the highest in the area. Though this is a place with large high-rise office buildings and employs more than 125,000 people, few people actually live in this neighborhood. This is an indication of an imbalance of land-use weighted too heavily toward commercial office space.

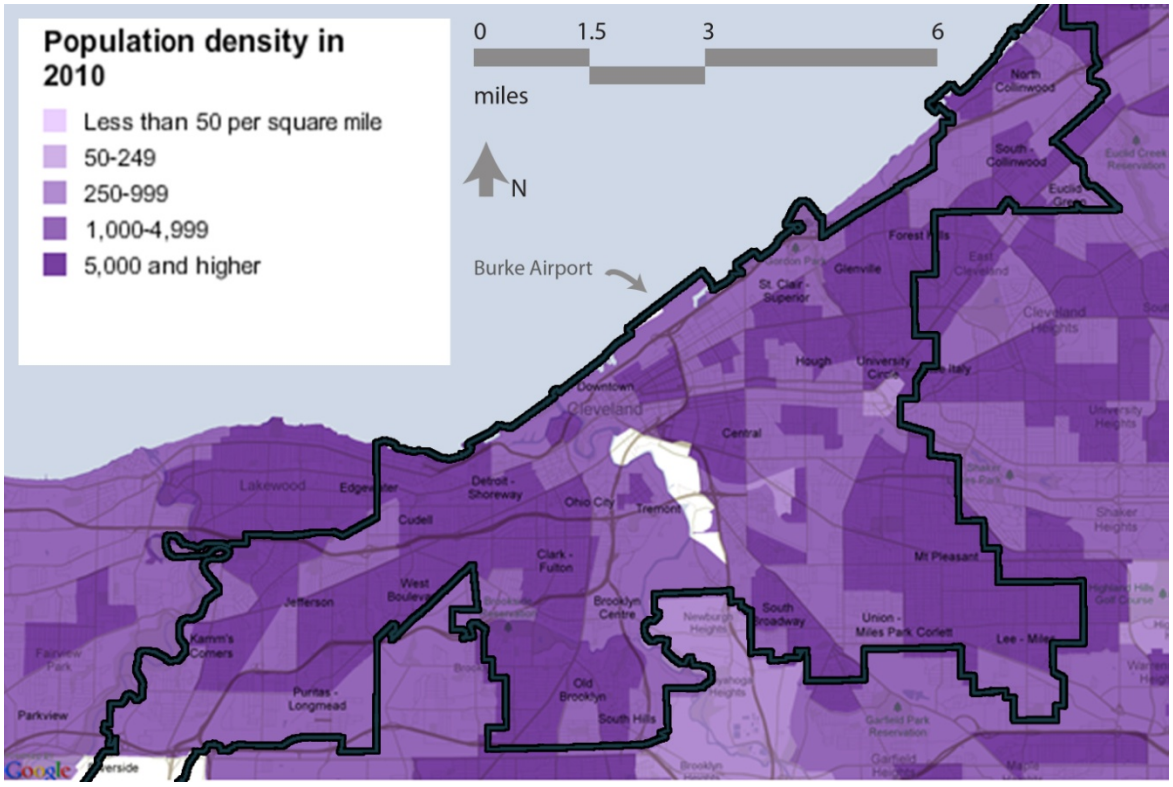


Figure 13. Population Density Map for the City of Cleveland (Busa & Google Maps) (Data Source: U.S. Census)

Population trends play an important role in assessing which areas to grow and which to retract. Figure 14 shows the population trends of the Cleveland Metropolitan Region. The gold colored areas are losing population and the blue colored areas are gaining population. This map clearly shows that while the city of Cleveland and many inner ring suburbs are experiencing population loss, many suburban communities around the periphery of the city are experiencing population growth. This is an indicator that the region as a whole is sprawling more than shrinking, as people re-locate from the center to the edge. Figure 15 shows population trends within the City of Cleveland's urban neighborhoods. This map shows that population loss is not consistent across all parts of the city.

Though the city lost 18% of its population between 2000 and 2010 (U.S. Census), some neighborhoods including Downtown (up 53%) and University Circle (up 76%) have shown significant upward trends in population growth. Areas with recent population growth or even population stability should be areas targeted for investment by the city.

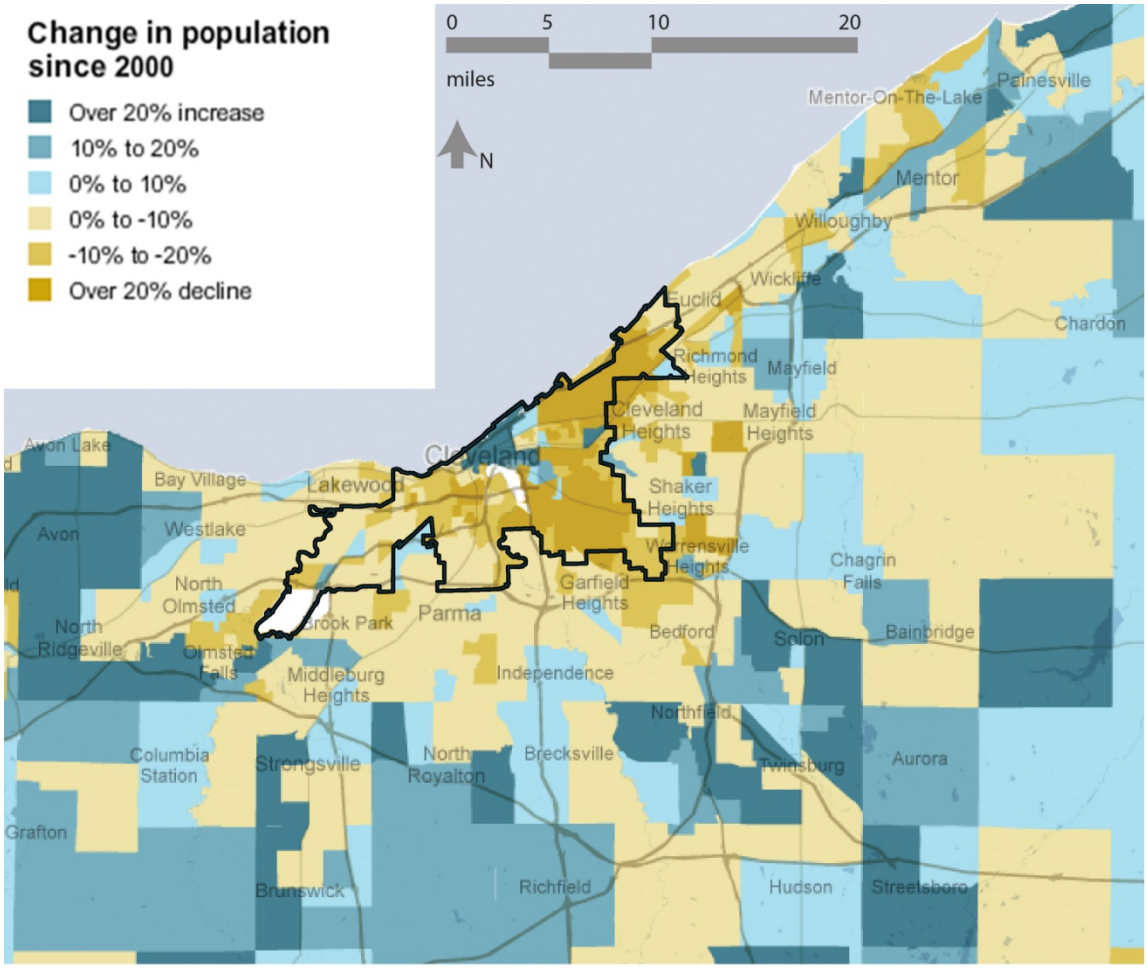


Figure 14. Population Growth Map for the Cleveland Metropolitan Region 9Busa & Google Maps) (Data Source: U.S. Census)

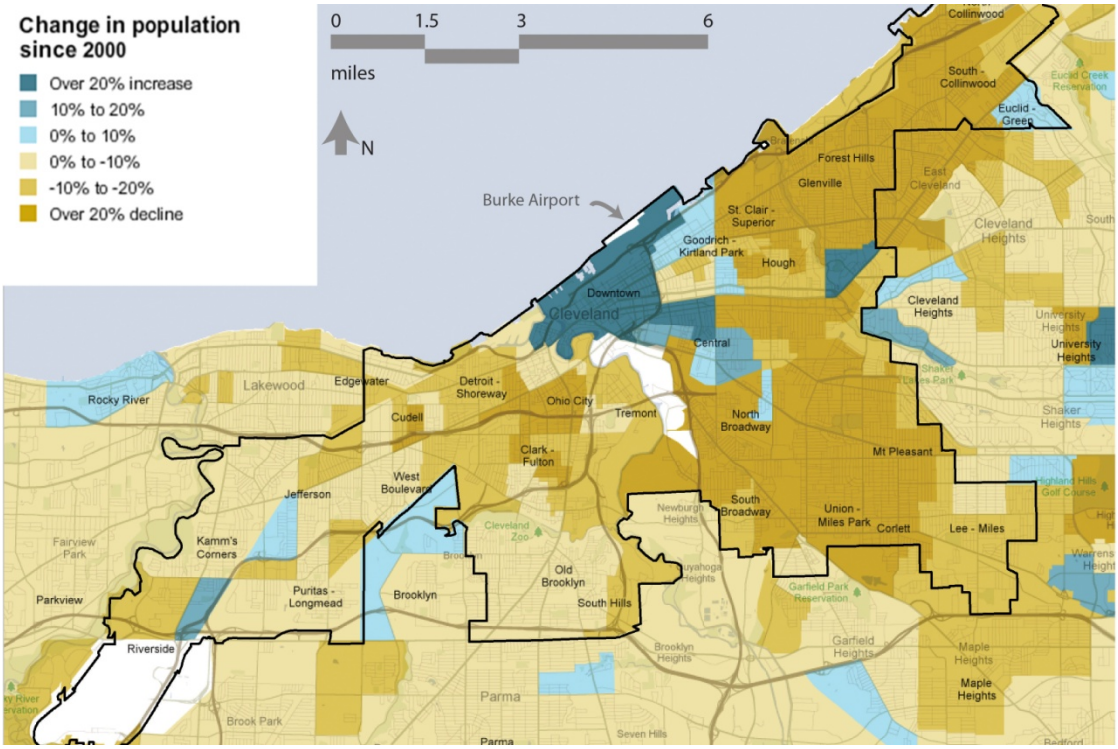


Figure 15. Population Growth Map for the City of Cleveland (Busa & Google Maps) (Data Source: U.S. Census)

Cleveland has more than 20,000 home foreclosures from 2006-2010. Many of these homes have become vacant or abandoned properties. Figure 16 illustrates where they are located throughout the city. Some neighborhoods have been hit harder than others, with large areas of vacancy occurring in the eastern and southeastern portions of the city. High vacancy rates indicate poor market potential for future development. This information plays an important role in shaping the city's decision-making in choosing which areas to un-develop and re-purpose as green belts.

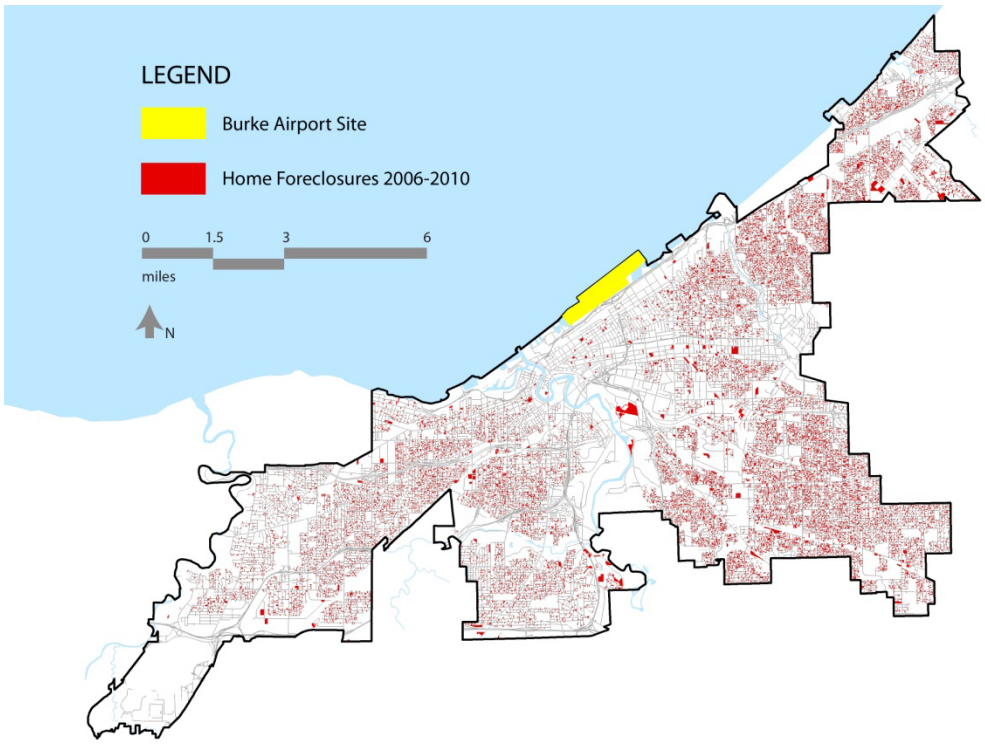


Figure 16. Map of Cleveland's Home Foreclosures, 2006-2010 (Busa) (Data Source: Cleveland GIS)

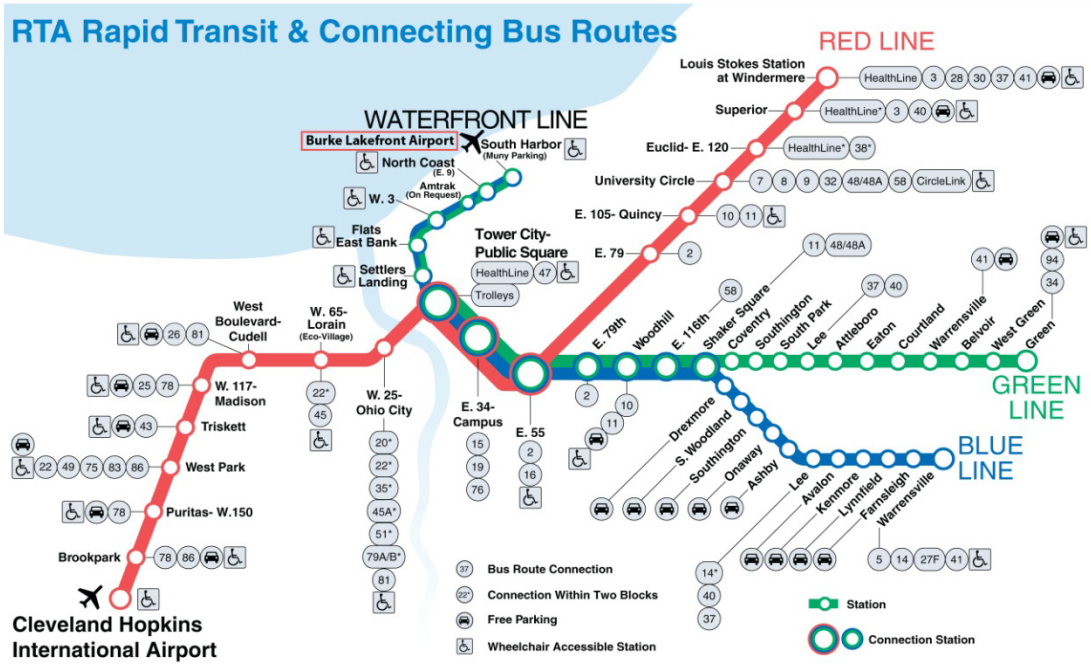


Figure 17. Map of Cleveland's Rapid Transit Rail System (Greater Cleveland Regional Transit Authority)

The location of transportation infrastructure plays an important role in mapping the city's urban islands. Transit infrastructure, especially passenger rail service, was constructed with significant capital expenditure by the city and should be exploited as asset. Rail stations can become points of connection between neighborhoods and the rest of the city, allowing it to function as a cohesive whole. Approximately 25 percent of households in Cleveland do not own cars (American Community Survey, 2009). This segment of the population relies heavily on public transportation as a means of mobility. Transit infrastructure, therefore, plays an important role in maintaining quality of life within the city and should be protected and invested in. Economic viability of public transportation relies on a critical population density to attract ridership. The neighborhoods surrounding many of Cleveland's rail stations have shrunk over the past several decades. As a result, service across the whole system has been cut back. This compromises the livability and quality of life for many residents. Encouraging densification within walkable areas around existing transit stations will help make the system more usable and economically viable over the long run and help create a better connected city.

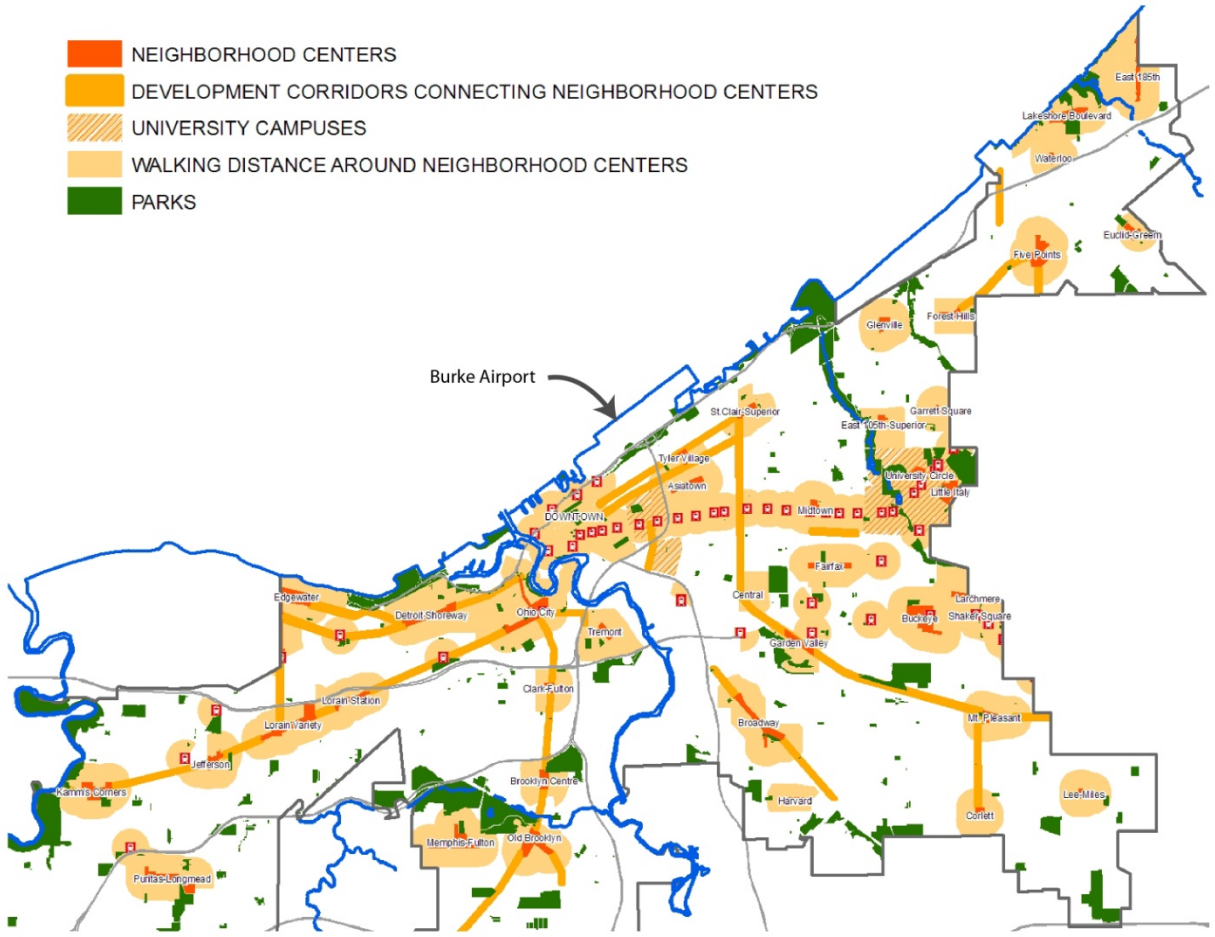


Figure 18. Map of Cleveland's Urban Islands – Draft Version - as Developed by Cleveland Planning Commission (City of Cleveland)

Cleveland city planners used this analysis of existing conditions to develop a methodology for identifying the size and extent of its urban islands, shown in figure 18. Their first step was to identify the centers of existing viable neighborhoods. According to one city official, Cleveland's criteria for identifying neighborhood centers include: recent, market driven commercial or residential development, property values above the citywide average, anticipation of future investment across multiple sectors of the economy, low vacancy rates, recent in-migration of middle and upper class residents, and proximity to existing

transportation infrastructure (Hunt, 2013). Using these criteria, the city then mapped existing neighborhood centers as well as a 1/3 mile walking distance around the neighborhood centers. It is these areas that the city has targeted to become its urban islands. Less viable areas showing rapid abandonment, lack of recent investment, and high poverty and crime levels (shown in white in figure 18) are areas that they intend to depopulate and turn into green belts. In these areas, vacant land is destined to be transformed into landscapes that manage stormwater, restore damaged ecosystems, produce food, provide recreation, or any number of other productive uses. This thesis seeks to explore how these policies might be carried out at the neighborhood scale and applied to a specific site.

SITE CONTEXT

The Burke Airport site occupies 450-acres along 2-miles of Cleveland's Lake Erie Waterfront. In order to understand how the site might be re-imagined to help create a more sustainable downtown neighborhood, it is critical to understand how the site relates to its surroundings. Figure 19 shows the existing land uses surrounding the airport. In this part of the city, land uses are highly segregated, with housing, industrial, and commercial land uses occupying their own distinct districts. As described in chapter 4, creating neighborhoods with mixed land-uses are an important component of creating a sustainable neighborhood. Currently, downtown has very few residents (approximately 10,000) considering its large workforce (approximately 125,000). As a result,

street life is quiet and retail businesses struggle to find customers on evenings and weekends, when workers leave the neighborhood. Census data indicates that housing demand in downtown is strong, as the population has increased by more than 50 percent since 2000.

Cleveland State University (CSU) is approximately 0.8 miles from the Burke Airport Site. The University has over 17,000 enrolled students and employs approximately 1,500 faculty and staff. The University has had a strong economic presence in the city, investing over $300 million in new buildings, streetscapes, and athletic facilities from 2004-2010. With a lack of housing stock around the university campus, CSU has remained primarily a commuter school, with only 4% of students living within walking distance (Cleveland State University, 2012). Because few students and faculty live near campus, the university has not been fully leveraged as a positive influence on the neighborhood. The Campus Master Plan shows that the university plans to significantly increase the number of on-campus housing in the future and create improved street and pedestrian connections to the surrounding neighborhood. The Burke site offers a tremendous opportunity to connect the University to the lakefront, offering an expansive landscape that could be used to augment student and faculty housing, recreation, and research opportunities. This move would help the university market itself to prospective students and help attract young, educated people to downtown Cleveland.

Light industrial properties occupy the land between the University and the Burke Airport site. Though industry has declined since its peak in 1950, it

remains a significant portion of Cleveland's economy today. The industrial properties adjacent to the airport have good access to rail, highway, and port transportation, giving them a competitive advantage over other sites. There are few vacant sites in this part of the city, demonstrating that it is a stable real estate market. The city should look to promote industry in this area and find ways to foster emerging manufacturing markets.

Figure 19. Land Use Map of Neighborhoods Surrounding Burke Lakefront Airport (Busa & Bing Maps)

As described in chapter 4, parks and open space play an important role in creating a livable and sustainable urban neighborhood. Clarence Perry's vision for an ideal urban neighborhood called for 10% of the land to be dedicated to parks and open space. Using this as a metric, the neighborhoods surrounding

the airport are extremely under-served, especially in the area of Cleveland State University, Tyler Village and Asia Town (see figure 20). Existing residents have few opportunities to interact with nature or exercise outdoors. The Cleveland Lakefront Bikeway (along Lake Erie) provides bicycle parallel to the Lake Erie Waterfront, but is fragmented and incomplete in many locations. Along Burke Lakefront Airport, the bikeway shares a service road with vehicular traffic and provides views of Burke's runways through a security fence. Burke's land has great potential to improve Cleveland's green space network by creating recreation space for under-served communities and improve trail connections along the waterfront. Continuous access around the perimeter of Burke would more than double the amount of public waterfront within the city limits.

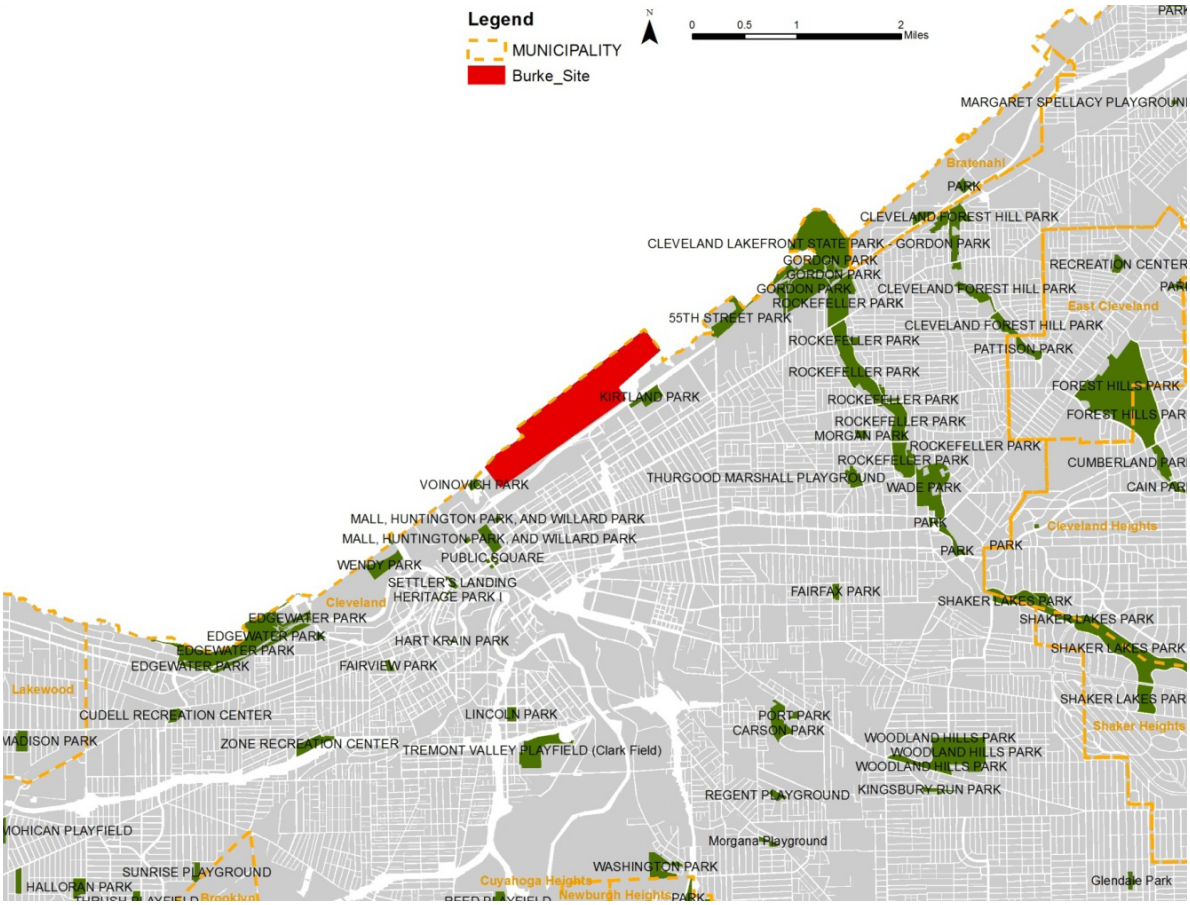


Figure 20. Park System Map for City of Cleveland (Busa) (Data Source: Cleveland GIS)

As described in chapter 4, access to transit is critical in an urban environment. With 25 percent of Cleveland's households not owning a car, many residents rely on transit as their primary means of transportation. Cleveland, has a small, but well-connected rail transit network, including several stations along the waterfront near Burke (see figure 31). This infrastructure is a tremendous asset to the city, yet it remains under-utilized. Much of the land to the north is low density development with few people able to take advantage this urban amenity. The site is also less than a half mile from the city's only Amtrak Station, which provides access to the larger region with routes to New York City,

Washington, and Chicago. Much of the western end of the Burke site is within walking distance of Amtrak as well as the South Harbor and North Coast rapid transit stations, giving this area strong potential for urban development.

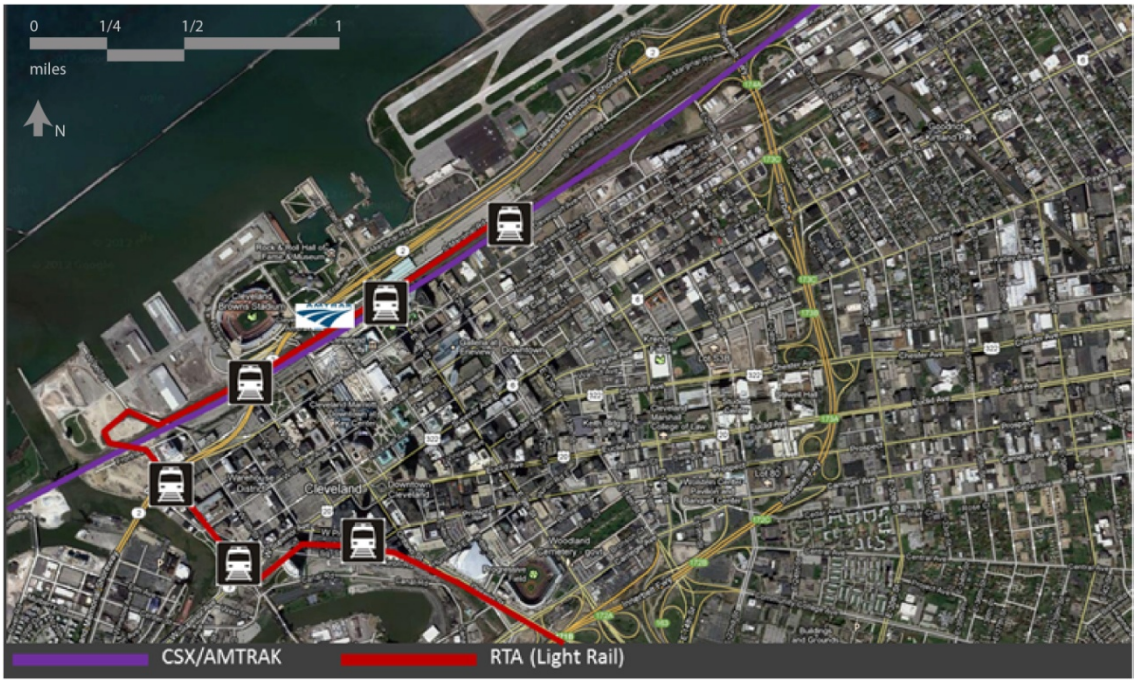


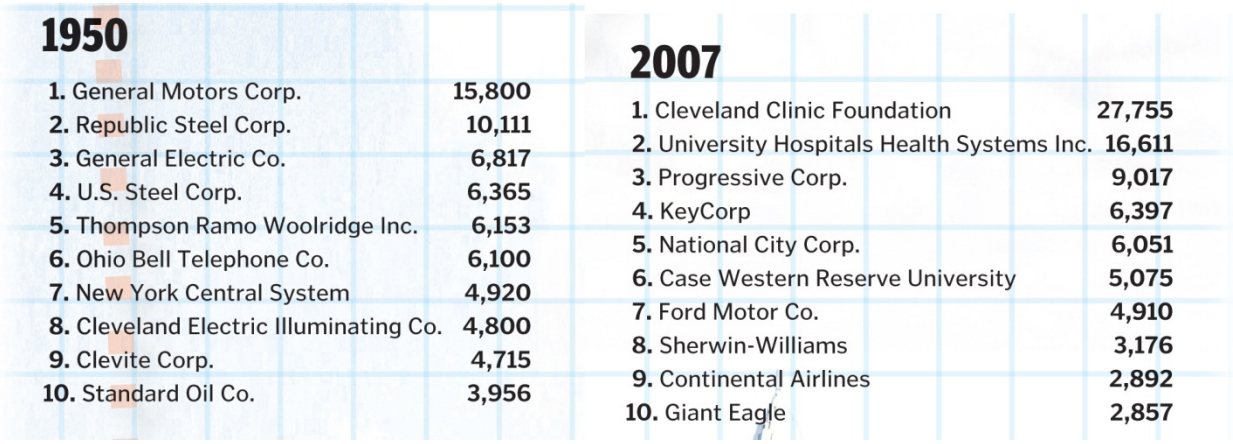
Figure 21. Transit Station Map for Downtown Cleveland (Busa & Google Earth)

In addition to transit, the western portion of the airport site is located close to entertainment and cultural amenities, including sports venues, theaters, museums, public buildings, civic landscapes, and a new casino. These existing attractions, shown in figure 31, offer events and cultural experiences that give spice to city living. These amenities are a strong attraction for students and young professionals. With 96% rental occupancy rates and 50% growth in population since 2010, it is clear that people want to live in this portion of the city. Creating opportunities for new housing along the waterfront has great potential to strengthen Downtown, as Cleveland's largest and strongest neighborhood node.

Figure 22. Map of Attractions and Major Institutions in Downtown Cleveland (Busa & Bing Maps)

Cleveland's Economy has changed significantly since its population peak in 1950. Figure 31 shows the top ten employers in Cleveland in 1950 and in 2007. These numbers show a shift from a manufacturing-based economy to a service-based economy that is anchored by the health care industry. Figure 24 shows the locations of the top employers in Cleveland. Three of them are located in downtown. The two largest hospitals, University Hospital and the Cleveland Clinic, are located 4 miles from downtown in the University Circle Neighborhood. The city is currently seeking to expand its national presence in

the medical industry, constructing the Cleveland Medical Mart, which will become a national trading floor and exposition center for medical devices. It will be located beneath Cleveland Mall. As shown in figure 24, the hospitals and medical mart are linked via the “Health Line”, which is a newly constructed rapid bus line that travels between downtown and University Circle via Euclid Avenue. With its close proximity to the Medical Mart, the Burke site has potential to become a meaningful amenity to the medical industry, helping the city attract visitors and business travelers with hotel and conference facilities and sites for new mixed use corporate development along the lakefront. Creating waterfront residences on the west end of Burke, with easy access to the Health Line, might also help the city retain its pool of young doctors.



1950

1. General Motors Corp.	15,800
2. Republic Steel Corp.	10,111
3. General Electric Co.	6,817
4. U.S. Steel Corp.	6,365
5. Thompson Ramo Woolridge Inc.	6,153
6. Ohio Bell Telephone Co.	6,100
7. New York Central System	4,920
8. Cleveland Electric Illuminating Co.	4,800
9. Clevite Corp.	4,715
10. Standard Oil Co.	3,956

2007

1. Cleveland Clinic Foundation	27,755
2. University Hospitals Health Systems Inc.	16,611
3. Progressive Corp.	9,017
4. KeyCorp	6,397
5. National City Corp.	6,051
6. Case Western Reserve University	5,075
7. Ford Motor Co.	4,910
8. Sherwin-Williams	3,176
9. Continental Airlines	2,892
10. Giant Eagle	2,857

Figure 23. List of Top 10 Largest Employers in Cuyahoga County in 1950 and 2007. (Busa) (Data Source: The Plain Dealer)

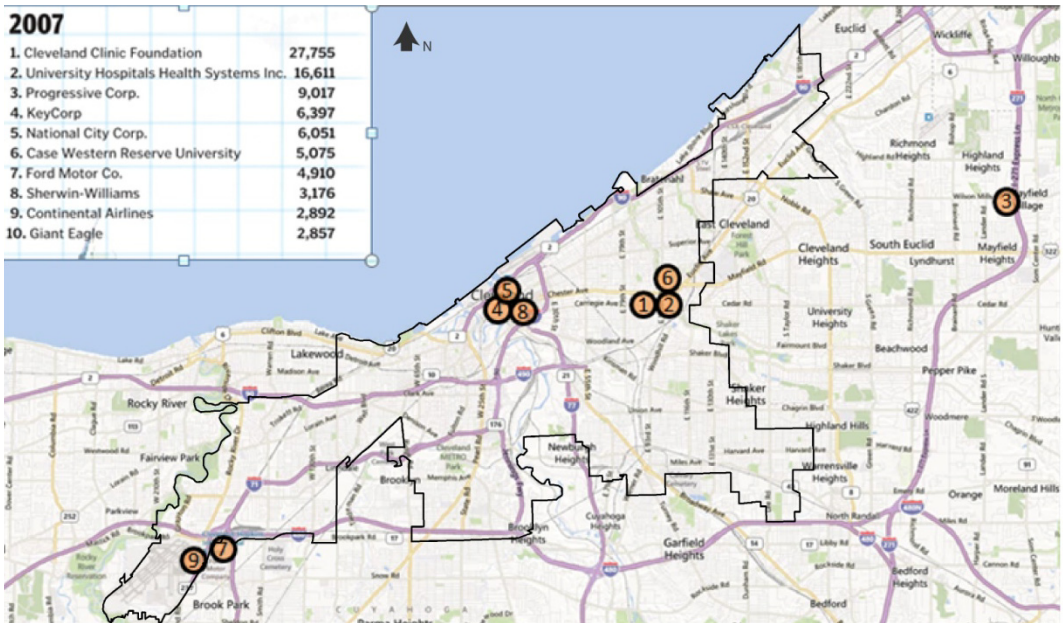


Figure 24. Map of Top 10 Largest Employers in Cuyahoga County in 2007. (Busa & Bing Maps)

Figure 25. Map of the Locations of Major Medical Institutions in Cleveland and Opportunities to Expand Their Influence on Downtown (Busa & Cleveland GIS)

BARRIERS TO THE WATERFRONT

RAILROAD & HIGHWAY CORRIDOR

The neighborhoods adjacent to Burke Lakefront Airport are not well-connected to Lake Erie. As shown in figure 26 and 27, the Cleveland Memorial Shoreway and a major rail corridor are significant barriers between the city street grid and the water. Between the Cuyahoga River and E. 55th Street, a 3.4-mile stretch, there are only 4 street connections that give access to the waterfront. These street connections, shown in figure 28, are car-dominated and provide poor access for pedestrians. East 9th Street is the main north-south street between downtown and the waterfront, and is located just 4-blocks west of the Burke Airport site. The Cleveland Memorial Shoreway is an under-utilized stretch of highway that changes to an urban boulevard 3-miles west of downtown. Converting this highway into an urban boulevard with slower traffic speeds and more at-grade street connections would help transform this roadway from a barrier to a connector. An analysis of the existing street grid revealed potential connection points at E.13th Street, East 18th Street, East 26th Street, and East 40th Street. Improving access to the waterfront has potential to bring value to inland properties and help stabilize the real estate market.

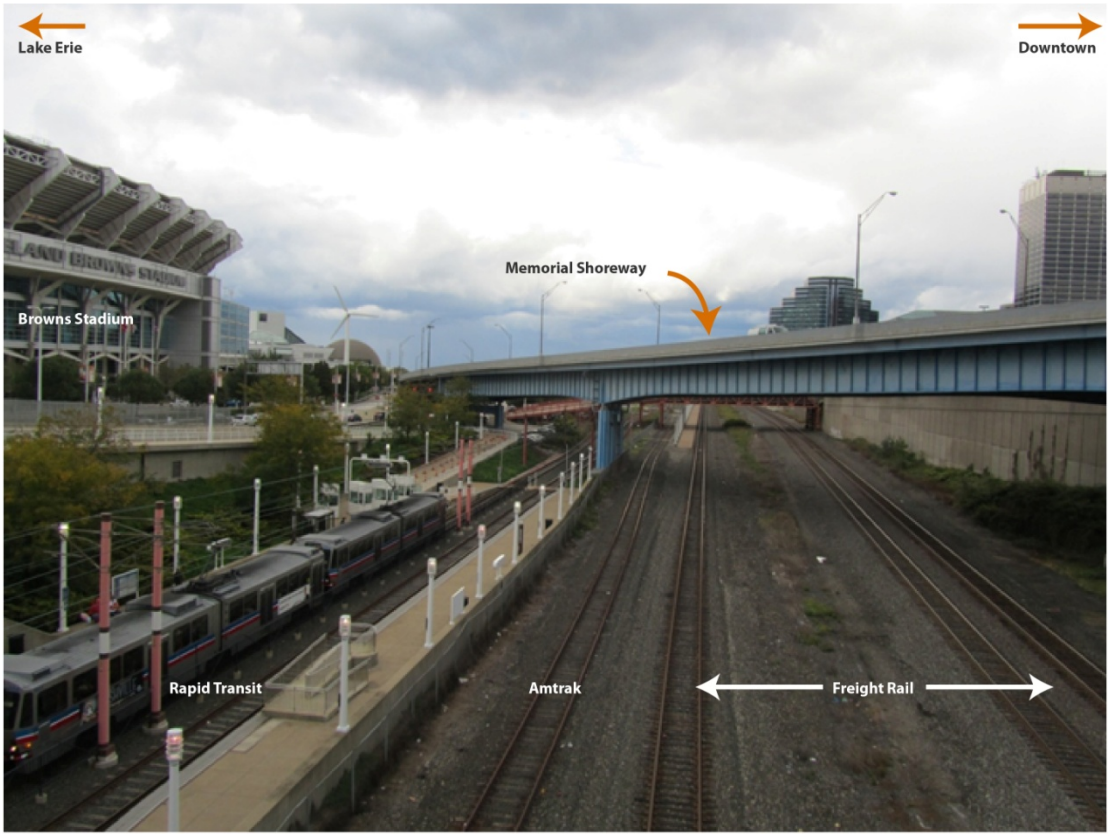


Figure 26. Photograph of Rail & Highway Right-of-Way, a Barrier Between Downtown Cleveland (Right) and the Waterfront (Left). (Busa)

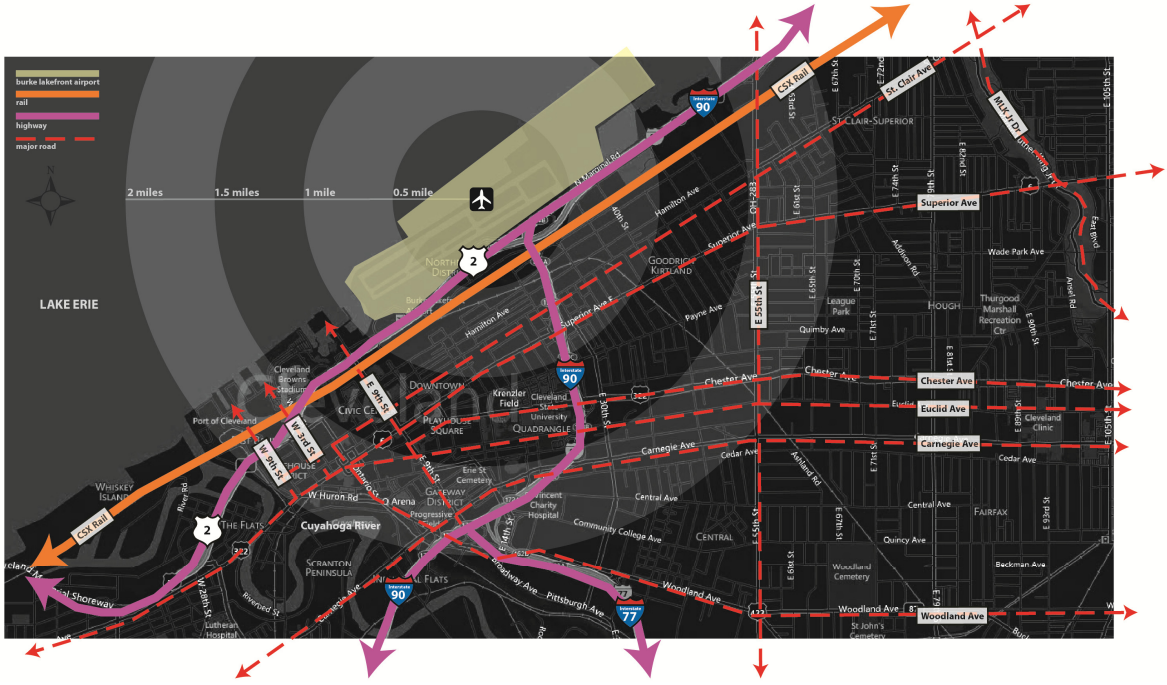


Figure 27. Circulation Map of Downtown Cleveland Showing Major Vehicular and Train Routes (Busa & Bing Maps)

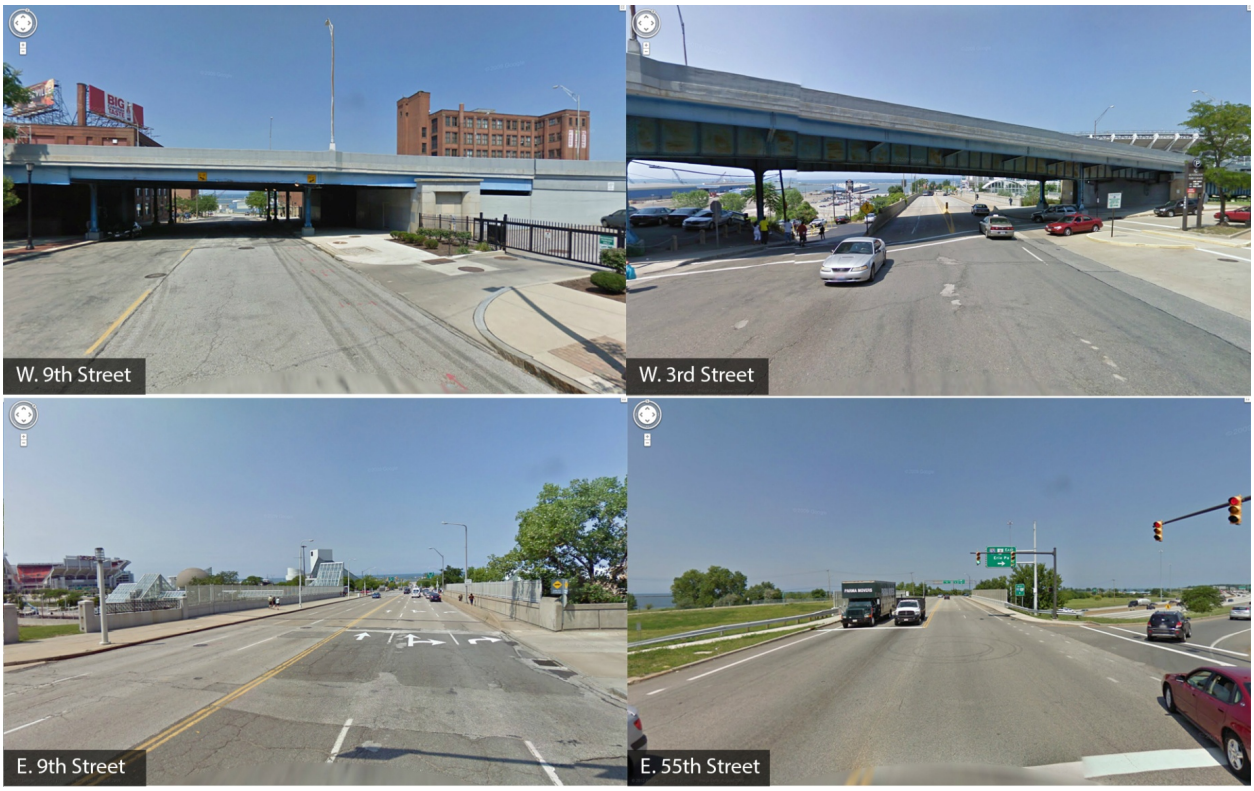


Figure 28. Photographs of the Only Four Street Connections Between Cuyahoga River & East 55th Street. (Busa)

DISTANCE & TOPOGRAPHY

As shown in the topography map in figure 29, Downtown Cleveland sits 50 to 70-feet above the level of Lake Erie. The original shoreline was a high bluff that rose up steeply to a relatively flat plateau on which the city was built. Over the past century, land fill has been added along the edge of lake erie, pushing the shoreline further away from the city. Inland communities located on top of the bluff once sat on waterfront property, but today they are a half mile from the water in some cases. The large distance between development and the shoreline is a physical and psychological barrier. Without urban density extending to the waterfront, people have to go far out of their way to reach the

water. Extending the city's built form across the railroad tracks all the way to the water's edge would help negate this distance barrier.

The bluff's grade change is equivalent to a 5-story building and is another barrier to the waterfront because it creates visual separation between buildings, streets, and people on either side. The steep slope requires the construction of bridges that will allow people and vehicles to decend more gently down to water level.

Figure 29. Topography Map of Downtown Cleveland. (Busa) (Data Source: Cuyahoga County GIS)

WATER ISSUES

Lake Erie is one of the largest freshwater lakes in the world. It is Cleveland's largest and most identifiable natural resource, and is an undeniable asset to the city. Lake Erie is the source of the city's drinking water, a conduit for

major freight shipping, a playground for many types of recreation, and habitat for hundreds of species of plants and animals. Erie is the shallowest and most urbanized of the Great Lakes, making it the most vulnerable to water pollution issues. In recent years, large algal blooms have formed over the western portion of the Lake Erie as the result of high pollution loads (mainly nitrogen and phosphorous) entering the water body from farms and urban development. Algae removes dissolved oxygen from the water, which is critical to supporting other forms of aquatic life, such as fish and amphibians. Nutrients from Cleveland's combined sewer system contributes to this problem, while also introducing bacteria that makes contact with the water a health hazard for both people and animals.

COMBINED SEWER OVERFLOWS

Cleveland has three wastewater treatment plants, shown in figure 30, which treat both stormwater and wastewater before dispelling it back into Lake Erie. Much of the city is part of a combined system, meaning that building waste water and sewage travels in the same pipe as stormwater. During large rain storms, the wastewater treatment plants cannot process the water fast enough to keep up with water flowing into storm drains. Once the system reaches capacity, the storm drains are designed to overflow into the environment, dispelling untreated water into local rivers and Lake Erie. The subwatersheds of Cleveland are shown in figure 30 show the city's existing drainage patterns. Burke

Lakefront Airport lies in the Lake Erie Watershed, meaning that water naturally drains toward the lake.

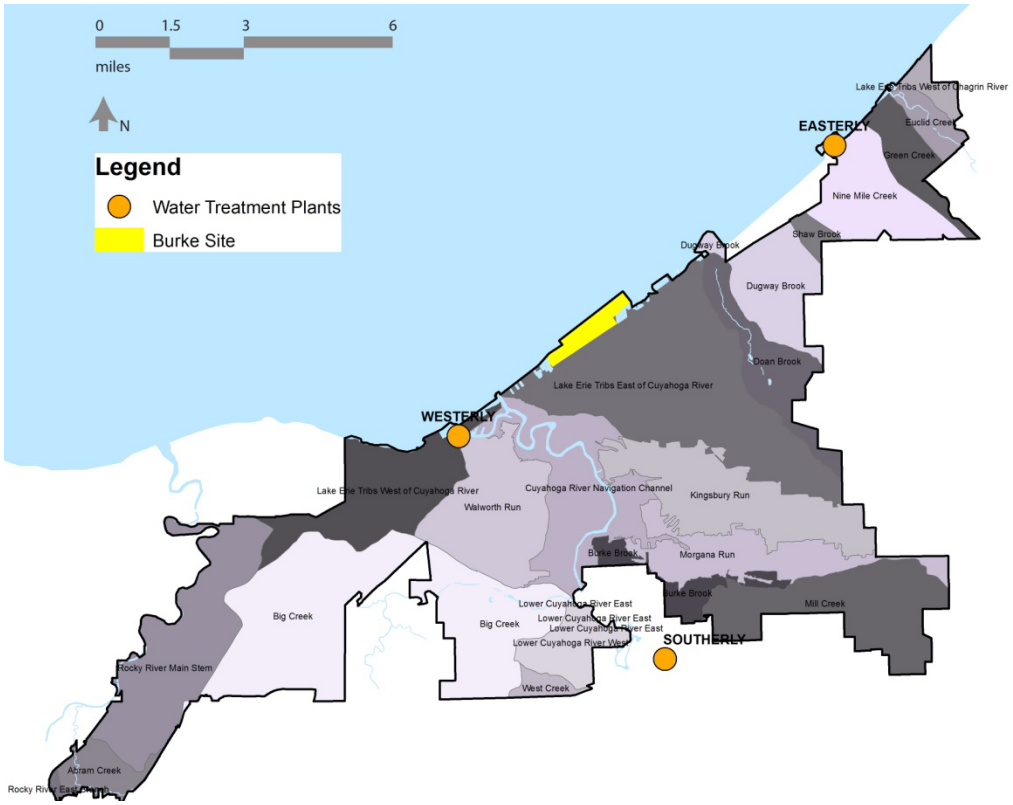


Figure 30. Subwatershed Map of Cleveland Showing Locations of Waste Water Treatment Plants (Busa) (Data Source: Northeast Ohio Sewer District GIS)

Figure 31 shows the location of major and minor sewer pipes in the vicinity of the Burke Airport site. The yellow dots indicate the locations of seven combined sewer overflows located on the site. During heavy rain storms, these are points where dirty water, including raw sewage, is dispelled into the lake. Figure 31 also shows the number of days each pipe overflowed in 2012. There are two approaches to solving this problem. The first is using gray infrastructure, which requires constructing large pipes and tunnels capable of storing larger quantities of runoff and building larger, more efficient wastewater treatment plants that can treat water faster than existing systems. This approach is very

expensive to implement as it requires massive engineering projects. The second approach is to use green infrastructure to capture and infiltrate stormwater at the location where it falls, reducing the stormwater volume that enters the combined sewer system. This approach is far less costly than a gray infrastructure approach, but requires large amounts of land to capture and infiltrate water using rain gardens, bioretention areas, constructed wetlands, or other approaches. Cleveland, which has little money and lots of vacant land, should be considering green infrastructure as the best approach for solving their water problem. Looking at the Northeast Ohio Sewer District's "Project Clean Lake" plan (see figure 32), they are planning to invest $3 billion over the next 25 years to reduce the quantity of combined sewer overflow. Only 1.4 percent of this sum, however, is planned to be spent on green infrastructure projects.

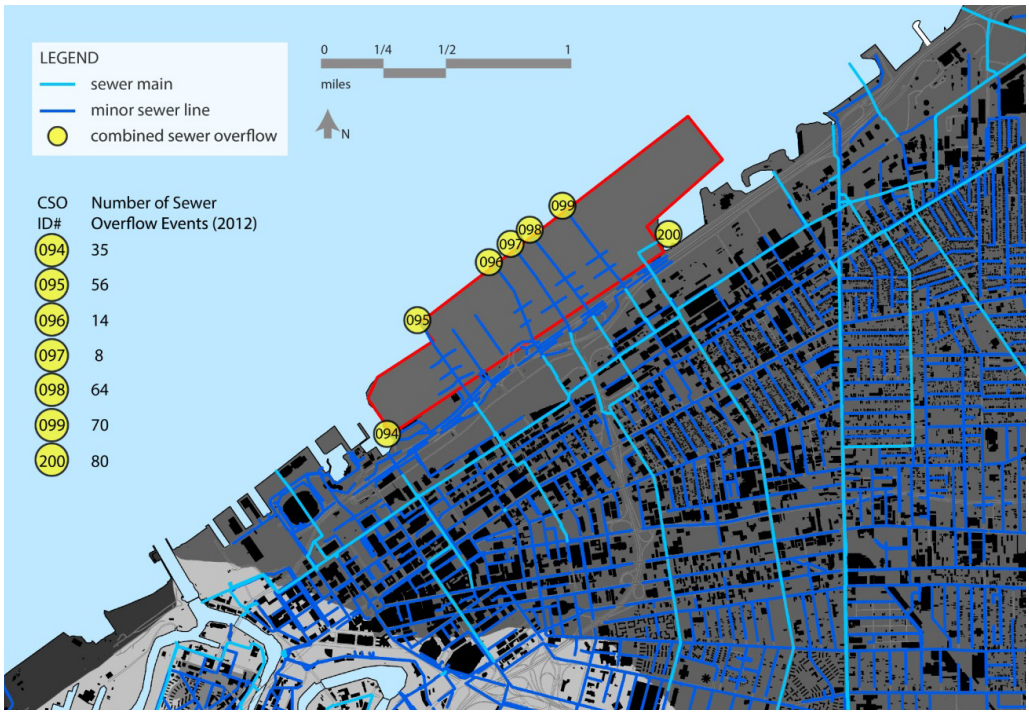


Figure 31. Sewer System Map for Downtown Cleveland, Showing Locations of Combined Sewer Overflows on Burke Airport Site (Busa) (Data Source: Northeast Ohio Sewer District GIS)

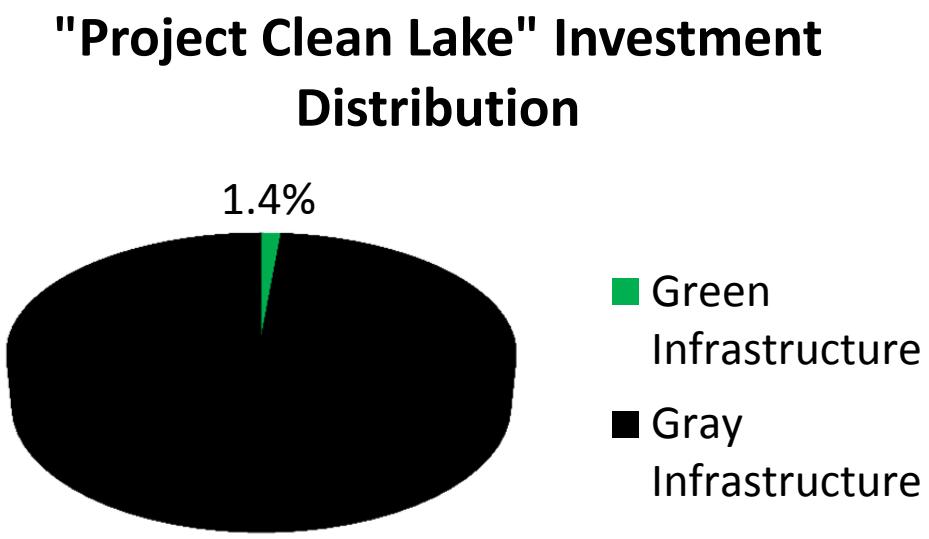


Figure 32. Graph Comparing Green Infrastructure versus Gray Infrastructure Expenditures Planned by the Northeast Ohio Sewer District from 2010 to 2035 to Address Combined Sewer Overflow Problem. (Busa) (Data Source: Northeast Ohio Sewer District)

To understand the role that green infrastructure can play in mitigating combined sewer overflows at the Burke Airport site, it is critical to understand how much water is expelled into the lake. Figure 33 shows the volume of water that overflows given several design storm intensities. Between the seven overflows on the Burke Airport site, 19.8 million gallons of water are dispelled into Lake Erie during a 5-year storm event. Figure 34 shows the sewer catchment areas for each of the seven overflows. If 19.8 million gallons were able to be captured and infiltrated within the sewer catchment area, overflow events would only occur once in every five years, on average. In areas of the city that are

planned to be un-developed, vacant land could be re-purposed as green infrastructure to help capture and store some of this water.

Figure 45 shows the locations of 129 vacant parcels within the sewer catchment area. According to the City Planning Department's map identifying urban islands (see figure 36), six of these vacant properties are located in areas targeted for infill development. In targeted development areas, entire sites should not be converted to green infrastructure. Instead, other Low Impact Development techniques, such as green roofs, porous paving, or bioretention areas, are a more appropriate solution that still allow for urban densification. The remaining 123 vacant properties (15 total acres) are located outside the targeted development areas. Assuming a standard rain garden detail, consisting of 6" ponding capacity (100% air space) and 3' rain garden soil depth (20% air space), these vacant properties are capable of holding over 5.4 million gallons of stormwater.

Vacant Land Water Storage Capacity Calculations

15 acres = 653,400 square feet

(653,400 SF * .5 Foot Ponding Depth)
+ (653,400 SF * 3 Feet Rain Garden Soil * 20% Air Space)
= 718,740 Cubic Feet

718,740 Cubic Feet = 5,376,550 Gallons (26% of total volume).

This means that vacant land rain gardens have potential to reduce the combined sewer problem at Burke Airport by 26% during a 5-year design storm.[1] The remaining 74% of the volume requires alternative green infrastructure strategies. Retrofitting existing streets with bio-retention cells and/or daylighting the combined sewer pipes into a wasterwater treatment wetland at Burke are potential solutions. These proposed interventions will be discussed in chapter 6.

Table 7-7. Overflow Volumes and Activations – CSO Control Plans (continued)

CSO Outfall	Design Storm Volumes (MG)						Typical Year		
	1-Mon	4-Mon	6-Mon	1-Yr	2-Yr	5-Yr	Vol. (MG)	# O/F	Duration (hh:mm)
Lake Erie									
CSO 094	0.00	0.00	0.00	1.42	2.60	5.09	0.49	1	6:45
CSO 095	0.00	0.00	0.03	1.22	2.11	4.34	0.89	3	4:00
CSO 096	0.00	0.00	0.02	0.61	1.03	2.31	0.54	3	2:45
CSO 097	0.00	0.00	0.00	0.11	0.25	0.57	0.03	1	0:30
CSO 098	0.00	0.00	0.04	0.75	1.29	2.49	1.45	3	13:25
CSO 099	0.00	0.00	0.03	0.32	0.53	0.97	0.18	2	15:45
CSO 200	0.00	0.00	0.05	3.13	5.59	10.52	7.95	3	28:00
Total						19.8 Million Gallons			

Figure 33. Chart Showing Estimated Overflow Volumes for Each Combined Sewer Overflow at Burke Lakefront Airport (Northeast Ohio Sewer District)

[1] Note that this calculation does not take into account soil infiltration rates or local slope and land cover characteristics. This calculation is intended as a study of the total volume capacity that can be captured on vacant land.

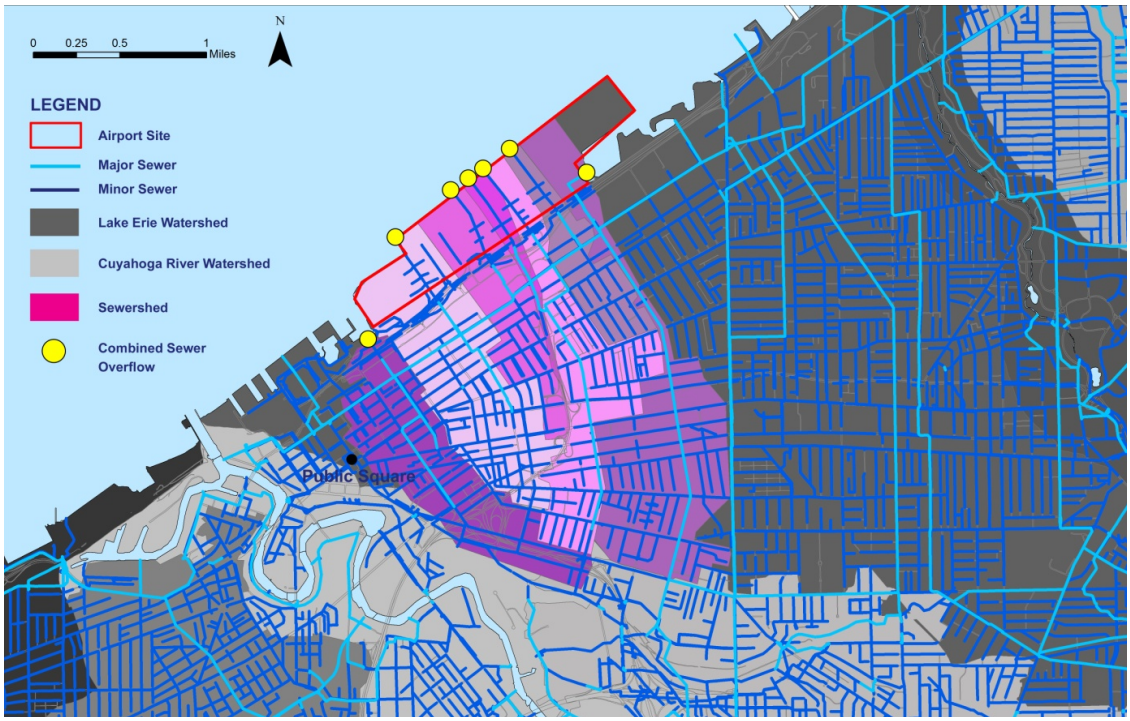


Figure 34. Sewershed Map of Downtown Cleveland, Showing Catchment Area for Each Combined Sewer Overflow at Burke Lakefront Airport (Busa) (Data Source: Northeast Ohio Sewer District)

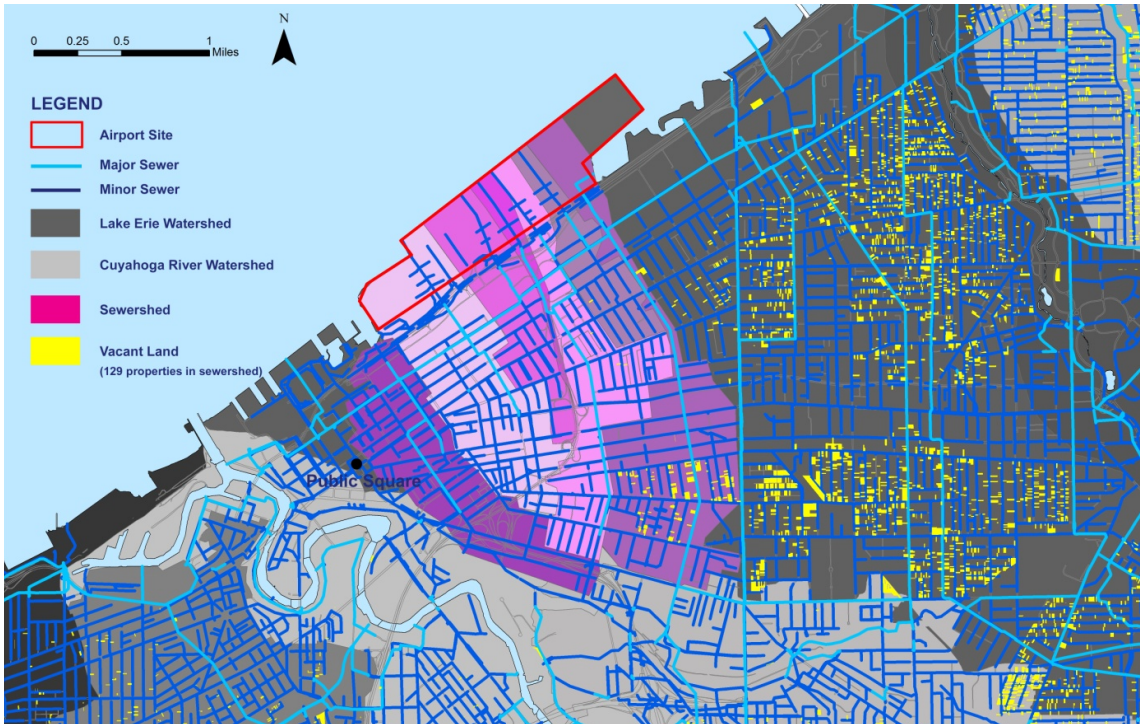


Figure 35. Sewershed Map for Burke Airport Site Showing Locations of Vacant Properties (Busa) (Data Source: Northeast Ohio Sewer District GIS)

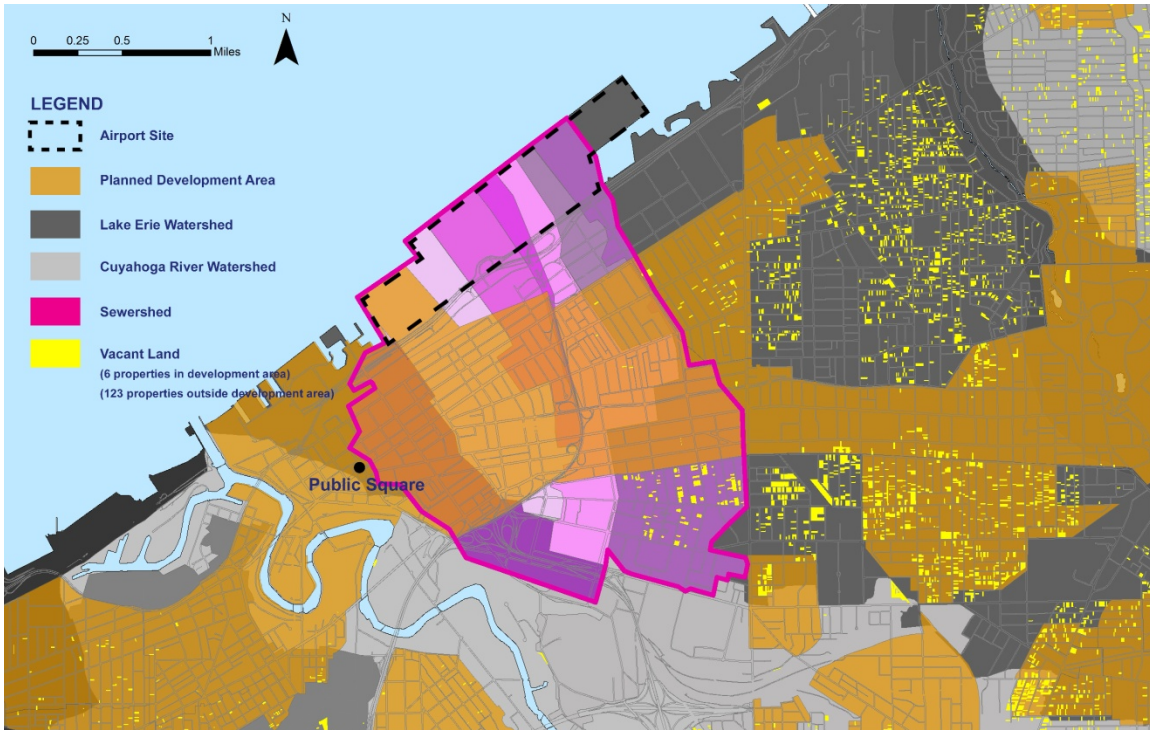


Figure 36. Map Showing Burke Airport Sewershed, Planned Development Areas, and Locations of Vacant Properties Owned by Cleveland Land Bank (Busa) (Data Sources: City of Cleveland & Northeast Ohio Sewer District GIS)

DREDGE DISPOSAL

Cleveland has long been an important port city on the Great Lakes. Iron Ore and other raw materials are carried on massive freighters up the Cuyahoga River to steel mills and other manufacturing facilities. The river and port are the lifeblood of Cleveland's heavy manufacturing, accounting for an estimated 4,518 jobs and $396 million in local spending. To maintain shipping lanes, the Army Corps of Engineers dredges sediment from the bottom of the river to maintain a minimum depth of 23-feet. Figure 37 shows the locations of current dredging. Each year, approximately 333,000 cubic yards of sediment is removed from bottom of Cleveland's waterways each year (Ohio EPA, 2010). This is equivalent

to the area of a football field piled 152-feet high. To dispose of the dredge, the Army Corp of Engineers has historically built dike walls out into the lake that serve as “confined disposal facilities” for the sediment. Over time, the sediment piles up on the lake bottom and becomes new land. At this point, a new dike is constructed and the process repeats itself.

Historically, Burke Lakefront Airport has been the largest dredge disposal site in Cleveland. Since the early 1940s, dredge has been continually added to the Burke Airport site, pushing the shoreline further and further out into Lake Erie and creating 450-acres of new land. The historic shorelines of Lake Erie are shown in figure 48. The last dike wall was constructed in 1998 and is quickly running out of storage capacity. The port authority estimates that a new dike system will need to be constructed by 2018. Burke cannot extend any further into the lake because of a shipping lane located between the airport and the harbor wall. A new 157-acre site at East 55th Street has been proposed at a cost of $277 million (Baird, 2009). This location is further from the mouth of the river, therefore making it more expensive to transport the dredge.

With Burke Airport remaining in operation, the current site must remain relatively flat. This land use prevents the opportunity to explore options of piling up the dredge into large mounds. This option could potentially extend the capacity of Burke as a disposal site for many years, delaying the enormous cost of creating a new dike system elsewhere. The mounds could be pre-designed to evolve into recreational landscapes that would become an amenity for the city after the site has finished serving its useful purpose as a dredge disposal site.

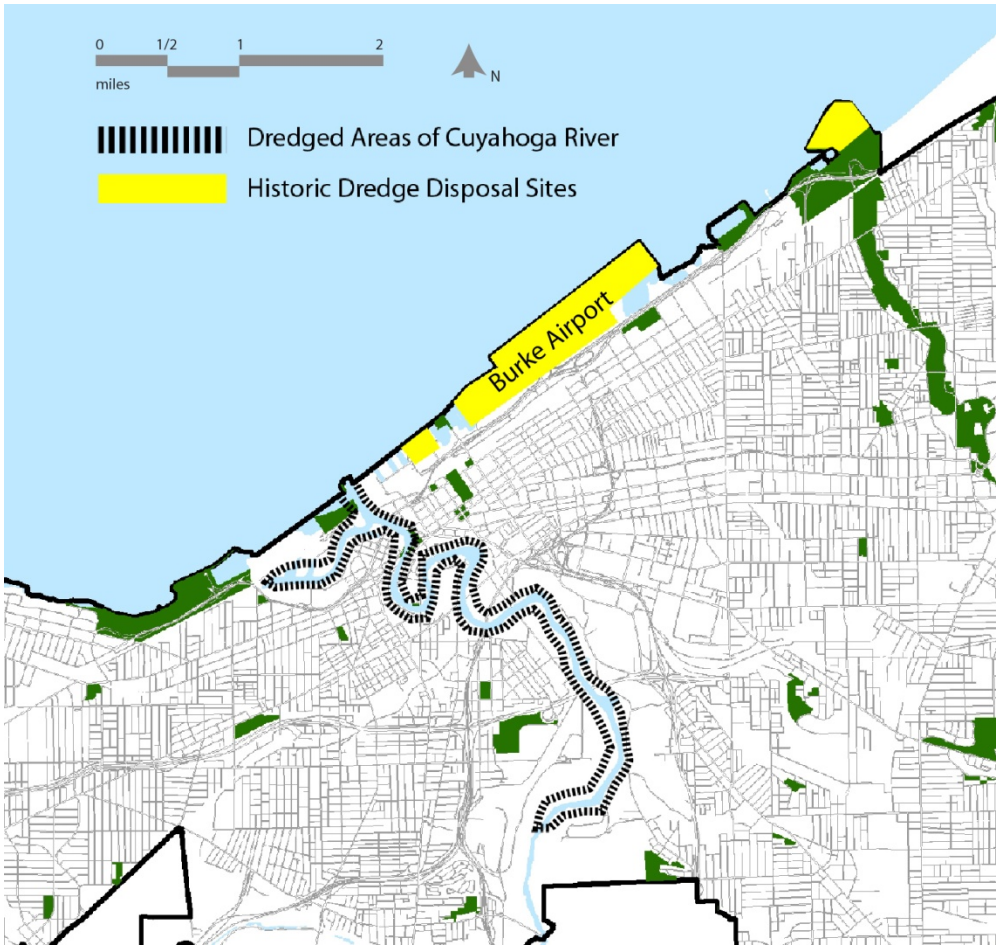


Figure 37. Map of Dredging Areas on Cuyahoga River and Cleveland Harbor and Historic Disposal Sites (Busa) (Data Source: Cleveland Port Authority)

Chapter 6: Design Proposal

DESIGN GOALS & OBJECTIVES

The overarching objective for this design project is to re-purpose the Burke Airport site to improve the social, environmental, and economic health of Downtown Cleveland as part of a more sustainable shrinking city. The following goals emerged in response to the site inventory and analysis, which identified a number of opportunities and constraints for the airport site.

Physical Goals

- Improve connections between existing city neighborhoods and the waterfront, reducing the impact of the rail and highway corridor as physical barriers to the waterfront
- Increase access to nature and recreation for existing, under-served neighborhoods
- Create continuous public access along the waterfront
- Re-purpose vacant land in a way that is cost-effective and productive
- Create opportunities for new mixed-use, waterfront development within walking distance of existing transit and downtown
- Improve Lakefront Bikeway Trail to promote safe connection to neighborhoods and lakefront destinations

Environmental Goals

- Improve water quality within the Cleveland Harbor by mitigating combined sewer overflows
- Create fish and wildlife habitat along the Lake Erie Shoreline
- Use dredge soils as a resource for creating recreational and ecological landscapes that add value to the community.

Economic Goals

- Reduce city budget liabilities by consolidating or eliminating underutilized highway and airport infrastructure
- Leverage existing medical and higher education institutions as drivers of the future economy.
- Embrace existing industrial land uses and encourage new green businesses
- Stabilize/increase land value of existing private property by increasing access to transit, park space, and the waterfront.
- Create a lakefront recreation landscape that will be a tourist attraction for the city and region

Social/Cultural Goals

- Improve the livability and quality of life for existing residents by increasing access to housing options, transit, park space, and the waterfront.
- Create diverse opportunities for people to engage with the water.

- Engage Cleveland State University with improved access to the waterfront and opportunities for student housing and field research
- Preserve and leverage Cleveland's unique history, culture, and ecology to enhance sense of place

LIVING SYSTEMS CONCEPT

The master plan for the 450-acre Burke Airport site was conceived out of the idea of creating a city that is part of a healthy living system. This concept developed out of the understanding that sustainability is not a finished product or deliverable that is achieved at a single point in time. It is not simply about implementing efficient technologies that remain in a static state for the duration of their useful lives. Sustainability is about life – a process by which living things such as wildlife, plants, people, businesses, neighborhoods, and industry ensure their long-term viability. It is about the process of building relationships between living things, whereby each component supports and is supported by the large whole. Using this approach, this design seeks to re-imagine the Burke Airport site as a means for building positive and restorative relationships between the living environmental, social, and economic systems of downtown Cleveland.

INTEGRATION OF NATURAL & BUILT SYSTEMS

Currently, Cleveland's built and natural systems are disconnected. The urban fabric is isolated from the waterfront by topography, distance, and transportation infrastructure. These barriers inhibit the positive impact that the lake might have on the economy and quality of life of urban residents. At the

same time, the health of the natural system is continually eroded by the built system through the ongoing processes of shoreline hardening, water pollution, forest fragmenting, ground paving, river channelization, etc. To help mend this broken relationship, this design seeks to integrate natural and built systems by extending the urban fabric to the water's edge while also restoring natural system function within the city. This mutually beneficial relationship will help create a sustainable living system in which the city benefits from ecosystem services, such as clean water, recreation landscapes, improved aesthetics, and increased real estate values. At the same time, the natural system will benefit from the creation of habitat, restoration of natural hydrology, and increased environmental awareness of urban residents.

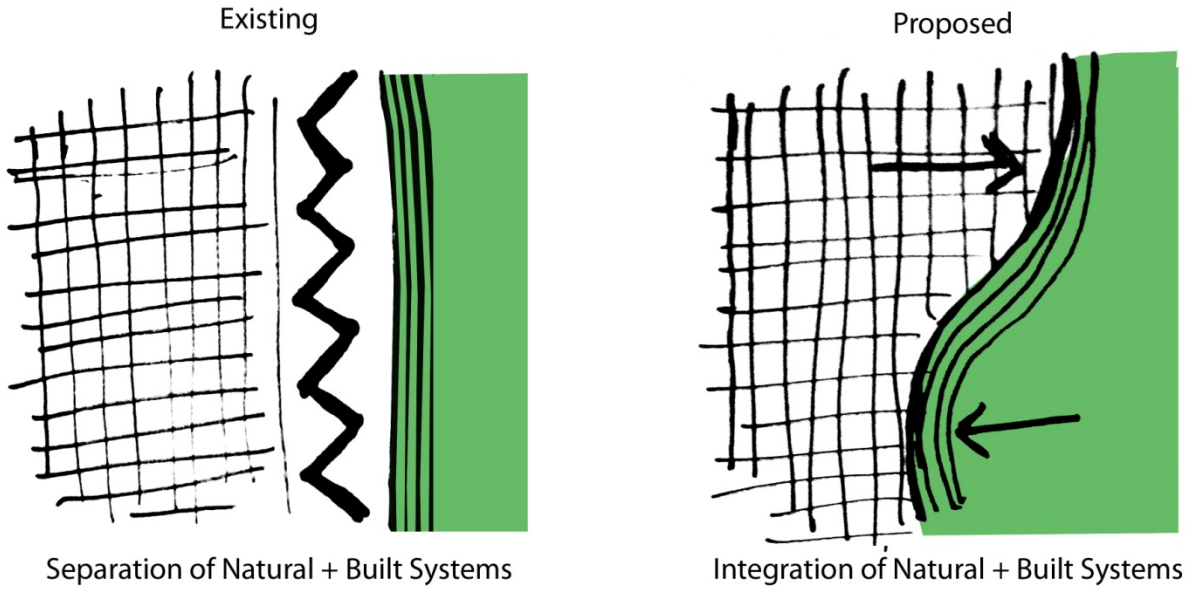


Figure 38. Concept Diagram Showing the Integration of Natural and Built Systems (Busa)

SUSTAINABLE RESOURCE USE

Resource Use is a key component to the living system. Both humans and natural ecosystems depend on natural resources for their healthy functioning. In recent human history, society has treated resources as being abundant and disposable. As a result, we use resources inefficiently and then create large amounts of waste when we are finished with their one-time use. Disposable resource use has been ever-present throughout Burke's history as a site for private aircraft (inefficient fossil fuel consumption), dumping dredge (treating land as waste), and out-letting combined sewer overflows into the lake (water as waste). The proposed design of the Burke Airport site looks to create a more sustainable pattern of resource use by creating a green infrastructure system to clean waste water before it enters the lake. It can also become a landscape that generates clean renewable energy through on-site wind and solar production, while recycling dredge material to create new recreational and ecological landscapes. This concept is described in the diagram in figure 50 below.

Figure 39. Sustainable Resource Use Concept Diagram (Busa)

SUTAINABLE LOCAL ECONOMY

As described in figure 40, one of the major problems facing shrinking cities is the downward spiral of underinvestment that results from a shrinking

population. This design seeks to create a viable economic system within the city and neighborhood by leveraging the theoretical, philosophical, and technical knowledge developed at the academies (Cleveland State University and Case Western Reserve University), developing it into physical tools through local research and development institutions (Cleveland Clinic, NASA), taking advantage of accessible infrastructure (rail, shipping, highways), and utilizing skills and machinery of earlier industries (tool and die) to attract new clean industries that invite healthy residential and recreational environments.

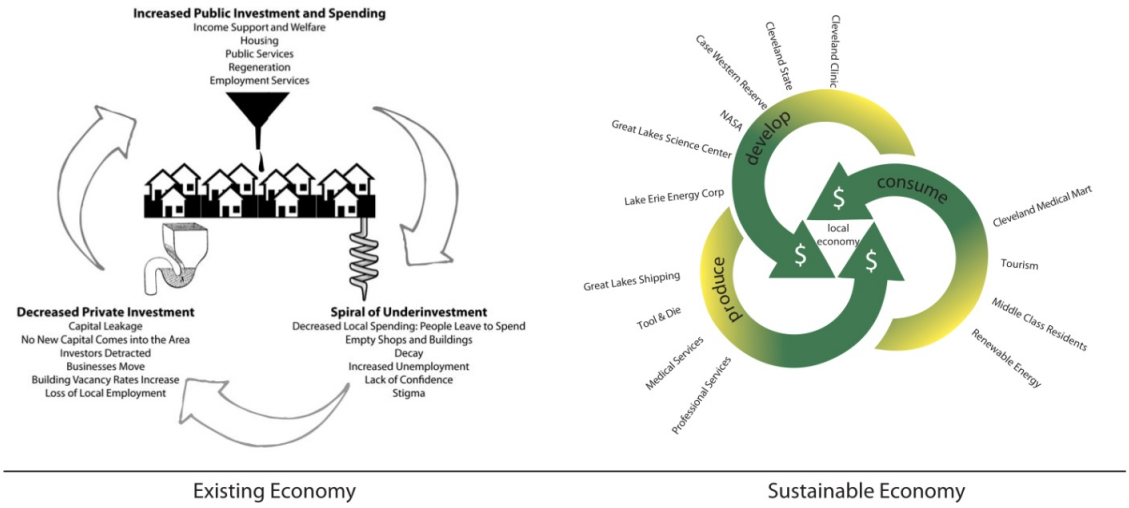


Figure 40. Sustainable Local Economy Concept Diagram (Busa)

MASTER PLAN

The master plan for the Burke Airport site, shown in figure 41, evolved in response to context by attempting to re-define relationships between built and natural systems, and creating an urban landscape that strengthens the local economy while setting up a framework for sustainable resource use. The design

responds to the city's plan to focus development in areas within walking distance of existing neighborhood centers and transit stations.

Figure 41. Proposed Master Plan for Burke Airport Site (Busa)

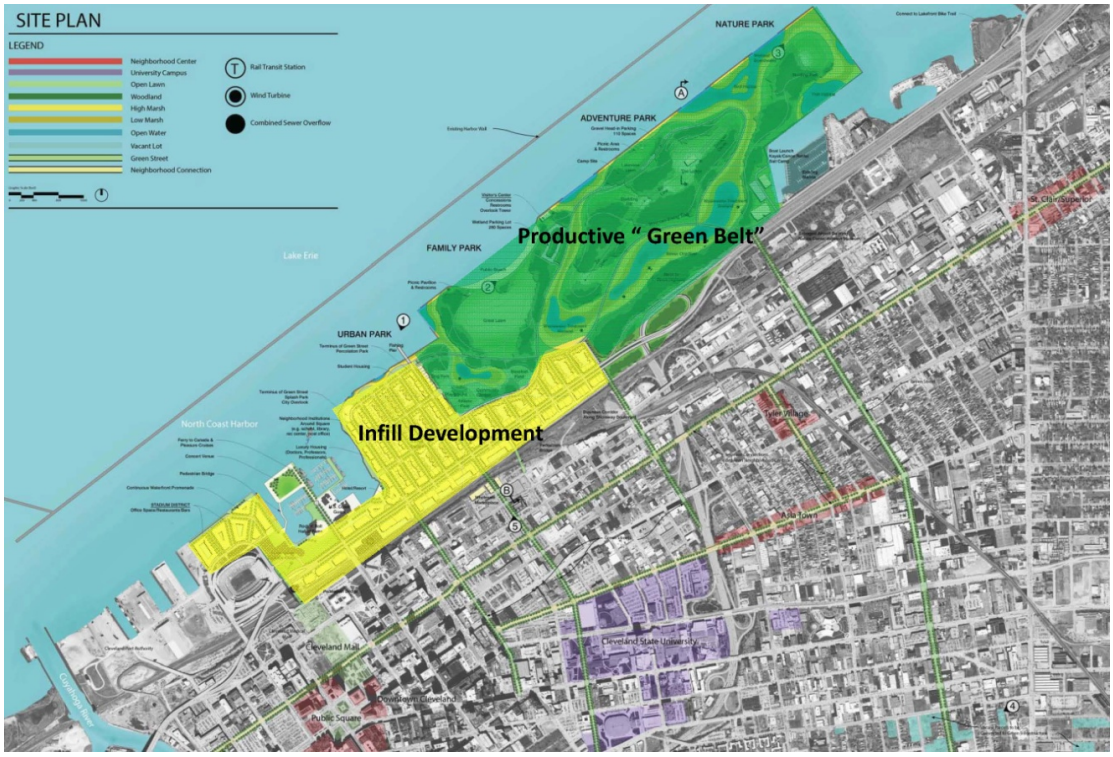


Figure 42. Diagram Showing Application of the Urban Islands Concept to the Burke Airport Site (Busa)

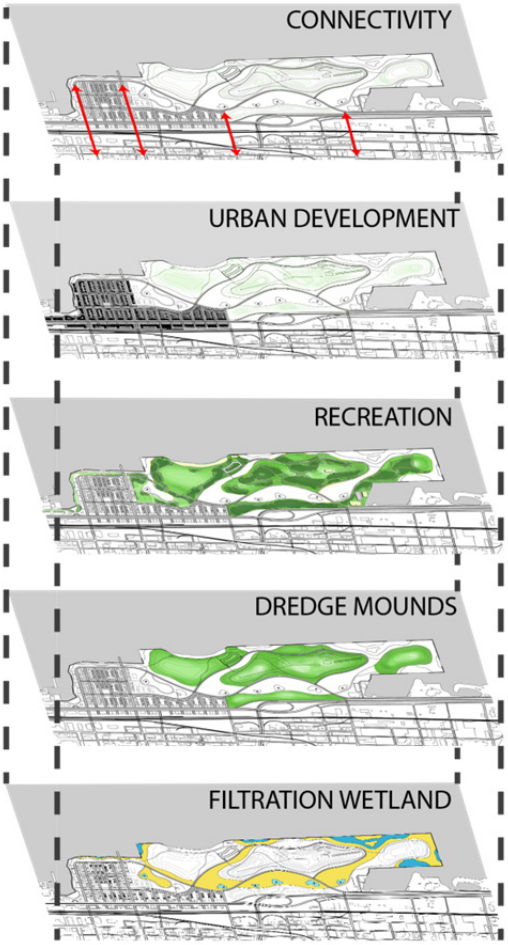


Figure 43. Proposed Layers of Functional Programming for Burke Airport Site (Busa)

The site consists of two main areas – a new lakefront development district on the western portion of the site and a multi-functional “green belt” landscape on the eastern portion of the site. Even though the city is shrinking, the neighborhood of downtown has been growing over the past decade, increasing in population by more than 50%. The lakefront development district creates an opportunity to leverage waterfront property that is close to transit, Cleveland State University, and downtown to attract new residents and businesses. The idea is to create a live/work/play downtown that builds on the strengths of the existing neighborhood as an employment and cultural center, adding new mixed

use development, more than two miles of continuous public access to Lake Erie, and a diverse recreational landscape.

A majority of the site lies outside the walkable distance to the downtown neighborhood center and transit, and therefore is not slated to be developed into urban land uses. This land, however, can still serve an important role in promoting the social, economic, and environmental health of the neighborhood. This multi-functional landscape is designed within a framework of green infrastructure, which captures and cleans polluted water from combined sewer overflows before it enters the lake. Large areas between the wetlands are designed to accommodate future dredge material that will transform the flat topography of the airport into a series of raised mounds that are sized and shaped to accommodate future recreational programming and habitat re-construction.

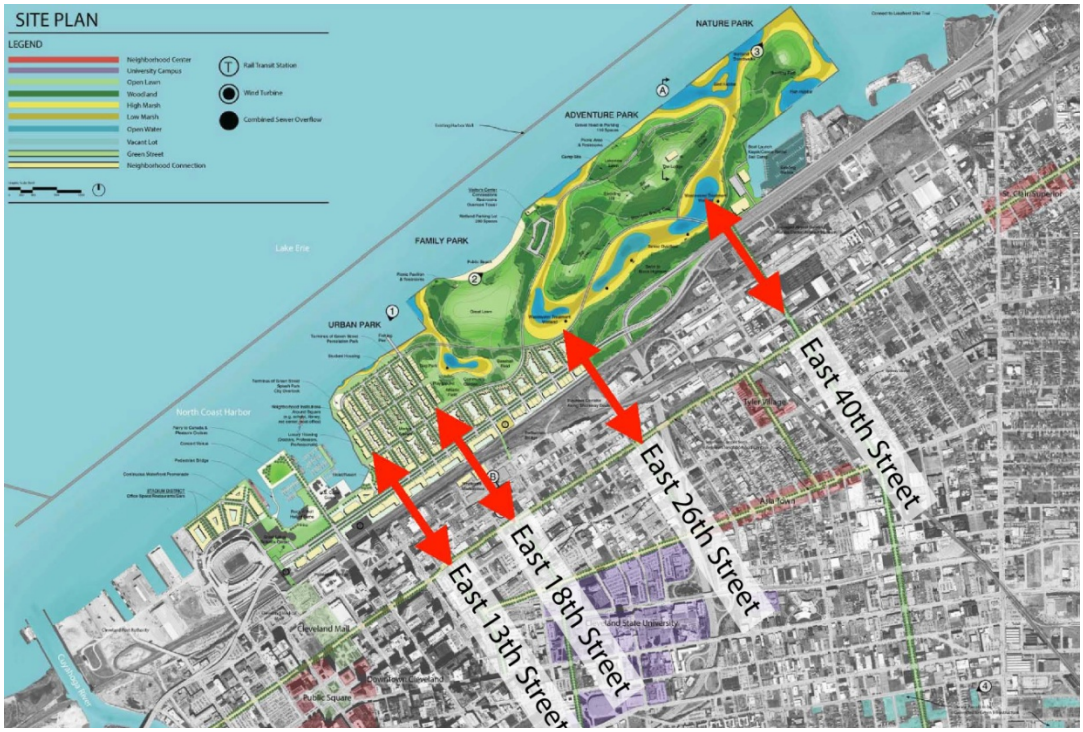


Figure 44. Proposed New Street Connections to the Lake Erie Waterfront (Busa)

Figure 45. Proposed Bicycle and Pedestrian Circulation Diagram (Busa)

Circulation and connectivity played a paramount role in laying out the master plan. The human circulation system is designed to coincide with the water circulation system, where streets, people and water can flow seamlessly from inland neighborhoods to the lake. As shown in figure 44, new street connections are proposed at E. 13th Street (linking to downtown), East 18th Street (linking to Cleveland State University), East 26th Street (linking to Cleveland State University and Interstate 90) and E. 40th Street (linking to Tyler Village and Asia Town Neighborhoods) in order to maximize the positive impact of the site on existing inland neighborhoods and institutions. These street connections are designed to be multi-modal access points that include bike lanes, pedestrian

crossings, vehicular corridors, and bio-retention water filtration cells. The proposed circulation also responds to the existing Cleveland Lakefront Bikeway, accommodating bicycle commuters with direct through-access while also creating a destination for recreational bikers with spur connections to secondary trails and programmed park spaces.

GREEN INFRASTRUCTURE FRAMEWORK

Green Infrastructure is defined as an interconnected network of landscapes that uses natural systems to facilitate stormwater infiltration and improve water quality. This system provides the skeletal framework for the design of the Burke Airport Master Plan, helping to organize and inform human circulation systems, neighborhood development patterns, and park programming. As described in Chapter 5, there are seven combined sewer overflows on the Burke Airport site that dump millions of gallons of untreated sewage and stormwater into the lake each year. The proposed green infrastructure system responds to the problem at the watershed level, creating landscapes capable of capturing and cleaning the water before it enters the lake. The sewer catchment area reaches approximately 2-miles inland from the Burke Airport site and encompasses portions of the city that warrant three different approaches to solving the problem - one dealing with small vacant parcels scattered among the remnant homes of a shrinking neighborhood, one confronting more densely developed portion of the city with little available vacant land, and the other addressing the large vacant parcel at the Burke Airport site. Figure 46 shows

the sewer catchment area and the proposed three-pronged green infrastructure system, consisting of vacant land rain gardens, green streets, and wastewater treatment wetlands.

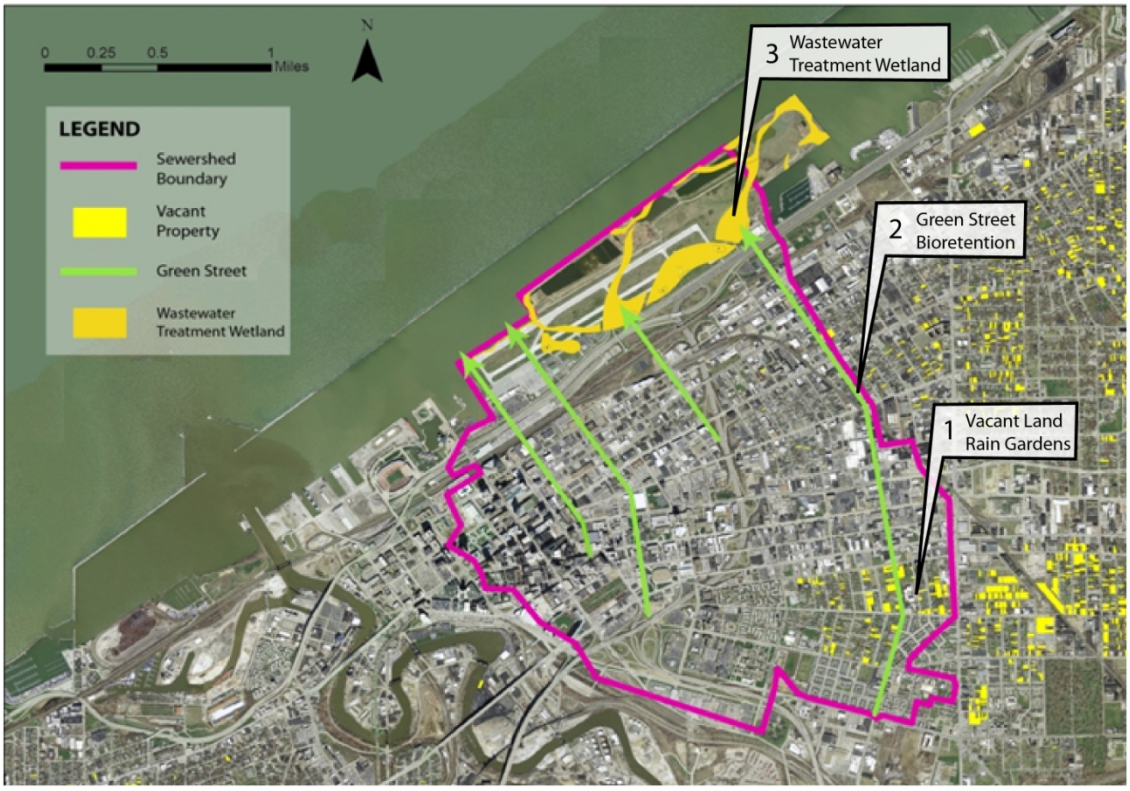


Figure 46. Proposed Three-Part Green Infrastructure System (Busa & Cleveland GIS)

SYSTEM 1: RAIN GARDENS (for small vacant parcels)

The first leg of the system begins adaptively re-uses vacant land parcels in an a residential neighborhood that has experienced significant population loss. There are 123 vacant parcels owned by the city land bank and inside the Burke sewer catchment area. The parcels, when counted together, account for 15-acres of open space that is not serving any productive purpose for the neighborhood or city. These parcels can easily be converted to stormwater management rain gardens that can capture and infiltrate water flowing off

surrounding roofs and streets. These lots will need to be re-graded to take on the form of catchment basins that are set at a lower elevation than the street and neighboring houses. Small sections of the street curb are removed and water is directed from the street into the rain garden where it can disperse and soak into the ground. At the same time, roof drains from surrounding houses are disconnected from city storm drains and re-directed into the rain garden. Paths and benches can be incorporated into the design to make the rain gardens into park amenities for local residents. The photographs in figure 47 show what this vacant land conversion might look like.

Existing soil conditions and water volume will dictate the exact specifications for how the rain garden is constructed, but will typically include 3-feet of well drained soil and 6-inches of surface ponding capacity. Plants that are well-adapted to periods of both inundation and drought are to be chosen for planting. As described in chapter 5, these 123-vacant properties are theoretically capable of holding more than 5 million gallons of water from a single storm event. This would help reduce combined sewer overflows into Lake Erie at Burke Airport by 26% during a 5-year storm event. Further study is required to examine existing land cover, quantity of impervious area, slope, and soil conditions within the catchment area to determine their true holding capacity.

Figure 47. Before and After Images Showing Conversion of Small Vacant Parcels to Rain Garden Green Infrastructure to Capture Runoff from Adjacent Roofs and Pavement (Busa & Bing Maps)

SYSTEM 2: GREEN STREETS (for densely developed urban areas)

The second leg of the system addresses stormwater management in areas targeted for densification and infill development. Here, there is not the

abundance of vacant land found in other portions of the shrinking city and therefore using entire sites for stormwater management is not practical. Under these circumstances, private property owners should be encouraged and incentivized to implement low impact strategies, such as green roofs, porous pavements, and small rain gardens that help reduce stormwater runoff from their sites. In the public realm, green streets can be designed to capture and clean street runoff using bioretention cells located between the street curb and the sidewalk. These landscapes are designed to intercept street water before it reaches a storm drain inlet.

As discussed earlier in the chapter, the master plan identifies four new street connections between existing inland neighborhoods and the waterfront. These streets are not designed merely for human circulation, but also as landscapes to capture and convey water. The plan calls for 4.2 miles of green streets (excluding intersections). If these streets are designed with 6' wide bioretention cells and to the same specifications as the vacant land rain gardens, the green streets are capable of capturing over 1.3 million gallons of water (See calculations below). This translates into a reduction of overflow volume at Burke Airport by 6.6% during a 5-year storm.

Green Street Storage Capacity Calculations

4.2 miles = 22,176 feet (street length)

22,176 feet x 2 (sides of street) x 60% (street coverage) x 6' (cell width) =159,667 square feet of coverage

159,667 (square feet) x 0.5' (ponding depth)
+159,667 (square feet) x 3' (soil mix) x 20% (air space in soil)
=175,633 cubic feet (storage capacity)

175,633 cubic feet = 1,313,826 Gallons (6.6% of total overflow volume)

The design of the bioretention cells are intended to create a rhythm and repetition of form and materials that establishes a distinctive street character, painting the pathway to the waterfront. Public art and interpretive signage should be incorporated into the streetscape to promote environmental education and neighborhood culture. The green streets will help provide continuity even as the neighborhood transitions from university campus to light industry to new mixed use development. Each of the green streets is designed to terminate at a larger infiltration landscape, either a percolation park or a constructed wetland, marking the beginning of the third system of treatment – a wastewater treatment wetland. Figure 48 is an illustration showing how the green street will help create a strong visual link between existing neighborhoods and the waterfront. Figure 59 shows a sketch of how the green street can be designed on bridge connections that span the existing railroad tracks.

Figure 48. Before and After Images Showing Green Street Improvements Along East 18th Street in Existing Industrial Neighborhood (Busa)

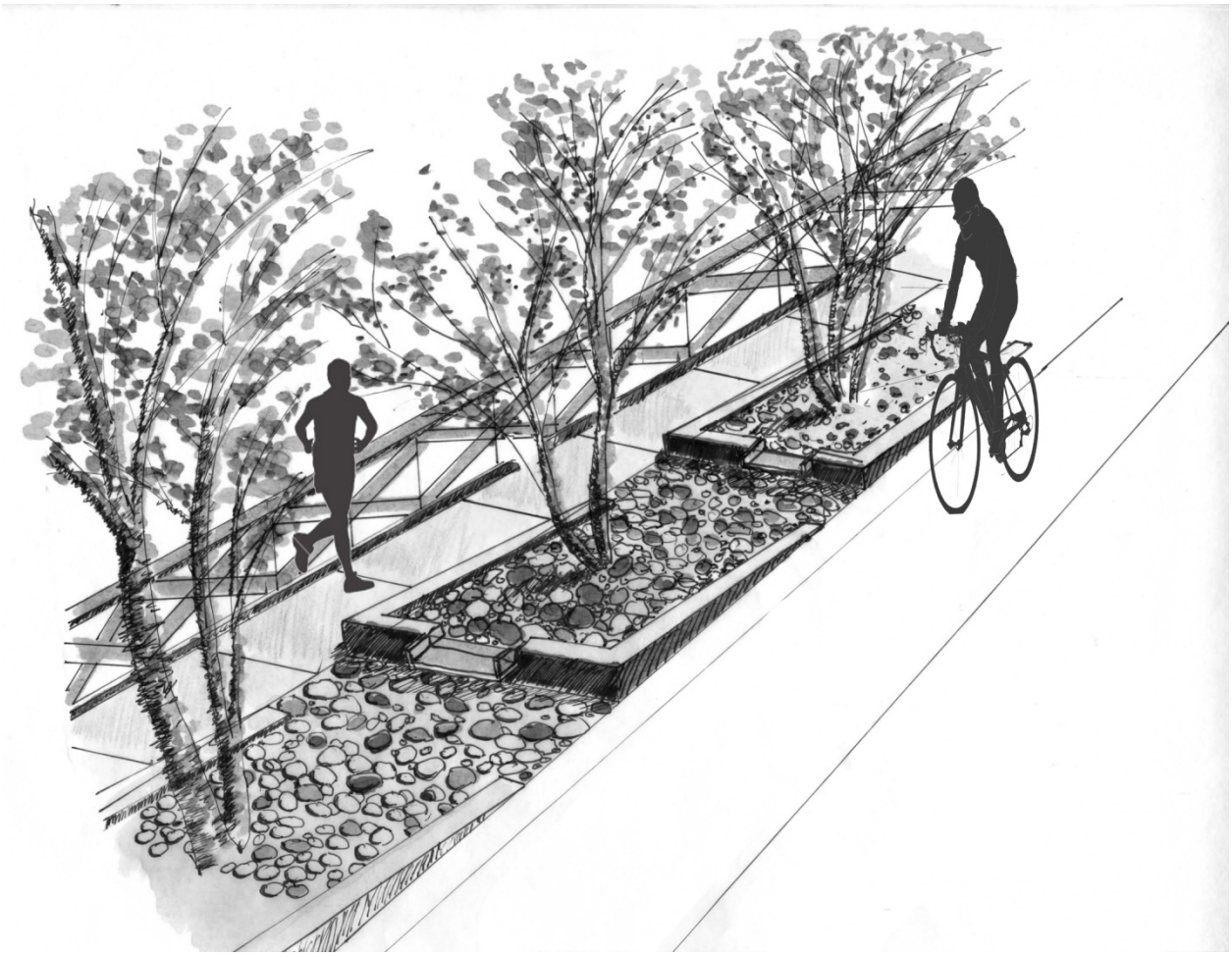


Figure 49. Perspective Drawing showing Green Street on Bridge Over Existing Rail Corridor (Busa)

SYSTEM 3: CONSTRUCTED WETLANDS FOR WASTEWATER TREATMENT (for large vacant parcels)

While the first two legs of the green infrastructure system captured and treated stormwater before it became mixed with building wastewater and sewage, the third leg is designed to capture and treat combined sewage. Constructed wetlands treatment systems are engineered systems that utilize the natural processes involving wetland vegetation, soils, and their associated microbes to assist in treating wastewater. They are designed to take advantage

of many of the same processes that occur within natural wetlands, but do so within a more controlled environment.

Constructed wetlands treatment systems generally fall into one of two categories: Subsurface Flow Systems and Free Water Surface Systems. Because Subsurface Flow Systems are not designed to handle large inundations of wastewater that are expected to occur during large storm events, this is not an option for treating the combined sewer overflows that occur at Burke Airport. Free Water Surface Systems, on the other hand, are designed to simulate natural wetlands, with the water flowing over the soil surface at shallow depths. Free Water Surface Systems not only improve water quality, but also provide high quality wetland habitat for waterfowl and other wildlife. As long as enough surface area is provided to allow the volume of water to spread out to a maximum depth of 1 foot, then the Free Water Surface System can be used at the Burke Airport site.

This type of wetland treatment system is typically constructed in basins or channels with an impermeable barrier beneath to limit seepage into the groundwater. The constructed wetland is composed of four main parts: a mechanical large solids removal system, a sediment removal forebay, a main wetland area, and a micropool. The first part of the system occurs while the water is still in the pipe. This initial treatment process uses a mechanical device, such as a rotating bar screen, to remove large solids such as branches or garbage and deposits them in a dumpster. Each of the seven overflow locations would

require this equipment and dumpsters would need to be monitored after each overflow event.

Once large solids are removed, the wastewater then leaves the pipe and enters the constructed wetland through a sediment removal forebay. Here, the fine sediments and coarse organic material settle out of the water as velocity slows. The water then overflows into the main wetland area. Here, the water from all overflow pipes on the site are combined. Once in the main wetland, water passes through emergent vegetation, acting like a sponge to filter organic materials and soluble nutrients. Finally, water collects in a micropool at the outlet, where remaining solids are removed and water is cooled prior to discharge into Lake Erie. A weir at the outlet point is set an elevation that controls the maximum ponding capacity of the wetland. This system concept is further described in figures 59 and 60.

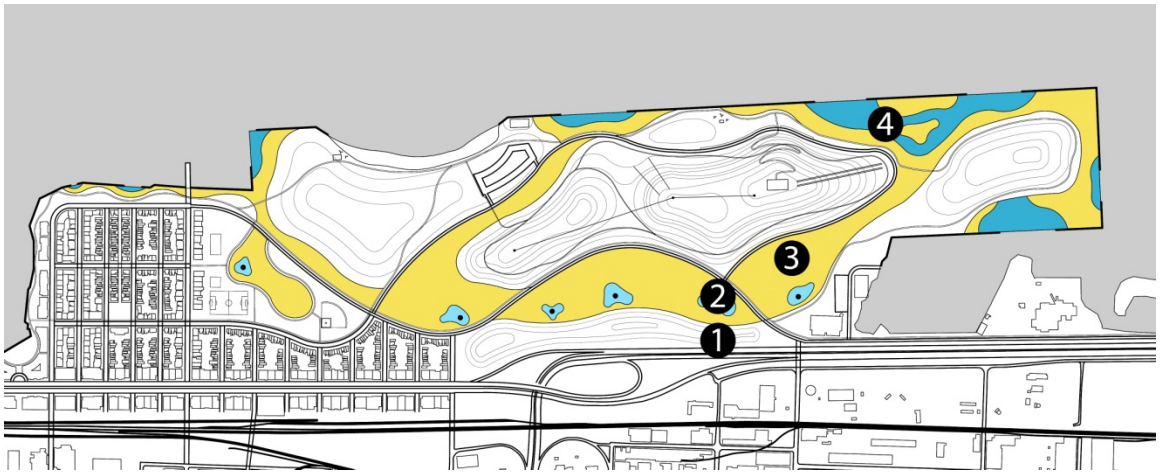


Figure 50. Plan Diagram Showing the Component Parts of the Wastewater Treatment Wetland System (Busa)

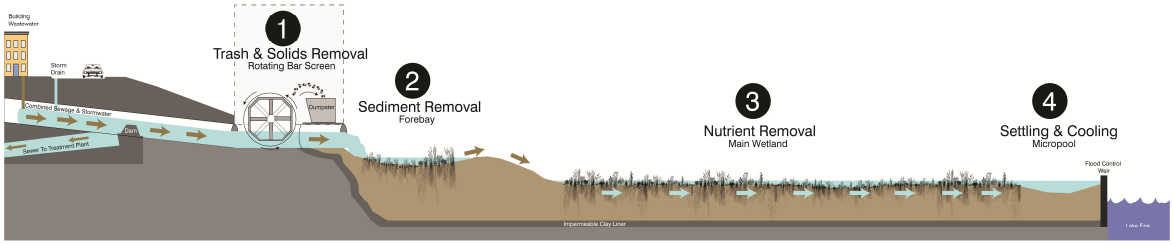


Figure 51. Section Diagram Showing Component Parts of the Proposed Wastewater Treatment Wetland System (Busa)

Given that vacant land rain gardens and green streets can reduce the overflow by approximately 32.6% (26% vacant land rain gardens + 6% Green Streets) during a 5-year storm event, the constructed wetland must be sized to handle the remaining 68.4% (or 13.5 million gallons). If the wetland is designed for a maximum 1 foot ponding capacity, then a minimum of 41.4 acres of wetland are needed to capture and treat the overflow of a five-year storm event (see calculations below).

Constructed Wetland Storage Capacity Calculations

13.5 million gallons (estimated overflow volume) = 41.4 acre-feet

41.4 acre-feet (estimated overflow volume) x 1 foot (ponding depth) = 41.4 acres

The 41-acre minimum size requirement and the locations of the combined sewer outfalls dictated how land on the site was allocated. The system was designed to allow dredge mounds to be constructed on the land between the wetlands. The design of the wetlands also helped establish an edge to the development district and gave direction and form to the street circulation within the park. In addition to filtering wastewater, the constructed wetland will improve

ecosystem function by creating new habitat and will provide a wonderful park amenity that will give urban residents a chance to engage with the Lake Erie ecology.

LAKEFRONT DEVELOPMENT DISTRICT

Figure 52. Proposed Plan for Lakefront Development District on Burke Airport Site. (Busa)

Figure 53. Photograph of Scale Model Looking East, Illustrating Proposed Master Plan for Burke Airport Site (Busa)

The Lakefront Development District is designed to bring the built form of the city to the water's edge. This design takes the recipe for sustainable neighborhood development, described in Chapter 4, and applies it to the site, taking into account the existing context of streets, topography, land uses, and transit stations. The location and extent of the new neighborhood was dictated by proximity to the downtown business district, Cleveland State University, and existing transit stations. With the establishment of the Cleveland Medical Mart, Cleveland has strong growth potential for medical-related businesses and product manufacturers. Creating development opportunities on the lakefront, along with good access to transit, housing, recreation, and entertainment, makes

this an attractive site for prospective businesses. Cleveland State University also has untapped potential to help build a more sustainable downtown. Currently, only 4% of students and faculty live within walking distance to the campus. By encouraging students to live downtown, the neighborhood will attract a young creative class that will help build a strong foundation of middle class residents. Located just 0.6 miles from the edge of campus, the Burke site could provide new opportunities for student and faculty housing.

Street hierarchy and public space form the backbone of the community design. The existing Cleveland Memorial Shoreway will be converted to a new urban boulevard, helping to convert this street from a dividing street to a uniting street. The new boulevard will become the neighborhood's "primary" street, and feature sidewalks, bikelanes, on-street parking, at-grade intersections, and building street frontages. It's high traffic volumes will make this street a natural location for the highest building density (5-7 story buildings) and the location of mixed use commercial and retail. While the Shoreway Boulevard is the neighborhoods "primary" street, East 13th, East 18th, and East 26th Streets are the "secondary" streets that connect to existing inland neighborhoods. These streets will still have relatively high densities (3-5 story buildings), but will have a more even mix of residential and commercial land uses. Remaining streets are tertiary streets that will be quieter with lower building heights (2-4 stories). These streets will have lower traffic volumes and are most suitable for residential land uses. At the center of the neighborhood, a small public square surrounded by local institutions – an elementary school, library, churches, and a recreation center –

will become the multi-functional meeting place in the community. Continuous public access along the waterfront makes this a valuable space to all members of the community, not just those people who own lakefront property.

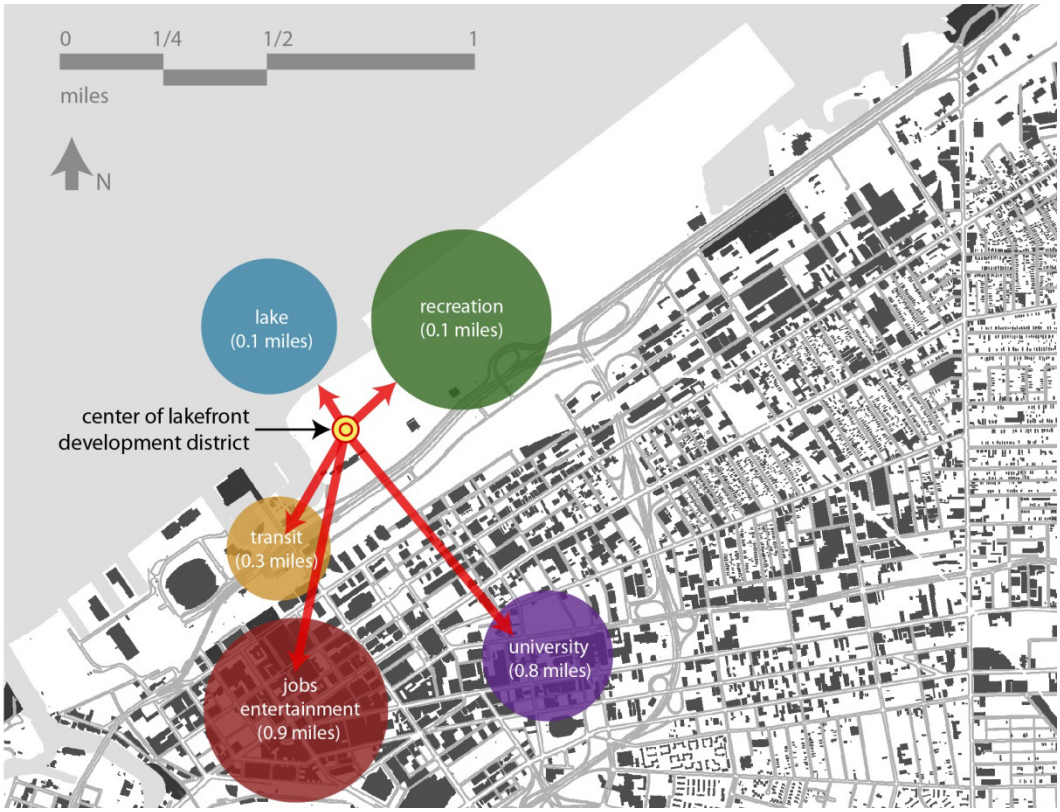


Figure 54. Walkability Diagram Showing Proximity of Proposed Lakefront Development District to Local Destinations (Busa & Cleveland GIS)

Figure 55. Land Use Diagram for Proposed Lakefront Development District (Busa & Cleveland GIS)

Figure 56 shows a detailed design for the intersection of East 18th Street and Shoreway Boulevard, studying the connection between the new development district and the existing industrial district to the south. A gateway plaza was created to establish the threshold of arrival to the waterfront. Ground-level shops and restaurants are set back from the street and face on the public plaza. Currently, distance, topography, railroad and highway create a significant barrier between the city and the waterfront. Conversion of the shoreway to an urban boulevard, new bridge connections, and the construction of new buildings along the waterfront will help lessen these barriers significantly. In addition, figure 57 illustrated how the elevation of the new Boulevard is raised to help

lessen the elevation change between the top of the bluff and the waterfront. This has multiple advantages, as it will depress the grade of the railroad tracks below street grade (making them less noticeable), allow two levels of underground parking in buildings backing the tracks, and will create a stronger visual connection to the lake as people will now be looking down hill toward the water.

This design looks to embrace the industrial district and explore ways of exploiting its location along a major rail right-of-way. The site plan also hints at the idea of constructing a train platform along the south edge of the tracks and an elevator system to transport goods between the lower level of the tracks and the industrial district above. This could create an opportunity for a new wholesale marketplace, similar to the New Fulton Fish Market in New York City, where food and other goods can be traded, sorted, and even sold to the public. This could bring a dynamic and meaningful transition between the old and new neighborhoods. It would also create an industrial ballet along the edge of the bluff, as a person could stand on the bridge and watch goods transition from train to platform to elevator to marketplace.

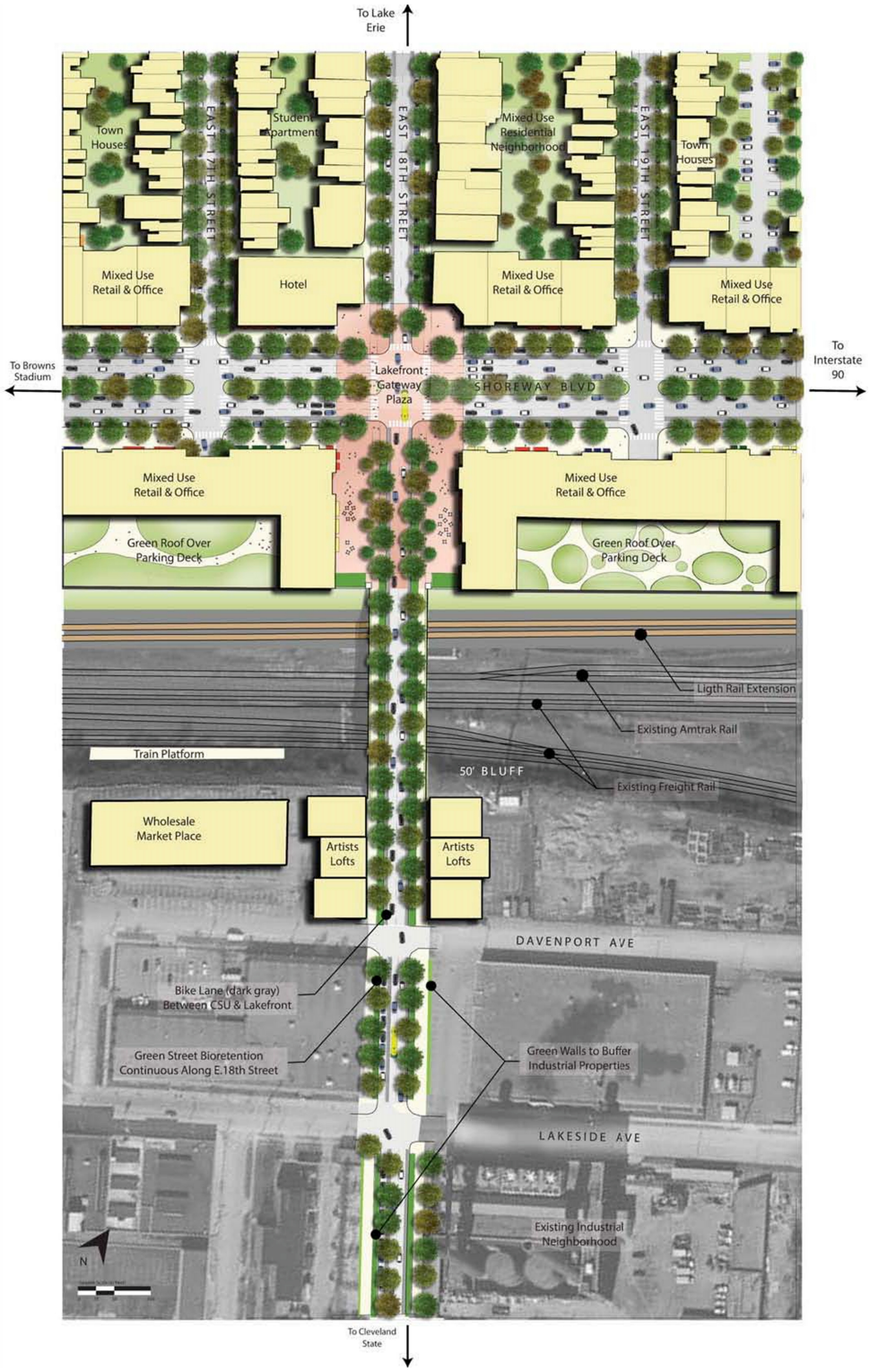


Figure 56. Detail Plan for Intersection of East 18th Street and Shoreway Boulevard (Busa & Cleveland GIS)

Figure 57. Section Through East 18th Street Showing Improved Connection to the Waterfront and Conversion of Memorial Shoreway to an Urban Boulevard (Busa)

DREDGE DISPOSAL SYSTEM

As discussed in chapter 5, the Burke Airport site has been a historic repository for dredge material that has been carved out of the bottom of the river and harbor to make way for large industrial shipping vessels. For years, dredge has been placed along the edge of Burke with no future intended use for the land, treating it as a waste product. This design explores the alternative of using the dredge to create a recreational and ecological landscape that would help support both human and natural systems. The land is designed to be shaped and molded to fit specific programming needs for future park uses and wildlife habitat.

The wastewater treatment wetland sets the boundary limits for each of the dredge mounds shown in figure 58. The system is designed so that as dredge gradually accumulates and each mound is completed, it can be planted and transformed into usable park space. As a result, the park will grow and evolve over a period of several decades. Because dredge is transported via large barges, each mound area is designed to have direct access to the shoreline. In

total, more than 333,000 cubic yards of dredge is scraped off the bottom of the Cuyahoga River shipping channels each year. The programming of park spaces demanded certain topographical constraints, prompting the five mounds to range from 30 feet to 100 feet in height. The table in figure 59 shows the volume of dredge needed to construct each of the mounds and the number of years that they will take to build.

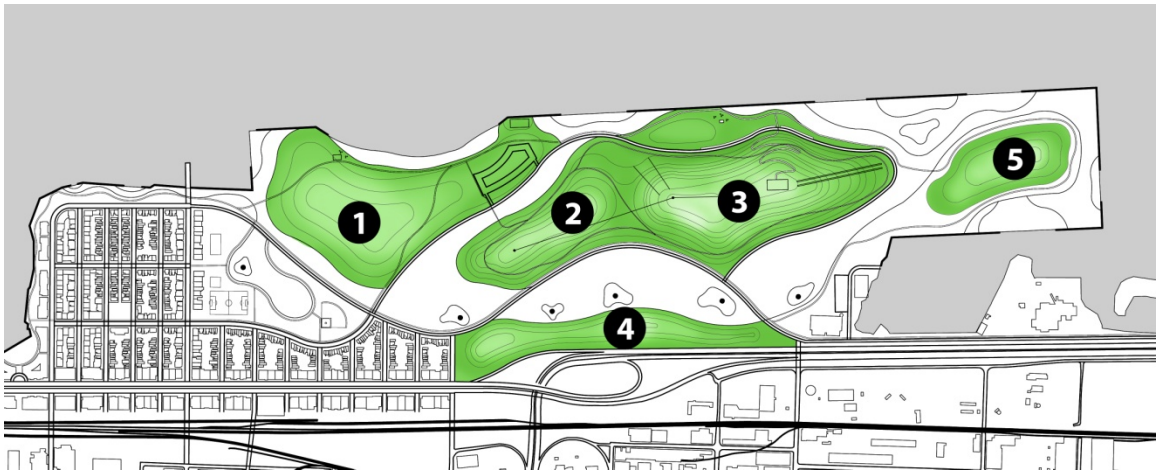


Figure 58. Plan Diagram Showing Locations of Dredge Mounds in Order of Construction (Busa)

	Soil Volume (cubic yards)	**Years of Accumulation**
Mound 1	1.05 million	3.2
Mound 2	1.33 million	4.0
Mound 3	3.70 million	11.2
Mound 4	.38 million	1.2
Mound 5	.55 million	1.7
Total	**7.01 Million**	**21.3**

Figure 59. Table Showing Soil Volume Capacity and Predicted Years of Accumulation Needed to Construct Dredge Mounds (Busa)

Figure 60. Photograph of Scale Model Looking West, Illustrating Topography of Dredge Mounds Designed to Support Specific Recreational Programming (Busa)

By adding an additional 21.3 years of capacity to this disposal site, the city is able to delay significant capital expenditures, estimated at $272 million, needed to construct a new dike system and dredge disposal site. As much of this cost is shouldered by local governments and local companies that depend on the shipping channel, this move will help lower their operating costs and improve the health of the Cleveland economy.

One of the problems with dredge is its low fertility and structural instability. The dredge disposal facilities at Green Bay and Milwaukee have pioneered methods for improving dredge soils, and have experimented with adding wood chips and decomposed sewage sludge to boost the soil's organic content.

Further study needs to be done to determine the constraints of Cleveland's dredge soils. Many cities throughout the United States are built on dredge, including much of Boston's Back Bay Neighborhood and New York's Lower Manhattan. This site offers a tremendous opportunity as a research site for local universities in the fields of engineering and soil science, for both the dredge mounds and the wastewater treatment system.

RECREATIONAL PROGRAMMING

The goal of the park design was to create a varied and multi-dimensional landscape that can become a destination for the entire city and region. As shown in figure 61, the park spaces change in character as you move away from downtown, transitioning incrementally from urban to natural landscapes. This again becomes an overlay of human and natural systems, as each quadrant of the park promoting the co-existence of the "natural" and the "man-made" as the spaces transition from urban park to family park to adventure park to nature park. A description of the programmed elements for each main section of the park will be described in the following sections.

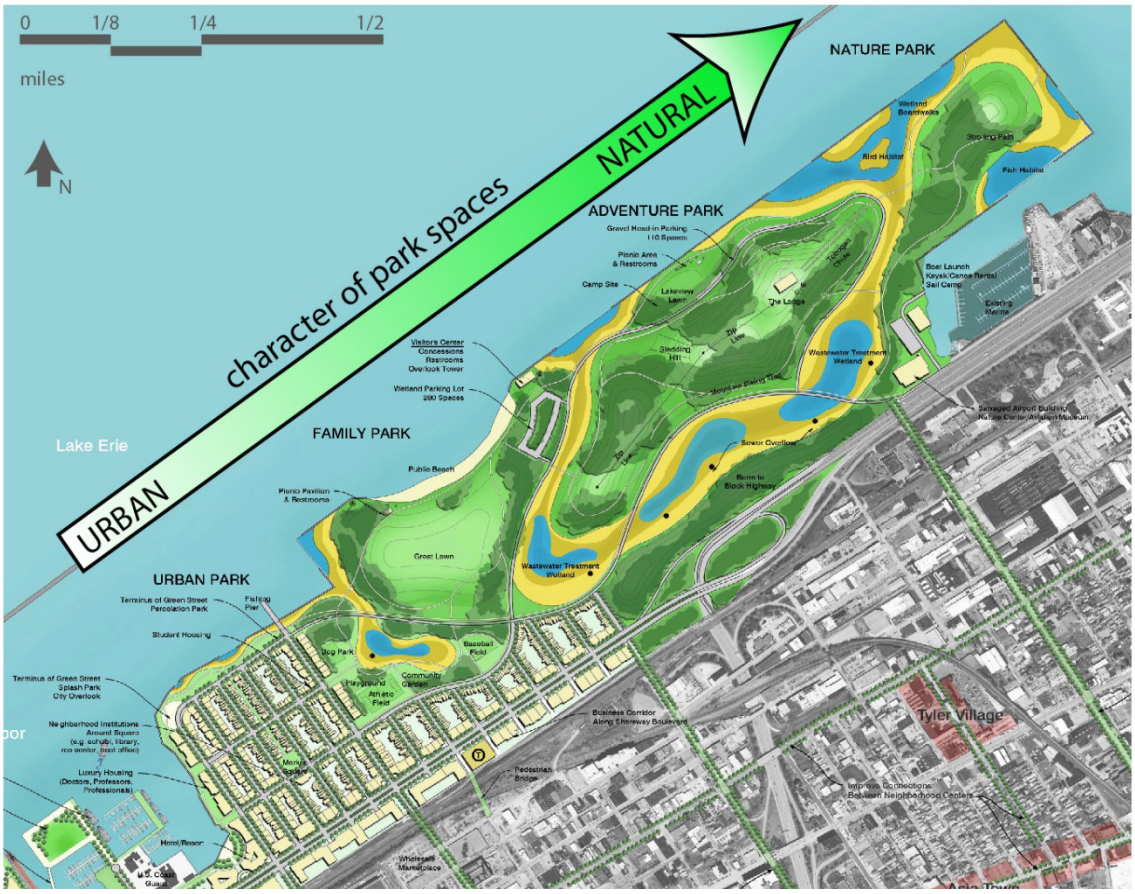


Figure 61. Park Space Master Plan Showing Progression of Landscape Character from Urban to Natural (Busa)

URBAN PARK

The Lakefront Development District features continuous public space along the waterfront. This long and linear space is designed to have strong visual and spatial connections between the built environment and the waterfront. City streets are designed to be corridors from the neighborhood to the waterfront, always terminating at access points with views of the water, rather than views of buildings or other structures. The western shoreline is imagined as a waterfront promenade, including wide paths, benches, trees, and café tables. Here, the hard edge of the shoreline allows buildings, people, and boats to approach the

edge between water and land. As one strolls toward the northern side of the urban waterfront, the shoreline softens as portions the dike wall are removed to allow lake water to flow into coastal freshwater marshes, attracting fish and wildlife to the water's edge. Percolation landscapes mark the terminuses of the two green streets that intersect the waterfront, allowing a final place of cleansing and infiltration before water flows into the lake. A fishing pier juts out into the lake, creating the opportunity to become completely surrounded by water where people can fish and enjoy the expansive views of Lake Erie as freighters move in and out of the harbor.

On the eastern edge of the neighborhood, the park takes on a different character than the waterfront. Because it is so close to where people live, it is programmed for short and frequent visits that make a local park valuable to the community. Here, athletic fields, a playground, a community garden, and dog park provide a landscape for daily community enjoyment. This is the place where kids go to kick the soccer ball or throw the Frisbee and where adults go to walk the dog or read a book.

Figure 62. Perspective Showing Proposed Waterfront Park, New Urban Development, and Existing Downtown Cleveland Beyond (Busa)

FAMILY PARK

Transitioning further from the city, the park transitions as you cross over the constructed wetland and enter the family park. This landscape is designed for the longer visits, creating venues for family gatherings, group activities, and recreation trails. This park features a broad public beach, large open lawn space, picnic tables, pavilions, and a visitor's center with restrooms, concessions, and an overlook tower. This landscape was designed with gently rolling topography to provide easy circulation, space for parking, and a large flat lawn space that can be used for concerts, festivals, and other events.

Figure 63. Perspective Showing Proposed Family Park with Beach, Trail, Great Lawn, and Visitor Center Beyond (Busa)

ADVENTURE PARK

Moving further from downtown, the park again changes in character as the topography steepens and plantings become more wild and untamed. This space is designed to become an adventure park, hosting activities such as hiking, mountain biking, sledding, tobogganing, zip lining, and cross county skiing. The steep topography will provide dramatic views of Lake Erie and the Cleveland skyline. The proposed programming for this space will create a unique and dynamic landscape unlike any recreation opportunity in the city. This landscape will become a draw for young people, adventure seekers, and eco-tourists.

Figure 64. Section Through Adventure Park Showing Relationship Between Lake Erie Shoreline and Proposed Dredge Mound (Busa)

NATURE PARK

The nature park completes the transition from the urban to the natural environment. Here, creation of habitat was the primary objective, creating nuanced topography that will support a wide variety of coastal wetland plant species, birds, fish, and other wildlife. Here, the dike wall is disassembled in several places to allow interaction between the larger lake ecosystem and the newly created habitat. The higher ground is designed to mimic the landscape of natural coastal dunes that appear throughout the Great Lakes region. Boardwalks and paths are designed to allow people to enjoy this natural landscape and become completely immersed in the Lake Erie ecology. The existing Aviation High School building is intended to become an aviation museum and nature center for the park. This complex will also host a kayak and canoe rental, boat launch, and summer sail camp for local children, allowing them to enjoy the benefits of living in a city on one of the largest freshwater lakes in the world. A short paddle to the east, and people will arrive at the Lakefront Nature Preserve, located just 2 miles away.

Figure 65. Perspective Showing Proposed Nature Park & Boardwalk at Easternmost Portion of Burke Airport Site (Busa)

Chapter 7: Conclusions

ANTICIPATED OUTCOMES

By closing Burke Lakefront Airport, Cleveland has an opportunity to convert a social, economic, and environmental liability into a neighborhood asset that cleans polluted water, mitigates dredge waste, supports diverse opportunities for recreation, creates new habitat, connects the city to the waterfront, and promote sustainable development with access to existing transit and jobs. In a broader context, this project offers potential to re-brand the city, positively impact the city budget , strengthen local economies, create a live/work/play downtown, and support a healthy and thriving Lake Erie ecosystem. These anticipated outcomes are further explained below.

RE-BRANDING THE CITY

Cleveland has an opportunity to make a loud and emphatic statement on its Lake Erie doorstep that city is at the forefront of sustainable thinking and innovation. For prospective businesses and residents, it would help suppress the stigma that Cleveland is a deteriorating rust belt city, and demonstrate the promising future that the city holds. Re-branding the city will help put Cleveland back in the national spotlight and help the city attract new investment and businesses, all while helping to stabilize the city's population and economy.

IMPACTS ON CITY BUDGET

The proposed master plan for the Burke Lakefront Airport site will significantly improve the economic position of the city by helping to reduce unnecessary expenditures and by converting under-utilized airport land into an economic generator for the city. A summary of the anticipated economic impacts of the proposed design are described below.

- Closing the Airport

  The airport currently loses approximately $1.5 million per year. Though this money is absorbed in the budget of Cleveland Hopkins, this move will help make Cleveland airports more competitive in the national market by lowering operating expenses. As described in Chapter 5, Cuyahoga County's Airports have plenty of capacity to absorb Burke's flights.

- Road Diet for the Cleveland Memorial Shoreway

  Converting the shoreway to an urban boulevard will cost some money up-front, but will cost less to maintain and repair over the long run. The new boulevard will reduce the number of travel lanes from eight to six, and replace on/off ramps with at-grade intersections, which require less structure and paving area.

- Dredging Costs

  The Cleveland Port Authority is anticipating an investment of $272 million to construct a new dike system for dredge disposal in the next 5-10 years. By mounding up the dredge across Burke Airport site, the

proposed design creates capacity for an additional 21 years of storage. By delaying construction of a new dredge disposal site, the city will save hundreds of millions of dollars. Furthermore, by treating the dredge as a resource rather than a waste product, the city is adding significant value to its waterfront by creating new recreational and ecological landscapes.

- Green Infrastructure

  The northeast Ohio Sewer District plans to spend more than $3 billion over the next 25 years to address its combined sewer overflow problems. The proposed three-part green infrastructure system will cost significantly less to install than planned gray infrastructure solutions, which include the construction of new storage tunnels and water treatment facilities. Green infrastructure also creates social and aesthetic value in existing neighborhoods by transforming vacant land and urban streetscapes into appealing neighborhood amenities that harbor people and wildlife in addition to stormwater.

- New Tax Generating Properties

  Currently the city does not generate any property taxes on Burke Airport's 450-acres because the property is city-owned. With the creation of new development district that allows private ownership of portions of the property, the city will generate significant new revenue through property taxes. Improved street connections to the waterfront are also likely to add value to existing inland properties.

- New Streets and Bridges

  Construction of new streets and bridge connections will warrant a need for up-front capital expenditures by the city. These costs, however, are investing in the long-term health and function of downtown and will likely be a good economic investment in the long run. The streets can be built incrementally in response to market demand and the evolution of the dredge mounds, beginning with East 13th Street and moving east.

- Park Construction & Maintenance

  The creation of more than 300-acres of park space will require significant up-front costs. Much of this cost will be absorbed within the normal operating budgets of the Cleveland Port Authority and Northeast Ohio Sewer District, which will pay for the construction of the mounds and constructed wastewater treatment wetlands. As for the park, public-private partnerships may be an option that will help shift park maintenance and programming responsibilities to the private sector. Much of the park space has been designed to be relatively low maintenance, with large areas of reforestation and wetland.

STRENGTHENING LOCAL ECONOMIES

- Medical Industry

  Cleveland is a national leader in the medical industry and with the opening of the new Cleveland Medical Mart beneath Cleveland Mall,

there is strong potential for new medical-related businesses and manufacturers to move to Cleveland. The new lakefront development district will help make downtown a live/work/play environment that is well connected to the waterfront, Medical Mart, and major hospitals. This will offer a strong draw for companies to locate in downtown rather than suburban office parks. New waterfront housing and park space will also help attract Cleveland's young doctor's and medical professionals to live in the city.

- Local Universities

  It was a major goal of this design to create a strong link between Cleveland State University and the Waterfront. With only 4% of students living on or near campus currently, there is an untapped market of young creative class citizens that could be attracted to live downtown. With new street, bus, bicycle, and pedestrian routes along East 18th Street and East 26th Street, student housing near the waterfront will be well connected to the university. With more students living locally, Cleveland State University could cut the size of its commuter parking lots which deaden the vibrancy of the campus. The site also provides opportunities for field research and experimentation in relation to constructed wasterwater treatment wetlands, engineering of dredge disposal mounds, habitat restoration, and renewable energy production.

- Manufacturing Industry

  Industry can still be an important factor in the long term economic health of downtown Cleveland. Precision tool and die shops can play a significant role in the production of green products that will be needed in a low carbon world. Creating a neighborhood environment that fosters collaboration and dialogue between product manufacturers and local universities will lead to innovation and product advancement. By creating new public landscapes and increasing walkabilty and street life, this design will spark new opportunities for chance encounters and cross-pollination between academia and industry. Demonstration of sustainable products and technologies in the public realm, such as wind turbines and green streets, will help attract new green industries to the neighborhood.

A LIVE/WORK/PLAY DOWNTOWN

Downtown has many existing assets, such as employment opportunities, sports and music venues, restaurants, and clubs that make it an attractive environment for young people. By adding affordable housing options, public access to the lake, and new recreation landscapes all within the walkable range of jobs, entertainment, the university, and transit, downtown will become an even stronger draw for new residents. Attracting a stable middle class population to

Cleveland begins with attracting young people and students that will help begin to change the perceptions of urban living.

A CLEAN LAKE AND THRIVING ECOSYSTEM

Today, the Lake Erie Ecosystem ends at the shoreline. This design seeks to blur the edges between the natural systems of Lake Erie and the built systems of the city, allowing the two to become overlapped and entwined with one another. By cleaning the water and creating a large area of shoreline habitat, native fish, birds, and wildlife will thrive in downtown Cleveland. The goal is to make Cleveland Harbor a fishable, swimmable water body capable of hosting a wide variety of recreation activities where people can enjoy the lake and its unique ecosystem.

A RECIPE FOR OTHER SHRINKING CITIES

This project employs a methodology for addressing shrinking city issues that can be applied to most shrinking cities. Cleveland's development patterns, which include both viable neighborhoods and failing neighborhoods, are common to nearly all post-industrial shrinking cities. Public policy, urban planning, and site design must work in concert to re-purpose vacant land as a productive resource for addressing specific local problems while promoting a high standard of living for existing urban residents. Below is a list of policy and urban design recommendations that were employed in this project and can be generalized to other shrinking cities.

(1) SET THE RULES OF THE LAND BANK TO CONTROL DEVELOPMENT PATTERNS

Cleveland's strategy for confronting its shrinking city problems relies heavily on the city's ability to control development patterns. The land bank, which aquires and assembles vacant properties, gives the city the power to do this. With the goal of shrinking the city's urban footprint into an archipeligo of viable neighborhood islands, the city must make clear rules for determinning the future use of vacant land. City government must work together to strategize how vacant land should be re-purposed, identifying potential land uses and funding streams to implement new projects.

(2) USE VACANT LAND TO SOLVE SPECIFIC LOCAL PROBLEMS

In shrinking areas of the city that are expected to continue to de-populate, vacant land can become a mechanism to solve specific local problems. In the case of downtown Cleveland, combined sewer overflows, dredge disposal, lack of recreation space, and a shortage of housing options were compromising the economic, social, and environmental sustainability of downtown. Vacant land presented an opportunity to address these problems while adding value to the existing community. Other areas of the city will certainly have different opportunities and problems than were presented in this case study. City's should not attempt to create blanket solutions to vacant land problems. Cleveland has already begun to map specific opportunities and constraints for possible vacant land uses across the city in its published document *8 Ideas for Re-Using Vacant Land*. This is a great starting point for creating site-specific vacant land

solutions. It is critical that government department's work together to evaluate, fund, and maintain vacant land projects.

(3) IDENTIFY OPPORTUNITIES TO DOWNSIZE OR REMOVE UNDER-UTILIZED INFRASTRUCTURE

Infrastructure maintenance is an ever-growing problem in the shrinking city. There may be opportunities to eliminate unnecessary expenditures by demolishing or downsizing existing infrastructure, making it appropriately scaled to the city's smaller population. Municipal airports, highways, and under-used city streets may be opportunities for downsizing, as demonstrated by this project. The city should look to remove streets (including street lights, sidewalks, sewers, and water service in areas that have been vacated), decreasing the amount of utility infrastructure that needs to be maintained over the long run. In many cases, there may be only a few houses left on a street. Once a street reaches a critical level of vacancy, (80% for example), then the city should provide financial incentives for remaining residents to re-locate to more viable neighborhoods. It may be cheaper to pay residents $50,000 to re-locate than to continue spending money on infrastructure maintenance and repair. This strategy is already being employed in Youngstown, OH.

(4) CONNECT THE NEIGHBORHOOD NODES

Within the smaller city footprint envisioned by the urban islands strategy, connections between neighborhood centers are critically important to maintaining

city function. The neighborhood islands should not be isolated entities, but part of an interconnected web of streets and transit that allows the whole to be stronger than the sum of its parts. Money saved from de-constructing minor streets in rapidly de-populating areas of the city should be re-invested in the connecting streets between viable neighborhoods. The idea is not just to create vehicular connections, but multi-modal connections between neighborhoods. The scale and population density of the neighborhood nodes will dictate the scale of investment in the street. Connecting large nodes may warrant new public transportation, such as light rail, street car, or rapid bus service (as was recently constructed between Downtown and University Circle, Cleveland's two largest and most viable neighborhoods). Smaller nodes may warrant more appropriately scaled street improvements, incorporating sidewalk improvements, street trees, on-street parking, and/or bike lanes. Not all neighborhoods have large enough populations to warrant construction of new transit facilities.

(5) IDENTIFY & INVEST IN COMMUNITY ASSETS

When cities shrink, they do not do so uniformly. Some neighborhoods manage to maintain stable populations while others decline rapidly. These neighborhoods generally have community assets that are not present in other, less viable parts of the city. These community assets (e.g. cultural institutions, places of employment, public transit, etc.) are critical to the long-term viability of a neighborhood and should be invested in. In the case of this project, Cleveland State University, Lake Erie, Cleveland Medical Mart, and access to existing rail

transit were determined to be key assets to the downtown neighborhood. Investment in the built environment was shaped to exploit, develop, and enhance these existing community assets.

Designing for the shrinking city demands that policy makers and design professionals break away from traditional strategies that rely heavily on growth for long-term success. Vacant land must be viewed as an asset that can be re-purposed in ways that enhance environmental, social, and economic sustainability of the shrinking city.

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