USING URBAN TRIAGE TO PLAN FOR WALKABILITY

by

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A REPORT

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abstract

Literature shows that walkable neighborhoods have the potential to significantly decrease the carbon footprint of cities by lessening the need to drive, as well as providing many health, economic, and social benefits to society. The goal of this research, therefore, was to devise a practical strategy to create walkable places in the car-oriented city of Wichita, Kansas. A necessary component of this strategy is an "urban triage," described by Jeff Speck in *Walkable City* as identifying streets with the most existing potential and concentrating limited resources to their improvement (2012, 254).

This report employed an urban triage of Wichita at two scales based on three central characteristics of walkability: urban fabric, dense street network and connectivity. Comparing block length and link to node ratio, I built a case for downtown, which is organized on a traditional grid of streets, over a typical shopping district organized around the more modern hierarchical pattern of streets. Within downtown, I further narrowed the study area primarily based on urban fabric, the degree to which streets are enclosed by buildings. I created a method to measure urban fabric, using aerial imagery and street views, taking into account the consistency of the street wall, height of buildings and foreground.

The strongest complete corridor, in terms of urban fabric, and three potential links between that corridor and downtown's largest event space, became the study area for further analysis. A rubric, based on characteristics of walkability extrapolated from literature, served as the instrument to measure the attributes of each block in the study area. Each attribute, as well as the characteristics that they create, yielded a map, contrasting strong and weak blocks. This analysis provided the detailed information necessary to create an informed conceptual strategy to resolve these weaknesses. Selective building infill resolved gaps in the urban fabric, road diets and improved crossings restored modal balance to the street, and a new pedestrian corridor completed a broken street and activated an existing park.

Using Urban Triage to Plan for Walkability

a block by block analysis of pedestrian potential in downtown Wichita, Kansas

Steven Holt

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introduction

Driving has become a proud tradition in America. From 1960 to 2000, the average American's yearly driving increased from 4,000 to 10,000 miles per year (Frumkin, Frank and Jackson 2004). Driving has become the primary mode of travel, replacing more active forms of transportation like walking, biking, and public transit. Not coincidentally, over that same span, the share of overweight Americans has nearly tripled (2004). Other growing health problems like respiratory disease, cardiovascular disease, and cancer are increased by the emissions from the cars driving those extra miles (2004). These problems have significant costs to society. Health care costs, as a share of GDP, have nearly tripled over that same span (Speck 2012). The costs of driving are also shouldered by the families who drive. Transportation costs, as a share of the family budget, rose from "10 percent in 1960 to 20 percent in 2001" (Lutz and Lutz Fernandez 2010, 80) quoted in (Speck 2012, 30). This inevitably puts pressure on the housing budget for those families. In fact, during the recession, "Housing prices on the fringe tended to drop at twice the metropolitan average while walkable urban housing tended to maintain value" (Leinberger 2011). Perhaps the largest side effect of all this additional driving is the damage to the climate. Ninety seven percent of climate scientists agree that the climate is warming due to the greenhouse gases emitted from human activities (NASA 2015). The most car-dependent cities are the biggest contributors to this problem (Speck 2012). To be fair, obesity, climate change, and the American economy are all complicated issues with many variables and contributors. But the a cultural shift away from walking and toward driving has played a fundamental role in all of these issues.

Figure 1 shows the rise in vehicle miles traveled from 1960 to 2010. Figure 2 shows global carbon dioxide emissions from 1900 to 2008.

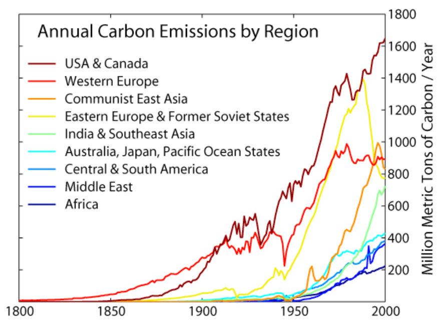


Figure 2: Annual Carbon Emissions by Region

Source: Carbon Dioxide Information Analysis Center

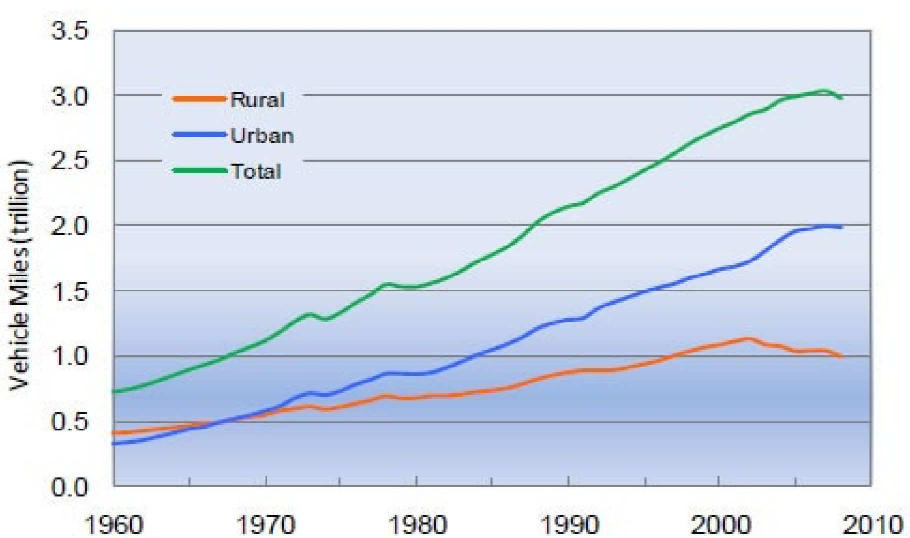


Figure 1: The Rise in Vehicle Miles Traveled

Source: Office of Highway Policy Information, US Department of Transportation

A common solution to these problems, and the goal of this research, is to prioritize design interventions that encourage people to make walking a part of their daily routine. The concept is simple, but implementation is not. The car has dominated our lifestyle, and become the driving force in all of our building habits, creating an urban environment with abundantly wide roads, fast traffic, and sparse destinations amid vast parking lots. This is great for the people driving cars, but terrible for everyone else. This widespread pattern of development cannot be reversed or repaired overnight, but with a focused and strategic effort, it is possible to create walkable neighborhoods that are functional and inviting enough to coax people out of their suburban sprawling counterparts, and into neighborhoods that promote active and healthier lifestyles.

"Better design, design that improves on sprawl in ways that seduce people out of their cars and onto sidewalks and bicycle paths, may be a critical part of increasing physical activity and promoting public health" (Frumkin, Frank and Jackson 2004, 108).

This master's project research contributes to a team of four other students with individual projects revolving around a central premise of Creative Placemaking. Our team, individually studying social resilience, public art, temporary landscapes, and active transportation, developed designs for a pop-up park on Douglas Avenue between Market Street and Main Street in Wichita, Kansas. We participated in a design charrette conducted by the Wichita Downtown Development Corporation, which has secured a grant to develop a vacant lot as a temporary public space. This space is scheduled to be constructed in summer 2015.

Several authors have described the qualities of a city that make it walkable, and how these qualities also contribute to the overall health and sustainability of a city. These qualities often contribute to one another, but in cities that are less walkable, are often largely absent. Jeff Speck argues in his book *Walkable City: How Downtown can Save America, One Step at a Time*, that cities seeking to encourage walkability must concentrate their resources to the streets and blocks with the most potential, which are the those within a dense, well-connected street network and framed by buildings with engaging store fronts. He calls this prioritized method "urban triage," and stresses its importance to create a meaningful impact on a limited budget.

"Where can spending the least money make the most difference?" (Speck 2012, 254).

As an individual master's project effort, I built upon Speck's concept of urban triage by narrowing the scope of study from the city of Wichita to a few blocks downtown, and developing an instrument to record, through visual assessment, the relative quality of the many street characteristics that foster walkability. Mapping the study area in terms of these qualities revealed strong street segments, weak street segments, and important weak links in the overall system. Based on the poor qualities of these missing links, I developed a prioritized strategy of improvement to resolve these weaknesses.

the creative placemaking group and the role of walkability

the creative placemaking group

The Creative Placemaking umbrella group, composed of five masters students in landscape architecture, established an early goal to combine our individual studies into a collaborative design proposal. We set out to establish a relationship with a community stakeholder to find an opportunity to design and build a temporary landscape that could contribute value to an urban setting in need. After exploring options in Manhattan, Kansas and Wichita, Kansas, we formed a partnership with the Wichita Downtown Development Corporation (WDDC). Having secured a grant to develop a 'Pop-Up Park' to fill a literal and figurative 'hole' on Douglas Avenue between Main and Market Streets, the WDDC invited our team to contribute to a design charrette and develop design details for potential site furnishings.

The umbrella group, which has individually developed research projects around temporary landscapes, site identity, public light art, active transportation, and this study of walkability, has incorporated studied concepts into design development of this site. The goal of the WDDC, and of this group, is to transform a void in the urban fabric into a vibrant and active asset. If the built project is successful in these goals, the WDDC plans to replicate this concept in other catalyst sites around downtown.

walkability research project

As an individual project within the Creative Placemaking group, the goal of this research project was to find the best approach, in terms of utilizing existing potential, to improve the walkability of downtown Wichita.

In particular, this project aims to identify streets with strong urban fabric and a dense well connected street network, qualities of cities that are not easily corrected. Because most cities have a limited budget to invest in the pedestrian realm, it's important to invest responsibly. This means concentrating interventions to streets that are strong in these three qualities, and thus have more inherent potential for walkability.

This study evaluated how the pop-up park can contribute to the walkability of downtown, and whether or not the site was an ideal candidate for this type of intervention. Additionally, through a more comprehensive study of downtown, I identified an ideal space to replicate this pop-up park and re-create the type of space developed as a group.

background: the value of walkability

Walkability is often one on many interrelated goals, along with revitalizing downtown, strengthening neighborhoods, improving safety, improving public transportation, that cities spell out for themselves in planning documents. By all of these measures, walkable neighborhoods tend to perform better than those oriented around the car. Promoting walkability, therefore, should be near the top of any city's priority list.

Figure 3: I Bike Douglas

Source: Wichita Downtown Development Corporation

Figure 4: Tallgrass Film Festival

Source: Tallgrass Film Festival

Figure 5: Old Town Farmers Market

Source: Wichita Downtown Development Corporation

environment

carbon emissions

Dense urban environments like New York City are sometimes perceived as ecological disasters due to their congested traffic, pollution, the prevalence of pavement, and the absence of natural features. However, in terms of energy consumption and carbon emissions, New York City and especially Manhattan are premier models for environmentally friendly living in America. The average resident of New York generates 7.1 metric tons of greenhouse gases per year, which is less than 30 percent of the national average of 24.5 metric tons. Manhattanites generate even less (Owen 2009).

The reason for this is simple: density and connectivity make it much more feasible to accomplish daily tasks without the use of cars. In fact, an astonishing 54 percent of New York City households, and 77 percent of Manhattan households, have no car at all. Far fewer own a second car, and those who do own a car use it sparingly, mainly for trips out of town (Owen 2009).

energy consumption

Furthermore, residents of these dense urban settings use much less electricity per capita. Part of this is simply smaller living spaces, meaning less space to heat and cool and light up. Additionally, large buildings can share heat, lights, and utilities, in ways that single family homes cannot. This adds up to New York City households consuming less than thirty percent of what the average household in Dallas consumes (Owen 2009).

the pre-car advantage

The character, density, and layout of New York City have not been replicated in the United States. Because the city developed before the popularization of the automobile, and because the island of Manhattan had fixed boundaries from the beginning, the city assumed a form inherently appropriate to the pedestrian, which remains largely intact. Most urban settings in the United States, do not share this built in walkability advantage. Instead, cities sprawl outward largely uninhibited, rendering the car the only practical mode for connecting them.

This should not discourage those unbounded cities, but remind them of the inherent value of the downtown urban cores that were constructed before the car became a mainstay in American lifestyles. Humans have been building cities at the pedestrian scale for thousands of years, but have only been building them at the automobile scale for several decades. The practice of building walkable cities may be a bit rusty, but it shouldn't be foreign. There are examples of great walkable cities all around the world, and even a handful in the United States. In fact, most sprawling cities have remnants of a dense downtown street network still intact, often with a scattering of tall buildings equipped to house a variety of tenants. But the prevalence of car travel has alienated the pedestrian, even in these areas fundamentally built for walking.

the problem with efficient cars and buildings

There has been a push in recent years to increase the efficiency of our cars and buildings. Cars and light trucks in the United States now average 25.5 miles per gallon, up almost 25% in just the last seven years (Sivak 2014). Additionally, LEED—Leaders in Environmental and Energy Design—has become a mainstay, awarding recognition to builders for many categories of sustainable design. The problem with LEED certification, is that it undervalues the environmental advantage of building in a dense walkable environment rather than a sprawling suburb, and therefore often awards recognition to buildings that are only accessible by car (Speck 2012) as is evident in Figure 6. "No building whose workers all drive alone to work should be able to win LEED certification at any level, even if the building is next door to a bus stop" (Owen 2009).

The development of more fuel efficient cars, perhaps noble on the surface, downplays the true harm created by cars. The prevalence of the car has created a society in which environments are built to the scale of the car. "The critical energy drain in a typical American suburb is not the Hummer in the driveway; it's everything the Hummer makes possible-- the oversized houses and irrigated yards, the network of new feeder roads and residential streets, the costly and inefficient outward expansion of the power grid, the duplicated stores and schools, the two-hour solo commutes" (Owen 2009, 104).

From a carbon emissions standpoint, many studies have alluded to the fact that fuel efficient cars actually increase the number of vehicle miles traveled. Sweden, for example, has led the world in purchasing green cars since 2008, yet their carbon emissions have steadily increased (Hollis 2013). This is frustrating, but makes sense. Increasing fuel efficiency brings down the cost of driving, which provides more incentive to drive. As prominent economists and authors Steve Levitt and Steven Dubner often point out in their books and podcasts: it is incentives, more than policy, that influence behavior.

Fuel efficient cars may increase the number of miles per gallon, but they do nothing to weaken the notion that a car is an essential tool that must be owned by everyone. Walkable cities, complete with a variety of uses in a comfortable pedestrian setting, can in fact weaken that notion, by creating an environment where there is more incentive to walk than to drive. A vibrant urban core with high connectivity, functionality, and safety can invite an individual, family, small business, or corporation out of the sprawl and into the core. This urban core can be quite attractive to those looking to ditch the expense, stress, time, health problems, and carbon footprint associated with the daily car commute.

In 2012, the EPA moved its region 7 headquarters from downtown Kansas City Kansas, walkscore 67, to a LEED platinum certified building in suburban Lenexa, walkscore 12, citing energy savings as the primary reason for the move.

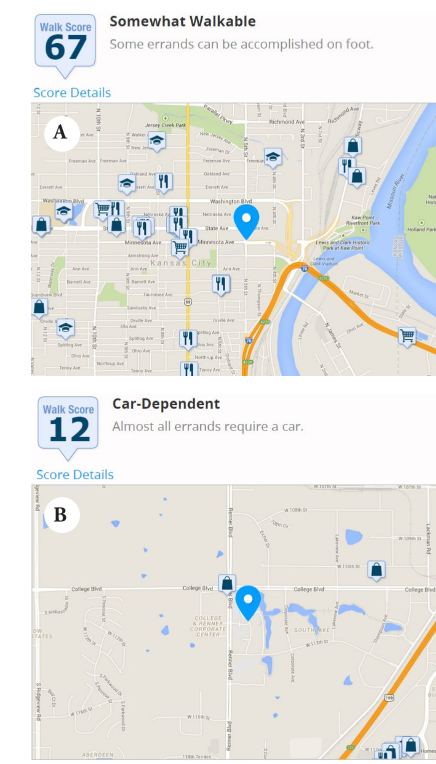


Figure 6: A Supposedly Environmentally Conscious Move

The Walkscores of the EPA's former and current buildings in **A.** Kansas City, KS and **B.** Lenexa, KS
Source: Walkscore.com

economic

the demand for walkable cities

Most cities already understand the importance of attracting young and educated people. Jeff Speck, an urban planner, describes a common question from clients: "How can we attract corporations, citizens, and especially young, entrepreneurial talent? (2012, 17). These cities understand that their financial security and growth potential is tied to bringing in sustainable businesses that will employ educated and creative people with earning power. Surveys show that creative class citizens are more likely to seek out neighborhoods that are walkable. Walkable neighborhoods place many activities in close proximity, and provide for a more active street life. This provides for more chance encounters, which allow people to break into the social scene in a new city. These preferences are supported by data that Americans in their twenties are driving less miles and the number of teens opting out of a driver's license is rising quickly. In fact, 77 percent of millennials report that they plan to live in America's urban cores (Doherty and Leinberger 2010) quoted in (Speck 2012, 21). If they cannot find walkable urban cores in the cities close to home, they will find the cities that do have them.

The other group of people poised to value walkable neighborhoods are the biggest bulge in the American population, the front end of the baby boomers. Americans are turning sixty-five at quadruple the rate of a decade ago (Leinberger 2009), and while there is little evidence that retirees are moving to walkable neighborhoods, it is quite practical that they should. This group is finding themselves in houses that are not only oversized for their empty nest lifestyles, but socially isolating and increasingly burdening to drive to with aging eyes and slowing reaction times (Leinberger 2009). Leinberger cites the American Journal of Public Health, which states that Americans are outliving their ability to drive safely (a woman, on average, by ten years, a man by seven). In car-oriented places, elderly people with decreased driving ability often rely on a network of family and friends for transportation. But the person's options could be very limited if those family members live in another city or state (Edleson, 2014). Retirees and empty nesters have little reason to value large houses and great schools, and every reason to value goods and services and social opportunities in close proximity.

shifting preferences

Another indicator of housing trends is visible in pop culture, which can serve as both a reflection of and a contributor to shifting preferences. Because the media entertainment industry conducts extensive consumer research, television shows can serve as "barometers of how Americans want to see themselves" (Leinberger 2008, 86). Suburban settings were introduced and romanticized on television in the 1950s and 60s, with shows like *Leave it to Beaver*, the *Dick Van Dyke Show*, and *The Brady Bunch*. The baby boomer generation grew up seeing all the potential benefits of this new way of life full of open spaces and the empowering automobile (Speck, 2012; Leinberger, 2008). Subsequently, suburban single family homes have boomed in the decades since. If television did in fact play a large role in this cultural shift, then it shouldn't be a surprise to see the trend in reverse. The 1990s and 2000s saw shows like *Seinfeld*, *Friends*, and *Sex and the City* become cultural phenomena, romanticizing urban life in cities. People who grew up watching these shows are entering the housing market, and there is reason to believe that they value dense, vibrant, walkable urban environments.

"Television shows... serve as barometers of how Americans want to see themselves"
(Leinberger 2008, 86).

unmet demand

Most interesting about the shifting preferences toward walkable urbanism, is the fact that the housing market is lagging behind. According to survey responses in Boston and Atlanta, about 30 to 40 percent of people want walkable urbanism, 30 to 40 percent want drivable urbanism and 30 percent are willing to accept either (Levine, 2005) quoted in (Leinberger, 2009). The disparity of preference between these cities was modest. However, the difference in housing supply was drastic: 70 percent of those seeking walkable urbanism in Boston were able to find it, while only 35 percent in Atlanta found walkable urban housing they could afford. We can conclude that many cities, particularly those with underdeveloped urban walkable infrastructure, have unmet housing demand.

With the two largest sects of the population seeking housing, and with a higher preference for walkability than at any time in the last 50 years, it's obvious that developers and cities should be shifting their priority away from sparse and isolated housing and commercial developments and instead concentrating on dense, urban mixed use development.

economic

attracting millennials

For evidence that young and educated people are actually relocating to cities that value walkability, the proof is in Portland. The city began investing heavily in sidewalks, bicycle facilities, and transit in the 1970's, completely transforming the downtown into a dense, mixed use neighborhood that is highly accessible without a car (Speck 2012, Owen 2009). This environment has been so successful in attracting young, creative, and educated people that the city now suffers from unemployment and underemployment due to the abundance of highly qualified workers (Russell 2014). The very workers that most cities are trying to attract are settling for lesser work in favor of life without a car in Portland.

real estate

In summary, there is evidence that young people, particularly educated job seekers, prefer walkable urban settings. Retirees and empty nesters also have much to gain from walkable neighborhoods. This has created a gap between demand and the supply of housing in walkable settings. This is supported by evidence that people are willing to spend much more on housing if it is walkable. A study by economist Joe Cortright concluded that each point on Walk Score's 0-100 rating correlated with a $700 to $3000 increase in the value of the house (Cortright 2009). In other words, walkability pays.

less money tied up in transportation

There is a reason that people seek housing in the sprawling suburbs. It is commonly perceived as more affordable. American families observe the practice of drive-till-you-qualify, seeking housing that meets bank lending requirements and ignore or underestimate increased driving costs, which often outweigh any house savings. In 2006, when gasoline averaged $2.86 per gallon, households in the auto zone were devoting roughly a quarter of their income to transportation, while those in walkable neighborhoods spent well under half that amount (Doherty 2010) quoted in (Speck 2012). Spending less on transportation has tremendous value to individuals and families, and therefore, to cities.

Joe Cortright estimates this value using Portland as a case study, a city that has implemented 'skinny streets' programs and urban boundaries in an attempt to favor the pedestrian and the bicycle, encourage density, and discourage sprawl. The result is that Portlanders drive 20 percent less than citizens of other American cities. The value of this is approximately $1.1 billion, which equates to 1.5% of all personal income, and over 3% when taking into account time not wasted in traffic (Cortright 2007). This frees up income for things like housing and recreation, rather than cars and gasoline. In this respect, cities that drive less have a greater capacity to spend money locally than cities that are more dependent on the car.

efficiency of services

The most well connected neighborhoods that encourage walkability also allow cities to more efficiently provide services such as trash collection and fire prevention. Residential trash collection is more efficient on high connectivity streets due to reduced need to back up and backtrack routes as well as decreased liability due to turn around. Fire stations in the most interconnected neighborhoods can provide service to more than three times as many commercial and residential units as the least connected neighborhood (Handy, Paterson, and Butler 2003). What people may not realize is that these increased costs from less efficient utilities are passed from the city to the developer, and from the developer on to the homeowner.

addition by subtraction

Perhaps the most compelling data for building walkable streets is the simple fact that they cost much less to build than freeways, tunnels, or viaducts, and they increase adjacent property values, rather than depreciate them. The Embarcadero Freeway in San Francisco and the Cheonggye Freeway in Seoul, South Korea (fig. 7), were both examples of massive elevated freeways in need of repair in congested urban areas. These cities elected to instead remove these structures and replace them with tree lined boulevards, which was not only dramatically less expensive, but has increased adjacent property values 300 percent and dramatically encouraged more urban development. The Preservation Institute sites these projects on their website, along with several others as success stories in "Removing Freeways- Restoring Cities". In most of these cases, removing freeways was more economical than replacing them, did not lead to gridlock, and was widely popular upon completion (Speck 2012).

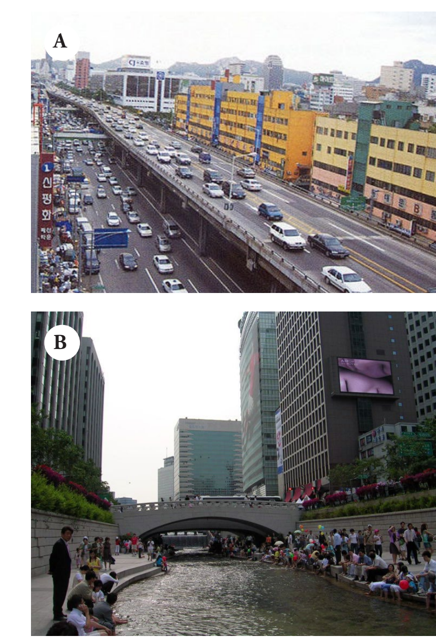


Figure 7: Create Place by Removing a Freeway

A. Before and **B.** After Photos of the Cheonggyecheon River in Seoul
Source: The Preservation Institute

health

combating obesity

The simplest way to understand how walking can improve our health is to study the harm in eliminating the walk. The human body is an excellent walking machine, and depriving it of this fundamental exercise leads to a variety of problems. A recent report from the Center for Disease Control in 2012 stated that 34.9% of adults are obese and at least 64 percent are overweight. The health problems created by obesity are vast, and include heart disease, diabetes, and a plethora of others. The total medical costs associated with these diseases was $147 billion per year in 2008 dollars, which equates to $1,429 per person higher than medical care for a person of healthy weight (Finkelstein et al. 2009).

While there are a wealth of theories about how diet affects health, the formula for weight gain is quite simple and undisputed: calories consumed > calories burned. In this respect, diet and exercise are both prominent contributors to rising obesity. While few studies conclusively state that exercise plays a bigger role, it is likely that the average American's daily exercise has deteriorated much further than the quality of their diet over the past forty years. The world is increasingly more mechanized, and labor has become increasingly more service oriented, and less dependent on physical tasks (Frumkin, Frank and Jackson 2004). One study from the British Medical Journal crudely attempted to determine whether 'gluttony', measured by energy intake and fat intake, or 'sloth', measured by cars per household and television viewership, was more responsible for obesity (fig. 8). They showed a much clearer relationship, suggesting a causal relationship, between the 'sloth' measures and obesity from a span of 1950 to 1990 (Frumkin, Frank and Jackson 2004).

It is important to note that there are different types of physical activity. One distinction is the difference between recreational, in which the primary purpose or goal is exercise, and utilitarian, in which the exercise serves a purpose like getting to a destination, and thus is the secondary goal. For this reason, utilitarian physical activity may be easier to build into a daily routine (Frumkin, Frank and Jackson 2004). Walking for utility does not require a devoted block of time, but is ancillary to other daily activities. Therefore, this type of walking is less intimidating and more approachable.

There is a wealth of data about obesity and a wealth of data about driving habits, and while most studies stop short of concluding a causal relationship, there is undeniably a correlation(fig. 9). Residents of auto-oriented suburbs tend to walk less and weigh more than people in walkable areas (Condon 2010).

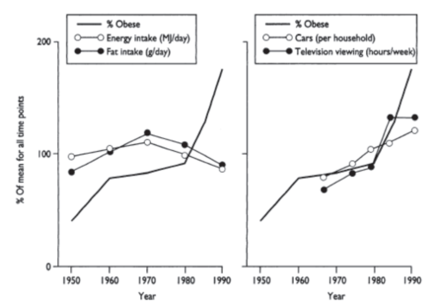


Figure 8: Gluttony or Sloth

Source: Courtesy of the British Medical Journal

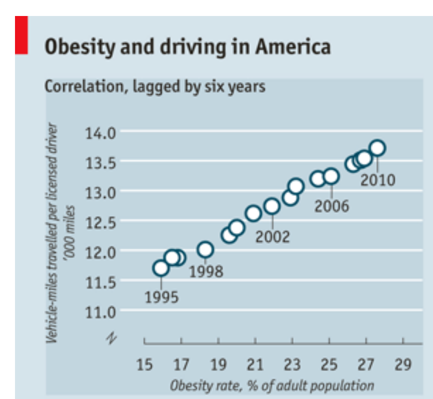


Figure 9: Obesity and Driving in America

Source: Jacobson et. al. Transport Policy

air quality

It was once a common sentiment that living on the city's edge, away from heavy industry, held the promise of cleaner air, and thus healthier lungs. However, this premise is rooted in the idea that industry is the largest contributor of CO2 and other greenhouse gases, which hasn't been true since 2000, when vehicle exhaust surpassed industrial exhaust (EPA 2003; fig. 10). However, this thirst for cleaner air away from factories fueled the separation of land uses, which still persists today despite reductions in industrial emissions. The unintended, and somewhat ironic consequence is that separating land uses causes increased driving distances, and thus increased CO2 emissions from transportation in these car-centric areas. This correlation is supported by the fact that "…pollution is considerably worse than it was a generation ago, and it is unsurprisingly worst in our most auto-dependent cities, like Los Angeles and Houston" (Speck, 2012). Car exhaust produces a number of volatile compounds that all contribute to poor respiratory health (Frumkin, Frank and Jackson 2004). Unsurprisingly, asthma attacks resulting in deaths occur at 3 times the rate of 1990 (Wasik 2009).

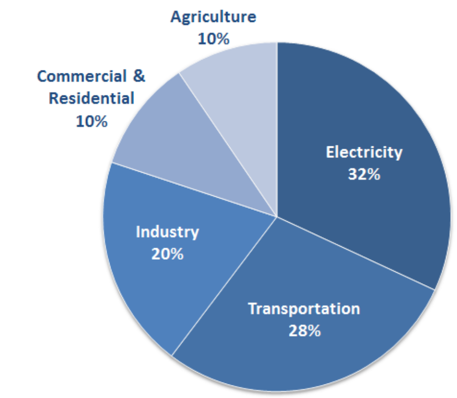


Figure 10: Greenhouse Gas Emissions by Economic Sector in 2012

Source: Environmental Protection Agency. 2012. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012.

traffic fatalities

No discussion of the health benefits of walking is complete without an understanding of the inherent risk of driving. New York City, which boasts the lowest rate of car ownership in the country, not coincidentally suffers the fewest traffic fatalities. In fact, the United States in 2004 suffered 14.5 traffic fatalities per 100,000 people. To compare, less auto oriented countries in Europe like Germany, Denmark, and the United Kingdom had 7.1, 6.8, and 5.3 fatalities per 100,000 people respectively. New York City had just over 3 per 100,000: less than a quarter of the national average. This is not an outlier. "Older, denser cities have much lower automobile fatality rates than newer, sprawling ones. It is the places shaped around automobiles that seem most effective at smashing them into each other" (Speck 2009, 45).

"Older, denser cities have much lower automobile fatality rates than newer, sprawling ones.

It is the places shaped around automobiles that seem most effective at smashing them into each other" (Speck 2012, 45).

mental health and happiness

Aside from the harm that daily car commuting inflicts on the heart and lungs, it also induces stress and degrades happiness. The relationship between driving commute times and stress, elevated blood pressure, and rage are described extensively in *Urban Sprawl and Public Health* (Frumkin, Frank and Jackson 2004). These are all contributors to an overall state of happiness, or unhappiness, which people tend to impose on surrounding drivers, creating a feedback loop where angry and inconsiderate drivers create more angry inconsiderate drivers. The relationship is undeniable: "one study found that a 23 minute commute had the same effect on happiness as a 19 percent reduction in income" (Speck 2012, 48). While walking is certainly not entirely free of stress, it is very difficult to be stuck in traffic while on foot. Additionally, it is now This relationship between active transportation and health has been explored in further depth by my classmate, Danielle DeOrsey (see Appendix 1: teammate abstracts).

equity

pedestrians and cyclists pay their share

Perhaps the biggest obstacle to public investment in walkable streets is the common notion that public funds should not be wasted on pedestrian and bicycle amenities or public transit because their users do not pay taxes. This notion is fundamentally false, and thus this report will devote little attention to discrediting it. According to a study from the Federal Highway Administration in 2012, approximately 93% of federal highway funding does in fact come from drivers in the form of fuel taxes, vehicle taxes, and tolls. However, drivers directly contribute only 52 % of the state highway budget, and only 7% of local highway budgets, with the rest coming from property taxes, bond proceeds, and other funds (Alpert 2014; fig. 11). In other words, as roads become smaller and more local, and thus more attractive to pedestrians and cyclists, the share of funding from drivers is smaller and smaller, which is logical. Car-oriented taxes tend to pay for car-oriented roads. People tend to pay for people-oriented roads.

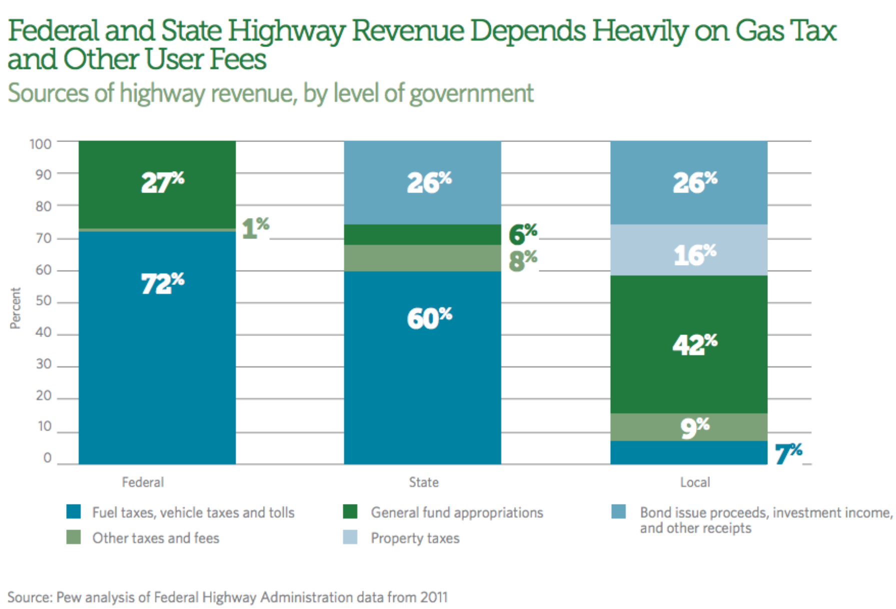


Figure 11: Sources of Highway Revenue, by Level of Government

Source: Pew analysis of Federal Highway Administration data from 2011.

the expense of parking

This still ignores an expensive side effect of car-oriented development, which is parking requirements. Parking is only used by drivers, but is paid for by everyone. A prominent writer of parking policy Donald Shoup describes it this way: "Initially, the developer pays for the required parking, but soon the tenants do, and then their customers, and so on, until the price of parking has diffused everywhere in the economy" (Shoup 2004, 2). But parking requirements are not an absolute fixed number determined by the actual needs of all cities. They are well-intentioned regulations enforced by cities to keep its residents happy. To paraphrase from a lecture by Julie Campoli, author of *Made for Walking*, "The problem isn't regulation. The problem is us. We all relate and sympathize with the driver. (2014)" This sympathy, she argues, creeps into all of our design decisions. This sympathy is unjust: it rewards and thus subsidizes a habit that disproportionately pollutes the environment and degrades the health of its citizens.

"Initially, the developer pays for the required parking, but soon the tenants do, and then their customers, and so on, until the price of parking has diffused everywhere in the economy"
(Shoup 2004, 2)

burden on low income families

Low density development quickly eats up available land, which leaves fewer options for families seeking to own homes. This means that low income families in particular must live further and further from their work in order to afford land (Condon 2010). This practice is often called 'drive till you quality' and tends to separate people by class and income, relegating the low income families to the areas that are least accessible and require the most driving. In this sense, low income families are more disproportionately burdened by the increased cost associated with transportation than higher income families.

social

chance encounters

Walkable neighborhoods provide better opportunities for people to find themselves on streets and in public spaces, which leads to more human interaction than in neighborhoods only designed for the car. These casual interactions are immensely valuable to our health and well being. As Jan Gehl describes, there are various forms of contact ranging from low intensity and high intensity; we depend on all of them. When people lack access to active public space, they lose the lower end of contact, which means that people are either alone or in a group, with little gray area (Gehl 2011).

Chance encounters, or low intensity social interactions, increase the chances of making contacts with neighbors, allows for the maintenance of established relationships in an undemanding way, and provides the most organic form of child's play (Gehl 2011). William H. Whyte related the decline of cities to the decline of interactions between strangers, and claimed that cities should encourage a variety of interactions in streets and public spaces (Whyte 1980).

Whyte, Gehl, Jane Jacobs among others all describe chance encounters as vital to the health and prosperity of a city. The power of the city is not held by political leaders, but emerges from the places where the most people are. The life of the street itself is the true measure of the vitality of the metropolis (Hollis 2013).

"A regular walk around the neighborhood...just to see what's going on...is the glue that holds most great communities together"
(Walljasper 2007, 16).

social capital

Social capital refers to the sum of relationships and sense of belonging one feels with their community. Social capital is created both by chance encounters with neighbors on the street and through participation in clubs, civic activities, and organized social functions, and can be measured in terms of trust and reciprocity for one's neighbors (Frumkin, Frank and Jackson 2004). Sprawling neighborhoods can undermine our ability to develop social capital by restricting the amount of time and energy available for civic involvement, reducing opportunities for spontaneous interaction, privatizing the public realm, and separating people into homogeneous communities (2004).

Walkable neighborhoods, inversely, have the potential to reduce the amount of time spent commuting and reduce the stress associated with that commute. This can lead to an increased willingness to engage with neighbors and the community in a variety of ways. They encourage more of our daily activities to be carried out in shared community spaces. Dense, mixed use neighborhoods also tend to provide a more diverse range of housing, which provides people more opportunities to stay invested in a community even as their life circumstances change, as they often do (2004).

For these reasons, Frumkin, Frank, and Jackson, after describing the many health consequences of sprawling neighborhoods, promote smart growth strategies including mixed use development, compact building design, a diverse range of housing, and walkable neighborhoods (2004).

dilemma

Walkability has tremendous value to individuals, cities, and the planet. Yet most American cities are largely car dependent at the expense of walking, cycling, and public transit. In Wichita, Kansas, along with many American cities, car-oriented design is widespread, thus fixing the problem at a large scale is neither practical nor feasible. Planning for walkability requires a concentrated and informed strategy to ensure that investment is not wasted.

thesis

Based on research of literature relevant to walkability and an acceptance of the importance of urban triage (Speck 2012), I narrowed the scope of study, based on walkability potential, from Wichita, Kansas to a few blocks downtown. I developed a rubric to measure, block by block, the existing qualities that contribute to a walkable environment in an effort to understand the strengths, weaknesses, and most pressing gaps in the overall street network. Using the urban triage method, communities can develop a concentrated strategy to resolve important weaknesses and improve walkability.

literature review

characteristics of walkable neighborhoods

Many authors have written about the characteristics of walkable streets and neighborhoods and their contribution to the health of the city. In general, walkable places accomplish three basic goals: they can be accessed easily without a car, they make users feel relatively safe from being hit by a car, and they provide a comfortable and engaging place to be on foot. Figure 12 diagram summarizes some of the key qualities of walkability and some of the sources that speak to their importance.

Most authors describe the qualities of places that are walkable, which creates a vision of the types of places many cities would like to create. Speck is unique in proposing the practical and prescriptive process of urban triage. In essence, he is saying that to build walkable places, cities need to focus their resources to the streets and blocks with the most potential. This concept has been fundamental to this report.

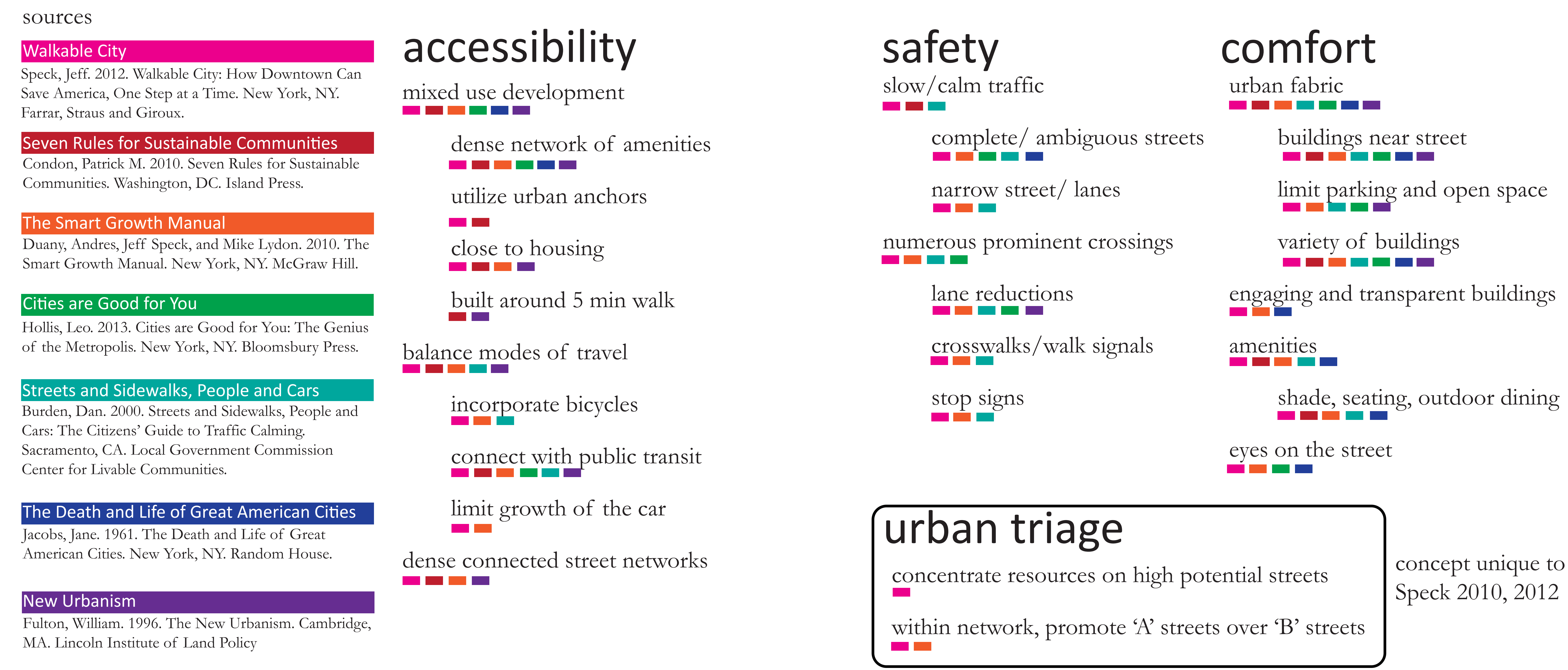


Figure 12: Literature Map

Source: by author

accessibility

defining accessibility

The automobile is one form of transportation, one tool for accessing the amenities, and places that shape our daily lives. The car supports a specific pattern of development, a pattern that discourages other methods of accessing places, such as walking, cycling, or public transportation. Walter G. Hansen, in an article describing how accessibility shapes land use, defines accessibility as 'the potential of opportunities for interaction" (Hansen 2007). Higher potential comes from more options for travel. If one mode of travel has become dominant at the expense of the others, cities should seek to restore a balance.

The car has become prevalent in most cities because the car is the most practical tool for accessing the wide variety of places and amenities that people require on a daily basis. To encourage people out of their cars, there needs to be incentive to take other modes, including walking, cycling, and public transit. All of these options depend on places that people want to be, where walking is more convenient than driving.

mixed use development

For walking to be more convenient than driving, destinations must be in close proximity to one another. This depends on density, variety, and connectivity.

A high quality mixed use environment depends on a high occupancy of businesses, and the vitality of each individual business or store depends on a broad variety of users. If all the inhabitants are on the same schedule, most typically a daytime work shift, patrons overwhelm businesses at a few key hours of the day and leave them abandoned the rest of the time, which is less than ideal for those business owners. A more sustainable scenario is a population on the street throughout the entire day. Achieving this depends on a diverse population of businesses supported by a diverse population of people (Jacobs 1961). Diversity, therefore fuels complexity, which increases the productivity of a city (Hollis 2013).

Neighborhoods should seek a balance of housing, working, shopping, recreation, and civic uses (Duany, Speck and Lydon 2010). While a perfect balance is rarely impossible, it's something for cities to strive for. This balance is not achieved by very large single function buildings, but through individual business owners crafting a space near other business owners. Dense street networks lend themselves well to mixed use development. A diverse network of transportation types, not just car travel, both support and feed off of mixed use development.

"A neighborhood should endeavor to include a balanced mix of housing, shopping, recreation, and civic uses"
(Duany, Speck and Lydon 2010, 5.1).

urban anchors

Mixed use development provides a setting for a diverse network of accessibility that encourages life on the street at all times. Urban anchors can contribute even more activity at on the street. Urban anchors could be major retailers, parking structures, movie theaters, performance halls, stadiums, or anything else capable of generating foot traffic on a regular basis (Speck 2012). Anchors could also be schools, commercial services, transit stops, and a diversity of housing, which Condon believes should all be accessible to one another via a 5 minute walk (Condon 2010). Duany speaks of all of these as key components of a healthy neighborhood, which should satisfy the daily needs of its residents within walking distance (Duany, Speck and Lydon 2010)

While definitions of urban anchors vary by source, the important takeaway is that elements of an urban environment that generate significant foot traffic should connect with the surrounding environment through a strong network of pedestrian, bicycle, and transit routes. Surrounding urban anchors with a sea of parking creates a dead zone of activity and squanders their potential to contribute to the life of the street.

close to housing

For walking to be a practical mode of travel on a daily basis, good jobs have to be located next to affordable homes, as they once were before the rapid growth of the automobile. Zoning regulations and the emergence of the car have encouraged housing to be built in large developments, often on large lots that encourage a monoculture of residents (Condon 2010). Aside from the environmental concerns, this creates pockets of separated housing types, which combined with separated land use in general, makes walking nearly impossible. Jane Jacobs, studying the ways that different types of people occupy the street at different hours, concluded that the health of a city depended on density and diversity to keep the streets alive around the clock (Jacobs 1961). This also makes cities more productive, as more can be accomplished in a 24 hour period (Hollis 2010).

Speck argues that most downtowns, the areas where walking to a good job is most feasible, lack housing in general. Some downtowns have housing, but not a range of housing that corresponds to the range of incomes that are present in a downtown (Speck 2012).

Duany describes a catalog of housing options that should reflect the diverse population of people in a sustainable and healthy neighborhood, including high rises, mid rises, commercial lofts, live/work buildings, row houses, large houses, and ancillary dwellings, which is the often illegal practice of building a secondary residence on a plot, often to house a elderly relative or college student (Duany 2010). These 'granny flats' insert affordable housing into single family neighborhoods and promote socioeconomic diversity (Duany, 2010, Speck, 2012). A broad range of housing options provides many degrees density, allow people to live in a residence suited to their lifestyle.

the five minute walk

The five minute walk, transit oriented development, and diversity of housing and land use are all core principles of New Urbanism, which aimed to slow the pattern of big box development and urban sprawl with traditionally designed neighborhoods (Fulton 1996). This movement has been met with mixed reviews, primarily because it blatantly challenges building habits of the last half century and opts for a design that would have been commonplace in pre-car American cities.

accessibility

provide for bicycles

In the quest to balance modes of travel in cities, the bicycle is an important piece of the network. A bicycle allows someone to cover at least 3 times the distance as walking, much more convenient parking than driving, and much more personal freedom than public transit. As an avid cyclist, I can attest that for trips under two miles in an urban environment, cycling is comparable to driving in terms of speed, and typically faster when considering time spent searching for parking and walking to and from a parking space. In terms of personal cost to the owner, there is really no comparison between a bicycle and a car, which most estimates say cost between $5000 and $8000 per year to own. In terms of environmental impact, the most fuel efficient car in the world cannot compete with a bicycle.

Though some will be discouraged by weather or the exercise, most are simply discouraged by the threat of being hit by a car. This is a problem of modal imbalance, which is self perpetuating. A lack of bicycles and bicycle lanes creates a lack of awareness among drivers and encourages speeding and complacency, which makes the roadway feel more unsafe for cyclists. Therefore, the primary value of bicycles to walkability is that cyclists force motorists to be more aware and responsive (Speck 2012). Cyclists complicate the roadway, which is one of many ways to calm traffic (Burden 2000).

The actual risk of cycling is debatable, depending on how many factors are considered. On his website, blogger Mr. Money Mustache often writes about the economic and health value of cycling. He calculates, comparing the cumulative risk of accidents and health problems associated with a sedentary lifestyle, that one hour of driving a car at 70 mph lowers life expectancy by 20 minutes, while one hour of riding a bike at 12 mph increases life expectancy by 4.5 hours. The lesson is that cycling is a much healthier, and thus arguably safer, form of travel than driving.

In the end, for people to ride bikes, as with any other form of travel, the incentives have to outweigh the risks. The incentive to ride bikes is higher in places with more mixed use development, higher street density and connectivity. The risk involved with cycling is lower on streets with frequent stops, slower traffic speeds, and more awareness among drivers, which typically occurs in these same types of areas. Infrastructure such as bicycle lanes and signs can make cycling more inviting and increase awareness among drivers. The goal of any city should be to acquire a critical mass of cyclists, which is often defined as the number of cyclists necessary for their presence to be constantly on the minds of drivers.

"Riding a bike is not more dangerous than driving a car. In fact, it is much, much safer" (mrmoneymustache.com).

In the interest of growing the population of cyclists to reach this critical mass, it is important to remember that there are many types of cyclists with varying degrees of confidence. Inviting more cyclists means providing for as many types of cyclists as possible including. This ranges from daily commuters looking for the most direct route, and feeling comfortable sharing the roadway with cars to recreational riders simply seeking exercise, with no interest in negotiating intersections with cars. There are infinite types of bicycle delineation with varying degrees of separation from traffic to provide for this broad range of users (fig. 13).

Most infrastructure can be categorized as separated trails or lanes, bike lanes, and shared routes or sharrows (Duany, Speck and Lydon 2010, Speck 2012). Separated trails are most appropriate in areas where bicycles travel adjacent to heavy or high speed car traffic, or ignore car traffic altogether and follow natural features. Shared routes are appropriate on low speed streets with frequent stops where a majority of car traffic is local. Bike lanes fit the streets in between: collectors with medium speed traffic (Duany, Speck and Lydon 2010).

In this sense, there is a way to incorporate bikes into most city streets. In the interest of restoring modal balance to a street by removing lanes for car traffic, this space can be delineated to bicycles (Speck 2012).

Figure 13: Types of Bike Infrastructure

A. Bike Lane Photo by: Kristen Langford **B.** Separated Bike Lane or Trail Photo by: Nicole Schneider **C.** Shared Lane or Sharrows Photo by: Heather Bowden
Source: bikepedimages.org

accessibility

relationship to public transit

In Patrick Condon's book *Seven Rules for Sustainable Communities*, "Restoring the Streetcar City" is first priority, with most of his other points building off that premise (Condon 2010). Cities that developed during the age of the streetcar were built in the pattern of a traditional neighborhood grid with streetcars along corridors. Those corridors became areas of the highest activity, the highest density. The transit stops should be spaced close enough together that most homes can be located within a five minute walk of a stop (2010).

The advantage of having a streetcar over buses is increased capacity per trip, and significantly quicker loading times, presuming that a pre-payment system has been devised. This creates less waiting time, which allows a city to run longer or more frequent routes in the same amount of time (Hollis 2013). Although cities may be skeptical of a streetcar due to the initial costs, it is estimated that streetcars, over the life cycle period, cost about 25% less per passenger-mile than diesel buses, and produce less than a quarter of the CO_2 per passenger mile (Condon 2010).

However, street cars or light rails should typically represent only a part of the transit system, as buses provide the flexibility necessary for a robust system. According to Speck, cities should seek a frequency of one route per ten minutes to create the minimal wait times necessary to make transit approachable. "If you can't fill a bus at that rate, get a van" (Speck 2012, 155).

Regardless of the specific vehicle, public transit moves traffic much more efficiently than automobiles. New York City is the best example in the United States. A recent story on Vox.com illustrated a study by Vancouver highway engineer Matt Taylor, who observed that over 2 million people commute to Manhattan daily, but only 16 percent of those commute by car. If everyone drove to the city rather than taking public transport, the city would need 48 additional bridges to accommodate the traffic (fig. 14).

With this in mind, it's easy to see the folly in widening roads to ease traffic congestion. Car traffic on roads eases when people have feasible options other than driving a car. Investing in one form of transportation yields a society in which people all depend on that one mode.

Several authors point out the fact that effective transit depends on local density and neighborhood structure, as people have to be able to walk to the transit stop (Speck 2012, Condon 2010, Duany, Speck and Lydon 2010). This is achieved in areas with traditional street layouts with short block lengths, small parcel sizes, and frequent intersections, all of which encourage walking and discourage driving.

Figure 14: Necessary Bridges if Everyone Drove

Source: Matt Taylor Blog. An Auto-Oriented Manhattan.

limit growth of the car

Induced demand is the phenomenon in which widening roads yields more congestion. Although roads are often widened with the goal to alleviate traffic, this fails to consider that people make individual decisions that respond to their environment. Widening roads by adding lanes temporarily eases congestion, which makes travel times quicker. This creates more incentive to drive on this road, which quickly negates the effect of the expansion (Speck 2012, Owen 2009, Duany, Speck and Lydon 2010).

This phenomenon was confirmed in a study of 30 California counties between 1973 and 1990, which found that for every 10 percent increase in metropolitan roadway capacity, vehicle-miles increased 9 percent within 4 years' time (Duany, Speck and Lydon 2010).

The simple alternative to widening roads is to invest that same money in modes of travel that are not cars. Traffic congestion cannot be solved by concentrating a disproportionate share of public funds to one specific mode of travel. A growth in a multi-modal transportation network is the only way to ease the congestion of one specific piece of that network. Understanding this simple premise is necessary to avoid building unnecessarily large roadways at tremendous cost to taxpayers in a futile effort to make life more convenient for the mode of travel that is most responsible for the congestion.

"Trying to cure traffic congestion by adding more capacity is like trying to cure obesity by loosening your belt"
(Duany, Speck and Lydon 2010, 3.10).

accessibility

dense and well connected street networks

There are two primary strategies of street design: traditional, which leans more toward a grid and is more likely to have shorter blocks, and hierarchical. These systems are somewhat conflicting in nature, and not surprisingly, favor different modes of transportation. The most commonly acknowledged road building strategy in modern transportation planning, and the system most detrimental to pedestrian life, is a hierarchical system (fig. 15). Roads are classified as Arterials, Collectors, and Locals. In this system, some streets must carry more traffic and at higher speeds than others. These arterials become barriers to pedestrian activity, dividing neighborhoods and potentially destroying local businesses by limiting their connections to the community (Laplante 2009; fig. 15).

Another problem with hierarchical design, or dendritic or branching systems, is that each street is assigned an inflexible role. Because each street type contributes an inflexible role to the greater system, it makes sense that traffic engineers would design them for a greater capacity than is necessary to accommodate the city's population growth. Branching systems often incorporate a number of cul-de-sacs, with the aim that these dead ends discourage traffic, thus making streets safer. This fails to account for the fact that this concentrates traffic on fewer streets, which tend to be longer, wider, and with fewer stops, all of which encourage speeding (Speck 2012, Condon 2010).

A gridded system, inversely, provides drivers with many more circulation options, which gives drivers flexibility to adjust their route to respond to traffic (fig. 16). In a grid system, each individual street bears only a partial brunt of increased traffic due to closures or growth (Speck 2013). This makes traditional neighborhoods more resilient to change.

All of this merely describes how a traditional gridded street system limits traffic speed, which is key to increasing pedestrian safety. This type of system is also tremendously more inviting to bicycles because cyclists have the option to ride on a lesser traveled street, rather than being forced to share a collector with fast moving cars. Public transit also works better in traditional street networks because they allow for more density around stops, which increases the number of options for riders (Condon 2010). Traditional street networks are also a better setting for mixed use development, which as we already established, promotes walking, cycling, and public transportation. It is apparent that the characteristics of diverse, walkable, healthy, and environmentally friendly neighborhoods all contribute to one another and seem to develop best in areas with high connectivity, short block lengths.

Figure 15: Hierarchical Street Network in Wichita, Kansas

Source: Bing Maps

Figure 16: Traditional Street Network in Wichita, Kansas

Source: Bing Maps

safety

slow / calm traffic

Traffic speed is the primary enemy of walkability. A study by the British government found that 85 percent of pedestrians hit by cars traveling 40 miles per hour were killed. In contrast, only 5 percent of pedestrians hit by vehicles traveling 20 mph were killed (Walljasper 2007). For this reason, streets with traffic speed under 20 mph are significantly more comfortable to pedestrians than streets with higher traffic speed.

Traffic engineers typically design streets to be safe for drivers while traveling faster than the speed limit. The intention is good: over engineer the street and it won't be the cause of any accidents. But streets designed for faster speeds encourage people to speed. Wider streets with fewer intersections and less activity along the road allow drivers to become complacent. Speck describes the process of 'risk homeostasis' in which humans adjust their behavior to assume a comfortable level of risk (Speck 2012). If there is little chance of colliding with something, people are comfortable multi-tasking while driving. This has tendency has become even more relevant as cell phones continue to capture an increasing share of our attention.

complete / ambiguous streets

For this reason, many authors advocate for complicated roadways, including complex geometries, numerous stops, narrow driving lanes, and a network of different modes of travel (Speck 2012, Burden 2000, Duany, Speck and Lydon 2010). The driver should not have the sense that the street belongs to them, the street should strike a balance, incorporating all forms of access.

In fact, traffic engineer Hans Monderman took this concept to the next level, encouraging cities to remove street marking, signs, crosswalks, and even curbs to create a shared space (fig. 17), in which each individual person is forced to participate in traffic negotiation, rather than the delineations and instruments of the street. His designs have drastically slowed traffic and reduced accidents in several cities in Europe, and are spreading to other parts of the world (pps.org).

Figure 17: "Shared Space" on Exhibition Road, London

Source: Google Maps

narrow streets/ lanes

For the same reason that simpler streets encourage speeding, so do wider drive lanes. A study in Longmont, Colorado examined 20,000 accidents over an eight year period and found that "as street width widens, accidents per mile per year increase exponentially" (Walljasper 2007, 57).

Narrower streets, framed by buildings and trees adjacent to the sidewalk, create a 'street wall' that frames the street and narrows the driver's field of vision, which encourages drivers to slow down (Burden 2000).

numerous prominent crossings

Reducing traffic speed is the most important task in creating pedestrian friendly streets. High quality crossings contribute to and complement slower traffic speeds. One reason that short blocks are more pedestrian friendly is the frequency of stops. Cars that are forced to stop often lose the opportunity to speed, and may be encouraged to drive on other roads, or even drive less if there is significant congestion (Burden 2000). Even designing a street to "feel" shorter by terminating a street with a roundabout can reduce traffic speeds (2000).

lane reductions

A lane reduction, bulbout, or curb extension is a process of narrowing a street near the intersection. This reduction in the street width, or expansion of the street, can take the place of parallel parking or actually reduce the number of traffic lanes (Duany, Speck and Lydon 2010, Burden 2000). This makes crossing more approachable to pedestrians and sends a message to motorists that the pedestrian is important. Reducing the radius of curbs has a similar effect to a lesser degree, reducing the length of the crosswalk, and forcing the driver to pay more attention (Duany, Speck and Lydon 2010, Burden 2000).

crosswalks/ walk signals

The crosswalk is an important component of a walkable street, but not all crosswalks are created equal. As Speck notes, more frequent walk signals are more convenient for competent pedestrians. Savvy walkers know how to cover diagonal distances faster by choosing the crossing in which the walk sign is on. In that respect, push button walk signals should be avoided as they burden the pedestrian and relegate them to a second class user of the street (Speck 2012).

stop signs

Stops signs are often replaced by stop lights in the interest of reducing traffic jams. Stop lights, however, give drivers the promise of continuing through an intersection without stopping, and in some cases encouraging them to speed up to avoid a red light. Stop signs send a clear message to drivers that a stop is inevitable and removes the incentive to speed (Walljasper 2007).

Streets with fewer stops will always be more inviting to drivers with more stops. In this respect, Speck cautions against traffic lights that are calibrated to create a 'green wave' of continuous traffic, and against traffic lights in general where a stop sign would suffice (Speck 2012).

Burden supports roundabouts over stop lights because they only require motorists to slow down, rather than stop, which can remove some of the motivation to speed in between intersections (Burden 2000). Both of these are better solutions than stoplights for the pedestrians sake.

comfort

urban fabric: buildings near the street

Human beings, like animals, are most comfortable in places that provide both prospect and refuge (Appleton 1975). In the wild, this is the boundary between forest and clearing where animals can get a view of their surroundings, yet enjoy the protection of the trees. In cities, refuge is created through urban fabric, which is composed primarily of buildings and can be strengthened by tree cover. Engaging buildings, such as active store fronts, are ideal because they provide interest for pedestrians and character to the street (Speck 2012, Duany, Speck and Lydon 2010). Buildings up against the street also create a sense that the street is built for the pedestrian. This desire to simultaneously achieve prospect and refuge was confirmed by the urbanist William H. Whyte, who observed that the most well used parts of public space were those that provided the best of both worlds: views of the activity, and some sense of protection from overhead trees (Whyte 1988).

limit parking lots and open space

In this respect, surface parking lots, which completely rob the street of a sense of enclosure, are disastrous to the sense of comfort (fig. 18). They allow the space of the street to spill over into adjacent blocks and enforce the idea that the street is built for cars.

Limiting the influence of surface parking is easier said than done. Parking garages are significantly more expensive to build and most cities have parking requirements for businesses that often fail to consider other forms of transportation as a mode of access (Speck 2012, Campoli 2014). Parking strategy is the source of an entire book by Donald Shoup called *The High Cost of Free Parking*, which promotes pricing parking to reflect demand. From a design perspective, the crippling effects of parking can be limited by building parking garages with store fronts at the street level, orienting the garages to the street rather than private businesses, and hiding surface lots away from prime walking corridors on adjacent blocks or along the backs of buildings (Duany, Speck and Lydon 2010, Speck 2012). Whatever the method, cities should find any creative means necessary to build streets for people, not just for cars.

Even vast urban landscapes built with the goal of inserting nature into the city for environmental concerns, weaken urban density, create gaps in the urban fabric, and discourage walking as a practical means of getting around (Owen 2009, Speck 2012). In this sense, open green space in cities can be environmentally counterproductive.

Figure 18: Benches facing an parking lot in Wichita, Kansas

Source: by author

variety of buildings

Accessibility and safety are the key priorities in encouraging walking. Building faces should encourage people to stop, look, shop, rest, talk, and linger. Transparent building faces achieve this best. A porous building exterior blurs the line between public and private, and promotes an interaction between merchant and patron. Cold blank concrete walls and parking lots are at the other end of the spectrum, which alienate the pedestrian and encourage them to walk faster.

There is also value in variety, in terms of architecture (fig. 19). Even beautiful buildings can become monotonous if the same style becomes too prevalent in an urban setting. "Almost nobody travels willingly from sameness to sameness and repetition to repetition, even if the physical effort required is trivial" (Jacobs 1961, 129). Therefore, cities should be cautious of handing too much land to a single designer. As Julie Campoli described in her lecture *Density by the Foot*, it is very difficult for a single builder to create the variety necessary to make a street interesting, try as they might.

Figure 19: The Best Urban Fabric is Built in Pieces

Photo by Julie Campoli, used with permission

comfort

engaging and transparent buildings

Even a blank wall contributes more comfort to the street space than a parking lot, but the ideal piece of a complete street is an engaging store front. Speck encourages building 'stickiness' through deeper facades, recessed entries, built in benches or window sills, awnings, outdoor dining, street displays, or anything else that provides comfort and welcomes people to stay, even if only for a few seconds (Speck 2012). Jacobs spoke of the value of slowing down pedestrians in terms of encouraging social interactions, which were more likely to occur on corners and near the entrances to businesses (Jacobs 1961). Both Jacobs and Jan Gehl describe how these chance interactions contribute to the health of a neighborhood (Gehl 2011).

amenities

Amenities are the easiest and most affordable thing for a city to repair in its streets. Benches provide the opportunity to rest, observe the street, have a conversation, wait for a companion to finish shopping, or even have lunch. Therefore, seating dramatically increases the comfort of a street. "Any gathering spot will become more lively if folks have a comfortable spot to relax" (Walljasper 2007, 38). Benches come in all shapes and sizes and can even be incorporated into building facades or street planters.

Outdoor dining is a great asset for a street, as it accommodates interaction in two ways. People in the restaurant get to enjoy the elements with a view of their surroundings, while people on the street get the impression of an active and exciting place.

Street trees perform a variety of functions that contribute to the comfort of a street. They provide shade in the summer, which not only makes walking more comfortable, but lightens the air conditioning load for the buildings along it. Trees provide an overhead canopy, which contributes, with the urban fabric, to the sense of enclosure that makes a street comfortable to people on foot. A good street tree even provides seasonal interest as the buds, blooms, and leaves change color. Trees also contribute to narrowing the feel of the street and obstructing visibility, which sends a visual cue to drivers to slow down (Burden 2000; fig. 20).

"Urban street trees create vertical walls framing streets, providing a defined edge, helping motrists guide their movement and assess their speed (leading to overall speed reductions)" (Burden 2006).

eyes on the street

A noticeable hindrance to downtown development is the perception of crime, whether warranted or not. Jane Jacobs and many after her advocated for 'eyes on the street,' a network of the people that oversee and govern a space (Jacobs 1961). This network is strongest when there is a diverse population of people with diverse schedules and habits, but with a sense of ownership for the street. Proximity to other cultures requires people to adapt their behavior and become more civil (Hollis 2013).

Building great cities must happen from the bottom up, beginning with great streets (Jacobs 1961). All the policy changes in the world cannot bring safety to a poorly designed street. Mixed use development, diverse housing and employment options, and a complete street that accommodates all modes of transportation puts the people on the street, which discourages crime.

Figure 20: Traffic Calming from Tree Placement

A. Tree lined streets send a visual cue to drive slower.
B. Wide open streets encourage faster driving.
Source: by author
Concept by: Burden, Dan. Urban Street Trees: 22 Benefits. August 2006

urban triage

definition of urban fabric

There is much written about the characteristics of healthy active communities, smart growth, environmentally conscious planning, with walkability emerging as a central concept of all of these themes. Most of these works describe what an ideal street looks like, giving planners a model to work towards. This is valuable: all of these authors describe the economic, health, and environmental value of walkability, stress it's importance, and encourage us to work towards it. However, it can be difficult to know where to begin, especially considering the limited resources that cities often have for walking, cycling, and public transportation.

Jeff Speck in *Walkable City: How Downtown can Save America* proposes the seemingly unique concept of 'urban triage' to evaluate how to concentrate public funds. The more common definition of 'triage' is the sorting of wounded patients in order of urgency, to determine the order of treatment. This process was often described in war time scenarios, with the broader implication that some wounded had a better chance of survival than others. Speck, like most pragmatists, recognizes that in most cities, there is momentum against walkability, with car-oriented development ever sprawling. Cities can never hope to become walkable if they spread their resources too thin, spending too much money on pedestrian amenities in areas that are fundamentally not designed for walking. To give walkability a chance, it's essential to recognize areas of the highest potential and concentrate resources in these places (Speck 2012).

As he goes on to explain, you can't make a city walkable overnight. To create areas where people can feasibly live, work, and play without a car, you have to start small, often with one street. Denver, for example, has gained a reputation as a walkable city in the last 20 years, but began with the development of just a few blocks of Denver's Lower Downtown. The walkable core, and the city's reputation for walkability, grew from there (2012).

"Where can spending the least money make the most difference? The answer, as obvious as it is ignored, is on streets that are already framed by buildings that have the potential to attract and sustain street life" (Speck 2008, 254). The areas with the most potential for walkability, as he describes, are those with complete urban fabric, dense street networks, and high connectivity, which are features that contribute to all of the other factors present in walkable places.

Where can spending the least money make the most difference? The answer, as obvious as it is ignored, is on streets that are already framed by buildings that have the potential to attract and sustain street life. (Speck 2012, 254)

high walkability potential | *low walkability potential*

Figure 21: High and Low Walkabilty Potential

A. Aerial of Douglas Ave. at Emporia St. **B.** Aerial of 21st St. at Rock Rd.
C. Street View of Douglas Ave. Looking West Toward Emporia St.
D. Street View of 21st St. Looking East Toward Rock Rd.

Source: Google Maps
Concept of Urban Triage by: Jeff Speck

Though seemingly counterintuitive, the area on the right is a well-used shopping area that many consider a nice place to be. The street on the left contains significant vacancy and faces a park that some consider unsafe. But the area on the right is fundamentally designed for the car: massive parking lots mean that stores are far from one another and more sparse street networks mean that collectors carry significant car travel, and are thus cumbersome to cross on foot. As Speck describes, areas like the one on the right will never be walkable and should be put on the back burner for walkability investment.

inter-related walkability characteristics and central concepts

definition of urban fabric

Figure 22 illustrates how the qualities of walkability, as described in literature, contribute to one another. In this diagram, three qualities emerge as central concepts that contribute to the rest: dense urban fabric, dense street network, and connectivity.

These are all qualities typically associated with traditional neighborhood design with gridded streets and short blocks. These qualities are also very difficult to apply areas with a hierarchical street network.

Speck advocates for a process of "urban triage" in which some streets are recognized as having more potential than others, and are thus better candidates for walkability investment (2012, 254). These three qualities closely resemble the factors that Speck describes as key to the urban triage process, and thus became the principal qualities for urban triage evaluation in Wichita, Kansas.

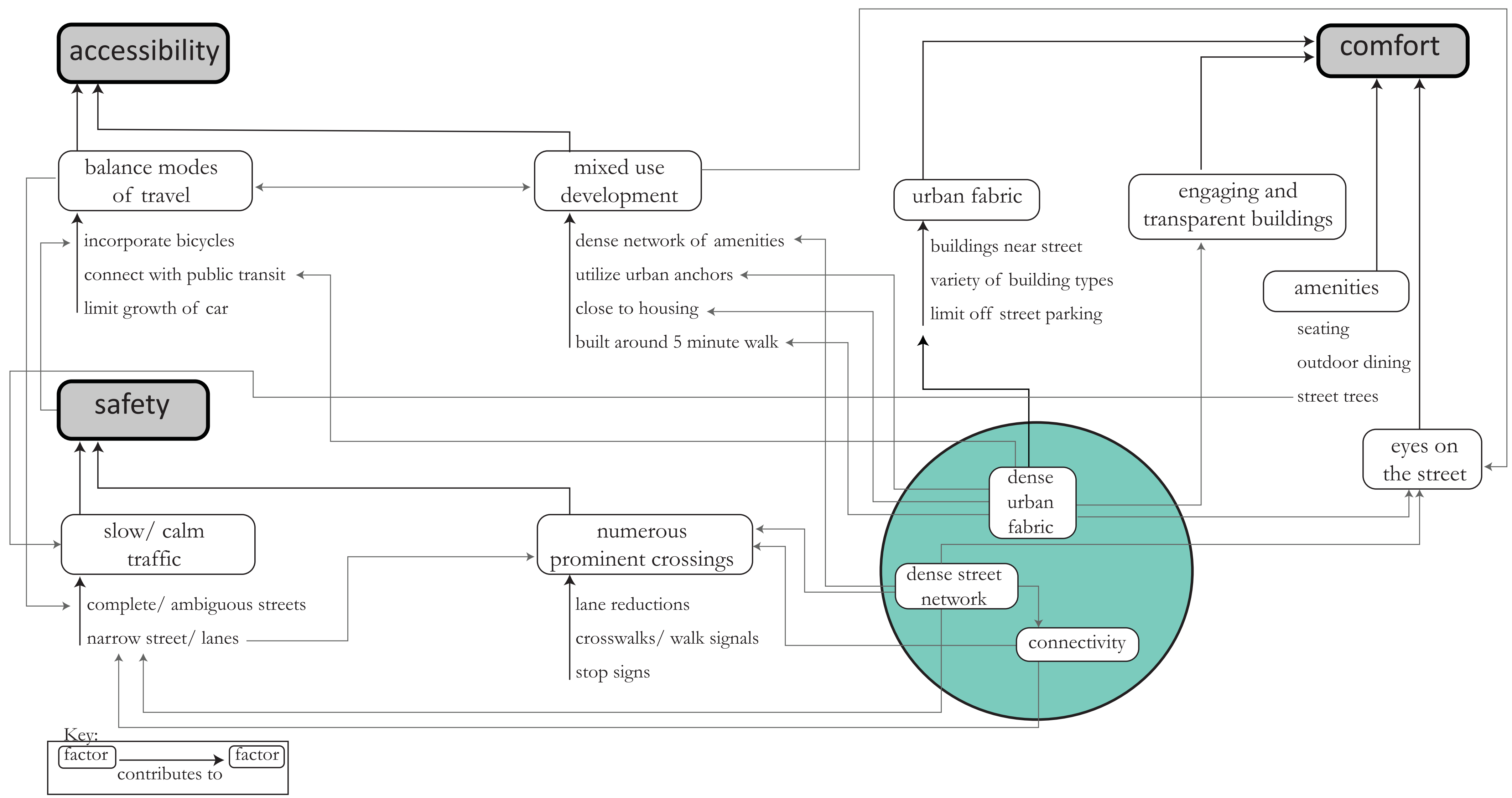


Figure 22: Inter-Related Walkability Characteristics and Core Concepts

Source: by author
Synthesized from literature review (see p 22 for all citations).

group work

development of pop up park design by creative placemaking group

This research project has both a group component and a complementary individual component. The group, with a central concept of Creative Placemaking, is composed of five Kansas State students with distinct research questions that will shape a collaborative design process. These abstracts of these individual studies are found in Appendix 1. This group established at an early date a goal to design and construct a public space demonstrating the findings of these individual studies.

This group established a relationship with the Wichita Downtown Development Corporation, which has secured a grant to develop a pop-up park on Douglas Avenue between Market Street and Main Street (fig. 24) featuring food trucks and seating elements (fig. 25). This park serves a temporary purpose, activating the site for three to five years while a building is developed for the space. The site has been empty for approximately twenty years after a grandiose development plan fell through. Commonly referred to as "the hole" due to the fact that most of the site sits six to ten feet below the grade of the street, this space is nothing more than an unpaved below grade parking lot (fig. 23). The WDDC hopes to transform this eyesore into a temporary urban asset until a building is constructed in the space. If successful, they plan to seek other catalyst sites downtown to develop similar spaces, possibly reusing elements from this park. Construction of this park is scheduled to begin in summer 2015.

The Creative Placemaking group participated in a design charrette, hosted by the WDDC in early January 2015, and attended by design professionals, community members, and local business owners, all with a vested interest in improving street life in downtown Wichita.

Figure 23: "The Hole"

Source: Rachel Fox

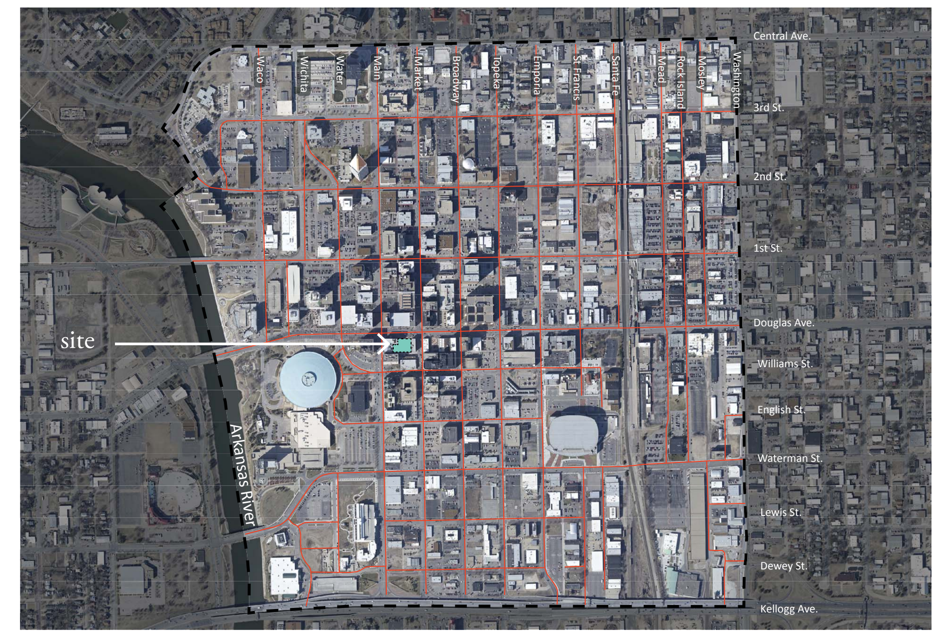


Figure 24: Location of Pop-Up Park

Source: by author

Figure 25: Conceptual Site Plan

Source: Wichita Downtown Development Corporation

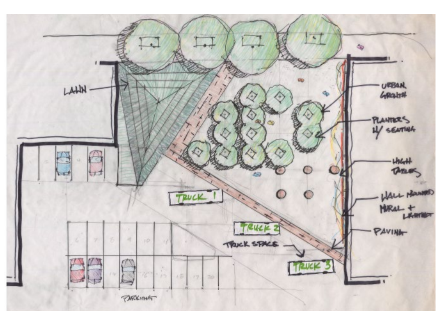
design charette

emerging concepts from design charrette

The Creative Placemaking group participated in a design charrette, hosted by the WDDC in early January 2015, and attended by design professionals, community members, and local business owners, all with a vested interest in improving street life in downtown Wichita. Mixed groups collaborated for two hours and presented drawings on trace to the group (fig. 26).

Among a community of design professionals, students, and community members, most recognized a need for shade, since the site's biggest crowds will likely come around the noon hour and there is little to obstruct the summer sun. There was also an interest in staggering the food trucks to both invite people into the space and provide maximum space to users. Plans also sought to implement a playfulness to the site through whimsical sculpture or simple climbable features like boulders or mounded turf.

The concepts dealt with program elements including a movie screen, recreation area, and parking allotments in different ways. In the end, it was determined that the space should most importantly respond to its primary function: to create a comfortable space to house food trucks around lunch time.



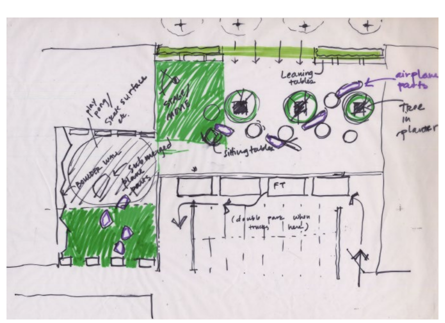


Figure 26: Conceptual Proposals

Source: Design Charette at the Wichita Downtown Development Corporation January 16, 2015

proposed layout

Based on further discussions and critique among our group and a follow up presentation to the Wichita Downtown Development Corporation, we developed a concept (fig. 28) to limit the primary food truck oriented space to the front half of the lot. With a smaller space, the park can feel vibrant with fewer people, and with success, the space can be expanded.

We also recognized the need for engaging features as close to the sidewalk as possible. We incorporated a bar top along the front edge of the space as well as a sculptural piece incorporating some element of aviation, to celebrate the history of Wichita. A geometrically shaped berm with artificial turf will provide a low maintenance, unique seating option as well as a rudimentary play structure.

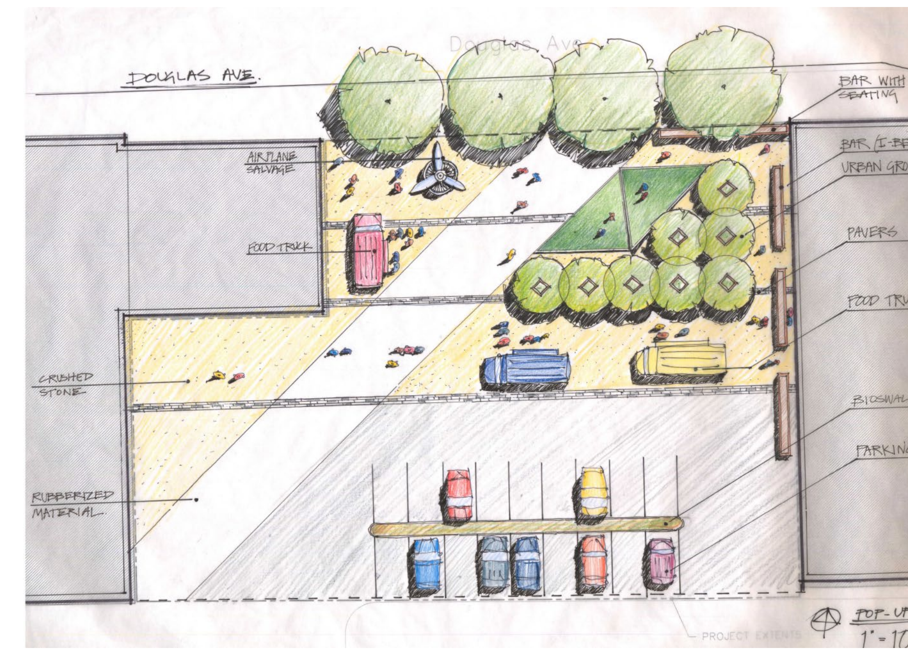


Figure 28: Conceptual Layout of Douglas Avenue Pop-Up Park

Source: Drawing developed by Nicholas Mercado and Abby Glastetter
Collaboration and critique from Steven Holt, Rachel Fox, and Danielle DeOrsey

designation of roles

Because some individual projects were more site specific than others, part of the group carried a bigger role in further developing concepts from the design charrette, while others, myself included, assumed the role of critiquing and reviewing those concepts (fig. 29).

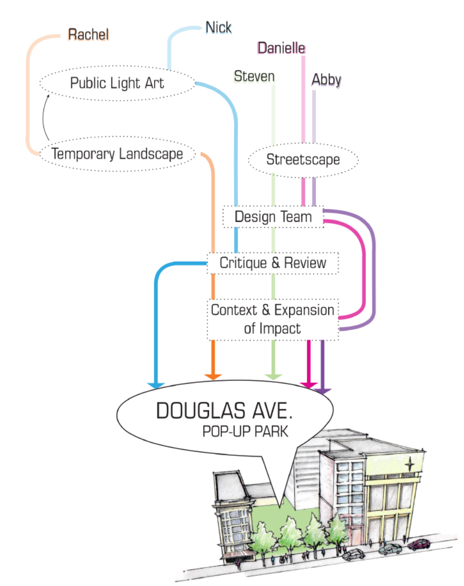


Figure 27: Roles of the Design Team

Source: by Nicholas Mercado.

methods
developing a strategy to plan for walkability

list of methods

develop a rubric for measuring qualities of walkability
establish study area
urban triage: narrowing of the study area
block by block analysis of narrowed study area
develop informed improvement strategy

summary of methods

The literature review has identified many qualities that are synonymous with walkable places. They are all admirable goals for a city to work towards, and are therefore all relevant. The first part of the methodology involves turning each of these qualities into measurable factors that can be studied on a block by block basis. Because the goal of this research is to help cities understand their relative strengths, weaknesses, and areas of opportunities, the primary objective of this research is to measure and map each of these factors in an effort to illuminate trends and conditions that would not otherwise be evident. From the literature review, I have composed a list of measurable factors to survey a downtown on a block by block basis (tables 1-3, pages 48-49). Through trial and error, I have adjusted the thresholds of these factors to assign each block one of three ratings: high (good), medium, and low (bad or weak).

I have accepted the project boundary of downtown as described by the WDDC. Because the rubric that I composed measures many attributes, it became necessary to narrow the scope of study to streets with high potential.

Using diagrams illustrating potential urban anchors, the quality of urban fabric, and existing attractions, I identified a specific corridor with the most potential to connect downtowns major components, as well as the few missing links to connect that corridor to downtown's biggest venue.

For this narrowed study, I conducted a block by block inventory based on the criteria in the rubric I developed. I then mapped these qualities individually and as weighted composite ratings.

The data has revealed glaring weaknesses to urban walkability in Wichita, some easily addressed, some less easily addressed. From this understanding, I've developed a prioritized strategy for walkability investment downtown. The major design decision is placement and conceptual design of Wichita's next urban pop-up park, assuming that the park developed by the Creative Placemaking umbrella group and the WDDC is successful in activating a void in the urban fabric.

development of a rubric

process

Most of the literature about walkability describes qualities or characteristics of the street, many of which are difficult to quantify. To create a rubric, I listed the ways that each characteristic could conceivably be measured based on the literature review. I created thresholds that would allow me to classify each block by each characteristic as low, medium, or high, in an effort to create very clean and concise maps of these conditions. I did not set these thresholds to necessarily describe a block as good or bad, but merely stronger or weaker with respect to the rest of the study area.

I tested the first rubric (table 1) on six blocks in Manhattan, Kansas including the blocks that I hypothesized to be among the most and least walkable. I adjusted some thresholds and measurable qualities based on this test. I tested a second iteration of the rubric (table 2) in Wichita, Kansas along Douglas Avenue, which I hypothesized to be the most walkable street, and again made adjustments to qualities and thresholds. At this point, I realized that measuring blocks by this rubric took about fifteen to twenty-five minutes per block, and thus the study area would need to be narrowed, as will be described in the section "narrowing the study area." I applied the third iteration (table 3) of the rubric to the narrowed study area in Wichita, Kansas.

weighting characteristics

Finally, I recognized that some characteristics are more difficult to change than others, and that some characteristics are more important than others. I assigned a weight to each characteristic in an effort to reward a block for being strong in a more important quality and penalize it less for lacking in something easy to repair.

However, these weights are assigned based my understanding of the relative importance based on the literature, and based on my limited understanding of how difficult the quality is to change. Due to the limitations of this project, I have not conducted a sensitivity analysis to better understand how these weights influence the results, or if they change the results significantly at all. In replicating this rubric to conduct a more thorough analysis of a city, a sensitivity analysis would help fine tune these weights to more accurately reflect the condition of the street.

category	characteristic	Measure per Block	Thresholds			Weight
			Low (1)	Medium (2)	High (3)	
accessibility	mixed uses	Number of Building Types on block	1	2	3+	1.0
		(Res, comm, Ind, Edu, Pub)				
		within 3 blocks	1	2	3+	0.9
		within 6 blocks	1	2	3+	0.8
		Number of Public Destinations on block	0-2	2-4	4+	1.0
		within 3 blocks	0-5	6-10	11+	0.9
		within 6 blocks	0-10	11-20	21+	0.8
	urban anchors	Walking Blocks to Nearest Urban Anchor	6+	2-5	0-1	1.0
	on street parking	# of Street Parking Spaces	0-10	20-30	30+	0.5
		# of vacant street parking spaces	20+	6-20, 0-2	3-6	0.5
	connection to transit	Walking Blocks to Nearest Transit Stop	4+	2-4	0-1	0.5
		Frequency of Transit per hour	0	1-2	3+	0.5
		# of Routes within 3 block walk	0	1	2+	0.5
	amenities for bikes	Extra width beyond 12' from center line	under 2'	2-4'	4' +	0.6
		Stop signs within 3 block length	0-3	3-6	6+	0.8
		Parallel Streets within 1000'	0-1	1-3	4+	0.8
		Block Length	400 +	300'-400'	<300'	1.0
		Bike Lane or Separated Path	0	0	1	0.6
		Bike Racks	0	1	2+	0.5
		Cyclists: count per 5 min	0	1	2+	0.5
safety	safety	Posted Speed Limit	35 +	25-30	20 or -	1.0
		Number of Driving Lanes	4+	3	2	0.8
		Width of Driving Lanes	14' +	12-13'	up to 11'	0.8
		Block Length	400' +	300-400'	< 300'	0.8
		Intersection Type	Gr Wave Light	Light	Stop Sign	0.6
		Number of Crosswalks	0	1	2	0.5
		Sidewalks	None/broken	1	2	0.6
		Unobstructed Sidewalk Width	less than 5'	5-7'	7' +	0.6
		Number of Car Entrances	4+	2-3	0-1	0.9
		Parallel Parking Occupancy	under 50%	50-75%	75% +	0.5
		Complicating Road Features	0	1	2+	0.8
		Pedestrians: count per 5 min	0	1-3	4+	0.6
		One Way Streets	yes		no	0.7
		Frequency of 'Walk' Signal	91+ sec, none	61-90 sec	up to 60 s	0.5
comfort	urban fabric	% of street level occupied by bldg.	under 50%	50-80%	80% +	1.0
		% of street occupied at 2nd level	under 40%	40-70%	70% +	0.9
		% of street occupied at 3rd level	under 30%	30-60%	60% +	0.8
		Total sq ft of building foreground	5000 +	1000-5000	< 1000	1.0
	amenities	Number of Trees	0-4	4-8	8+	0.6
		Maturity	0-10'	10-20'	20'+	0.5
		additional landscape Beds	0-1	1-2	3+	0.5
	engaging facades	Number of Front Doors	0-5	5-10	11+	1.0
		Number of buildings with at least 50% transpare	0-3	3-6	7+	1.0
		Outdoor Dining opportunities	0	1	2+	1.0
		Built in Benches	0	1	2+	0.9
		Number of Different Arch. Styles	1	2	3+	1.0
		Other Inviting Features	0	1	2 +	1.0
		Interest Level of Surface	Low	Med	High	1.0

Table 1: 1st Iteration of Walkability Rubric

Source: by author
Developed and tested on six city blocks in Manhattan, KS
Concepts extracted from literature listed on p 22.

distinction from walkscore

While this rubric and Walkscore.com are both tools for measuring walkability, they differ both in breadth and purpose. Walkscore employs a methodology, validated by researchers, that values walking options, density of amenities and population, block length and intersection density. It is an excellent resource for consumers hoping to learn about the livability of an unfamiliar area.

This rubric was developed to measure and illustrate the details and characteristics of the street, buildings, and accommodations for pedestrians. It is intended to be an instrument for planners, to inventory and analyze the conditions of a street, in order to make informed design decisions to improve walkability.

category	characteristic	Measure per Block	Thresholds			Weight
			Low (1)	Medium (2)	High (3)	
accessibility	mixed uses	Number of Building Types on block	1	2	3+	1.0
		(Res, comm, Ind, Edu, Pub)				
		within 2 blocks	1	2	3+	0.9
		within 4 blocks	1	2	3+	0.8
		Number of Public Destinations on block	0-5	5-12	13+	1.0
		within 2 blocks	0-10	11-20	21+	0.9
		within 4 blocks	0-20	21-40	41+	0.8
		Est Housing Units on Block	0-8	8-20	21+	1.0
		within 2 blocks	0-16	17-40	41+	0.9
		within 4 blocks	0-32	33-80	80+	0.8
	urban anchors	Large Employers (75+) within 4 blocks (x)	0	1-3	4+	1.0
		Parking Structures within 4 blocks	0	1	2+	1.0
		Grocers within 4 blocks	0	1	2+	1.0
		Major Shopping within 4 blocks	0	1	2+	1.0
	on street parking	# of Street Parking Spaces	0-10	20-30	30+	0.5
		# of Occupied Parking Spaces	0-8	9-17	18+	0.5
	connection to transit	Walking Blocks to Nearest Transit Stop	4+	2-4	0-1	0.5
		Frequency of Transit per hour	0	1-2	3+	0.5
		# of Routes within 3 block walk	0	1	2+	0.5
	amenities for bikes	Extra width beyond 12' from center line	under 2'	2-4'	4' +	0.6
		Unsignalled inters. 1/4 mi both directions	5+	3-4	0-2	0.8
		Parallel Streets within 1000'	0-1	1-3	4+	0.8
		Block Length	400 +	300'-400'	<300'	1.0
		Bike Lane or Separated Path	0	0	1	0.6
		Bike Racks	0	1	2+	0.5
		Posted Traffic Speed	35+	25-30	0-20	0.8
		Cyclists: count per 5 min	0	1	2+	0.5
safety	traffic speed	Posted Speed Limit	35 +	25-30	20 or -	1.0
		Number of Driving Lanes	4+	3	2	0.8
		Width of Driving Lanes	14' +	12-13'	up to 11'	0.8
		Block Length	400' +	300-400'	< 300'	0.8
		Intersection Type	Gr Wave Light	Light	Stop Sign	0.6
		Complicating Road Features	0	1	2+	0.8
		One Way Streets	yes		no	0.7
	crossings	Number of Crosswalks	0	1	2	0.5
		Sidewalks	None/broken	1	2	0.6
		Unobstructed Sidewalk Width	less than 5'	5-7'	7' +	0.6
		ADA access points	0-1	2	3+	0.5
		Number of Car Entrances	4+	2-3	0-1	0.9
		Parallel Parking Occupancy	under 50%	50-75%	75% +	0.5
		Pedestrians: count per 5 min	0	1-3	4+	0.6
		Frequency of 'Walk' Signal	91+ sec, none	61-90 sec	up to 60 s	0.5
comfort	urban fabric	% of street level occupied by bldg.	under 50%	50-80%	80% +	1.0
		% of street occupied at 2nd level	under 40%	40-70%	70% +	0.9
		% of street occupied at 3rd level	under 30%	30-60%	60% +	0.8
		Total sq ft of building foreground	5000 +	1000-5000	< 1000	1.0
	amenities	Number of Trees	0-4	4-8	8+	0.6
		Maturity	0-10'	10-20'	20'+	0.5
		additional landscape Beds	0-1	1-2	3+	0.5
		Outdoor Dining opportunities	0	1	2+	1.0
		Built in Benches	0	1	2+	0.9
	engaging facades	Number of Front Doors	0-8	9-15	16+	1.0
		% of block transparent	0-30%	30-70%	70% +	1.0
		Number of Different Arch. Styles	1	2	3+	1.0
		Recessed Entrances	0-5	6-10	11+	0.8
		Other Inviting Features	0	1	2 +	1.0
		Interest Level of Surface	Low	Med	High	1.0

Table 2: 2nd Iteration of Walkability Rubric

Source: by author
Adjusted thresholds from previous test and adjusted measurement criteria to better reflect qualities. Tested in Wichita, KS.

category	characteristic	Measure per Block	Thresholds			Weight
			Low (1)	Medium (2)	High (3)	
accessibility	mixed uses	Public Attractions on block	0-2	3-5	6+	1.0
		within 1 adjecent blocks (6 total)	0-11	12-23	24+	0.9
		within 2 adjacent blocks (22 total)	0-30	31-60	61+	0.8
		within 3 adjacent blocks (46 total)	0-45	46-90	91+	0.7
		Est Housing Units on block	0-8	8-20	21+	1.0
		within 1 adjacent block	0-15	16-30	31+	0.9
		within 2 adjacent blocks	0-32	33-80	81+	0.8
		within 3 adjacent blocks	0-45	46-105	120+	0.7
	urban anchors	Large Employers (75+) within 4 blocks	0	1-3	4+	1.0
		Parking Structures within 4 blocks	0	1	2+	1.0
		Grocers within 4 blocks	0	1	2+	1.0
		Major Shopping within 4 blocks	0	1	2+	1.0
		(4+ stores within 1 block)				
		Major Schools within 4 blocks	0	1	2+	1.0
		Major Event Centers within 3 adj blocks	0	1	2+	1.0
	on street parking *	# of Street Parking Spaces	0-9	10-16	17+	0.5
		# of Occupied Parking Spaces	0-7	8-13	14+	0.5
	connection to transit	Walking Blocks to Nearest Transit Stop	3+	within 2 adj.	on block	0.5
		Transit routes per hour within 3 blocks WD	0-4	5-8	9+	0.5
		Transit routes per hour within 3 blocks WE	0-4	5-8	9+	0.5
		# of Routes within 4 block walk	0-2	3-5	6+	0.5
	amenities for bikes	width beyond 12' of outside lane	under 2'	2-4'	4' +	0.6
		Unsignalled inters. 1/4 mi both directions	5+	3-4	0-2	0.8
		Parallel Streets within 1000'	0-1	1-3	4+	0.8
		Block Length	350'+	300-350'	<300'	1.0
		Bike Lane or Separated Path	0	0	1	0.6
		Bike Racks	0	1	2+	0.5
		Posted Traffic Speed	35+	25-30	0-20	0.8
		Cyclists: count per 5 min	0	1	2+	0.5
safety	traffic speed	Posted Speed Limit	35 +	25-30	20 or -	1.0
		Number of Driving Lanes	4+	3	2	0.8
		Width of Driving Lanes	14' +	12-13'	up to 11'	0.8
		Block Length	350'+	300-350'	< 300'	0.8
		Intersection Type	Gr Wave Light	Light	Stop Sign	0.6
		Complicating Road Features	0	1	2+	0.8
		One Way Streets	yes		no	0.7
	crossings	Number of Crosswalks	0	1	2	0.5
		Sidewalks	None/broken	1	2	0.6
		Unobstructed Sidewalk Width	less than 5'	5-7'	7' +	0.6
		ADA access points	0-3	4	5+	0.5
		Number of Car Entrances	4+	2-3	0-1	0.9
		Parallel Parking Occupancy	under 50%	50-75%	75% +	0.5
		Pedestrians: count per 5 min	0	1-3	4+	0.6
		Frequency of 'Walk' Signal	91+ sec, none, butt	61-90 sec	up to 60 s	0.5
comfort	urban fabric	% of street level occupied by bldg.	under 50%	50-80%	80% +	1.0
		% of street occupied at 2nd level	under 40%	40-70%	70% +	0.9
		% of street occupied at 3rd level	under 30%	30-60%	60% +	0.8
		Total sq ft of building foreground	5000 +	1000-5000	< 1000	1.0
	amenities *	Number of Trees	0-4	5-8	8+	1.0
		Maturity	0-15'	15-25'	25+ '	1.0
		additional landscape Beds	0-1	1-2	3+	0.5
		Outdoor Dining opportunities	0	1	2+	0.8
		Built in Benches	0	1	2+	0.7
		Other Inviting Features	0	1	2 +	0.5
	engaging facades	Number of Front Doors*	0-6	7-12	13+	1.0
		% of block transparent	0-30%	30-70%	70% +	1.0
		Number of Different Arch. Styles	1	2	3+	1.0
		Recessed Entrances	0-5	6-10	11+	1.0
		Interest Level of Surface (opinion)	Low	Med	High	1.0
* normalized for 350' block						

Table 3: 3rd Iteration of Walkability Rubric

Source: by author
Adjusted thresholds from previous test and adjusted measurement criteria to better reflect qualities. Tested in Wichita, KS.

adjustments based on observations

Adjusted measurable characteristic from previous rubric

Adjusted threshold from previous rubric

application of rubric

data collection

The rubric was designed with the intention to record all of the characteristics on site. I brought this rubric with me, along with the thresholds for each, and walked block by block throughout the study area. Many qualities were simple counting exercises like the number of curb cuts, recessed entrances, or street trees. I measured the sidewalk width and the width of drive lanes by stepping it off and measured the timing and quality of walk signals with a stop watch. Others qualities required my judgment, like assessing whether the stop lights were synchronized to encourage a green wave of traffic, or how many significantly unique architectural styles were present.

Some characteristics were difficult to count quickly on site, such as quantity of housing, number of bus routes, and number of parking garages within in a three block radius. I completed this process at my desk using reference maps that I created using housing data provided on downtownwichita.org, bus route data from wichitatransit.org, and parking garage locations based on aerial photography (fig. 29).

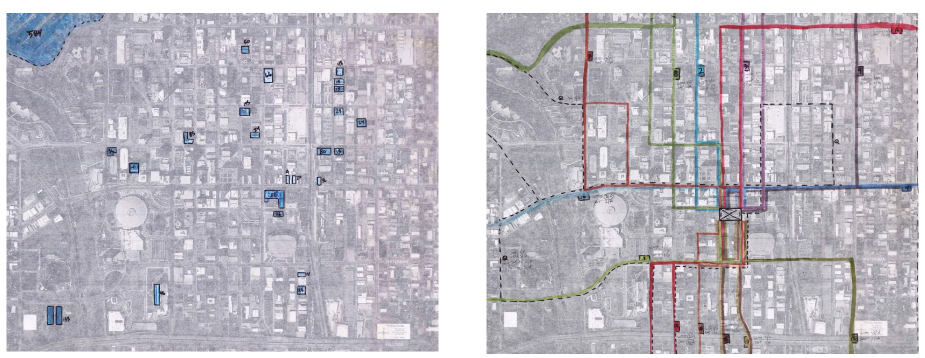


Figure 29: Reference Maps

A. Housing **B.** Bus Routes **C.** Parking
Source: by author
Adapted from data by Wichita Downtown Development Corporation, Wichita Transit, and Google Maps

data compilation

Figure 30: Attractions per Block

Source: by author
Compiled from Data Mapped by the Wichita Downtown Development Corporation

The most difficult data to compile was the number of existing attractions per block. It was at this point that I was forced to accept the fact that the rubric I created was too specific to collect data for the entire downtown. I used interactive maps created by the Wichita Downtwn Development Corporation to create a reference map of my own (fig. 30) and then compiled totals from adjacent blocks to give a one, two, and three block total for each block of the focused study area (fig. 31).

Figure 31: Process for Compiling Attractions

Source: by author
Adapted from Figure 30

project boundary

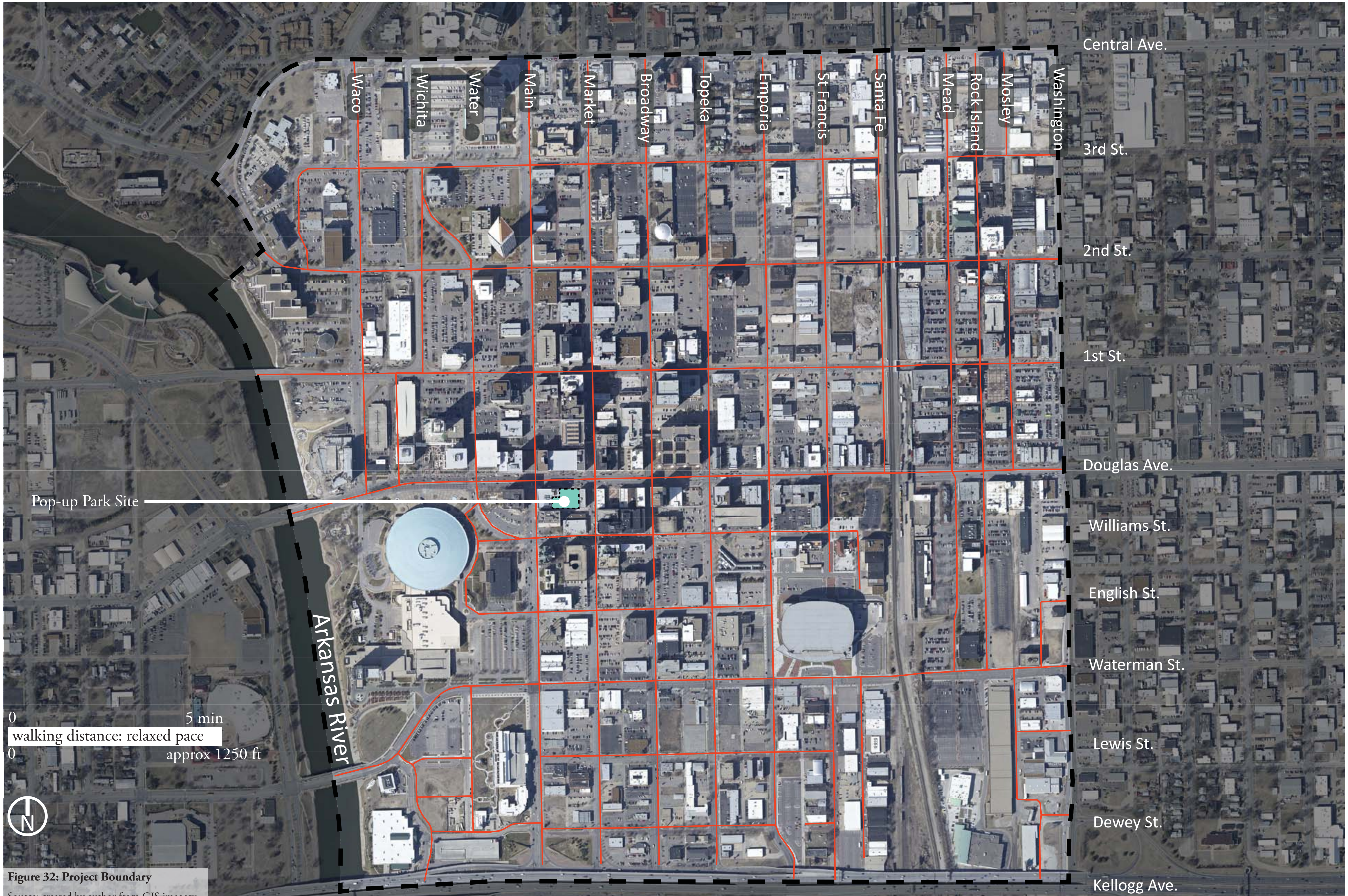


Figure 32: Project Boundary
Source: created by author from GIS imagery

The Wichita Downtown Development Corporation identifies the Downtown Self Supported Municipal Improvement District (SSMID) as the area bounded by Kellogg Avenue on the south, Central Avenue on the north, the Arkansas River on the west, and Washington Street on the east. This area is commonly accepted as downtown, and therefore served as a logical boundary for this project. This area encompasses roughly one square mile, and is composed primarily of streets in a regular grid pattern. Kellogg is the only major highway that interacts with this district.

the case for downtown
connectivity and block length

connectivity

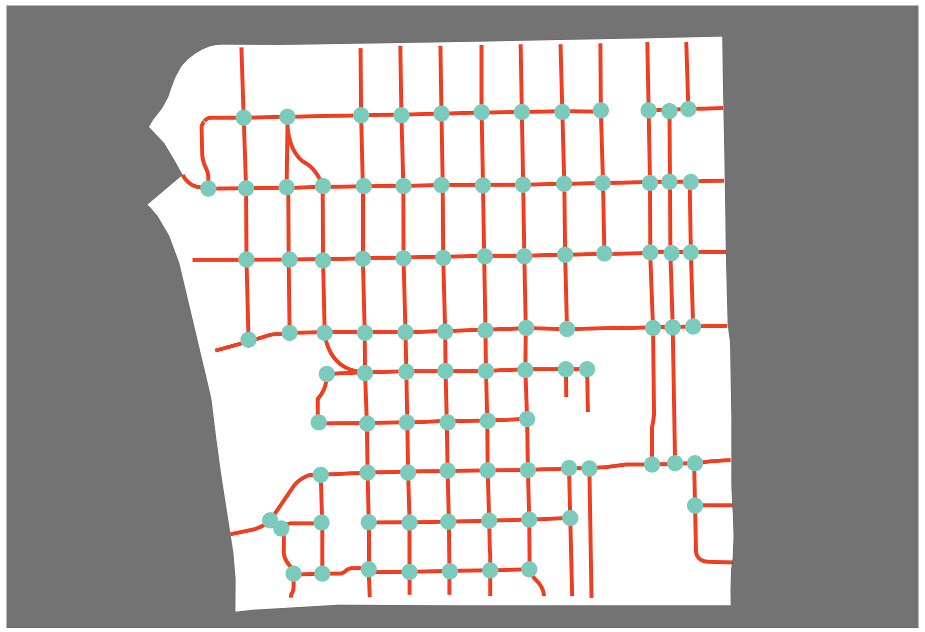


Figure 33: Link Node Ratio of Downtown

Source: by author

The decision to concentrate this study on downtown was not made simply out of convenience. As described in the literature review, traditional gridded street networks are more appropriate for walkability, mainly because a high number of streets means that streets don't have to be as wide. Narrower streets are easier for pedestrians to cross and discourage speeding.

Traditional street networks have a high degree of connectivity. One way to measure connectivity is link-node ratio. A higher ratio means that traffic has more options, and is thus speeding is less necessary.

The downtown district, roughly one square mile, has 185 links and 93 nodes for a ratio of 1.99.

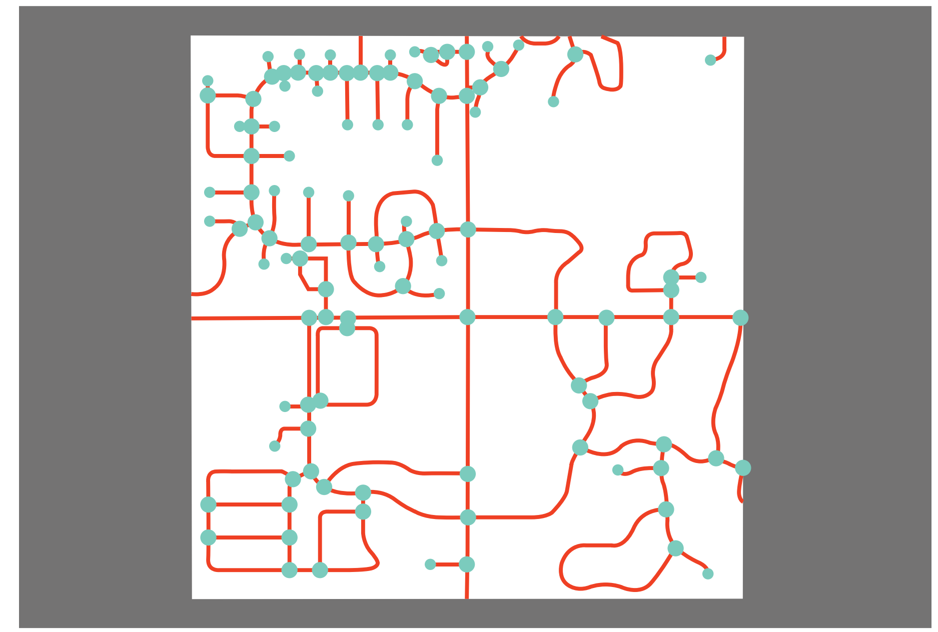


Figure 35: Link Node Ratio of Bradley Fair

Source: by author

In contrast, this upscale shopping area at 21st and Rock Road is built in a hierarchical street pattern. In this layout, travel is less direct as vehicles must transition from local to collector to arterial streets. Arterial streets tend to be longer and wider, thus encouraging speeding. This makes them particularly difficult to cross for pedestrians, discouraging walkability.

This square mile has 136 links and 108 nodes for a ratio of 1.26, significantly lower than downtown.

Street layouts like this one are not easily corrected. Massive investment was necessary to create such a place. For this reason, walkability investment from cities should not be wasted on areas like this one, which has very little potential to become walkable.

block length

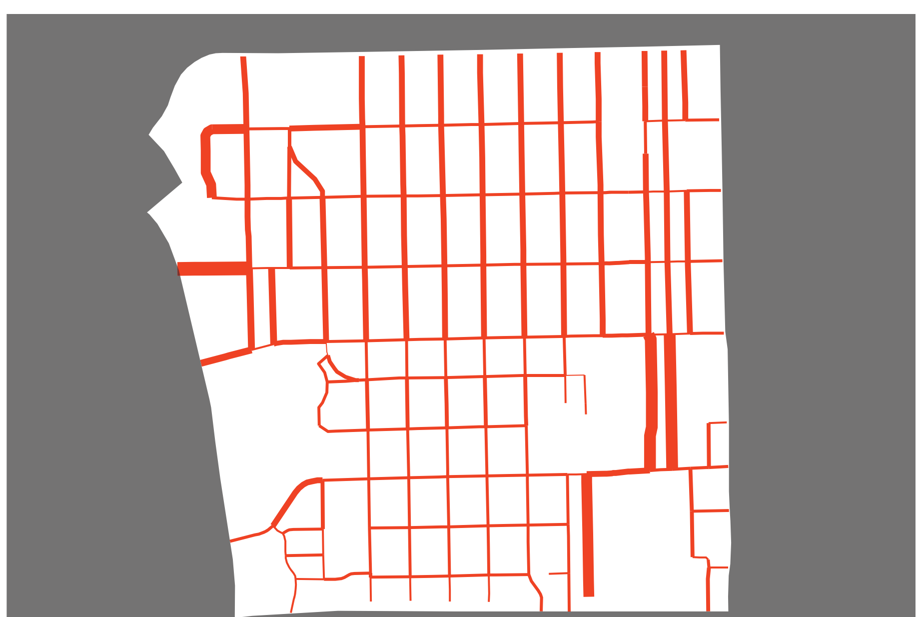


Figure 34: Average Block Length of Downtown

Source: by author

Link-node ratio and block length tend to be strongly correlated. These diagrams directly illustrate relative block length. As discussed, longer blocks tend to be wider blocks with faster traffic speeds. It is the street networks with short block lengths and a lot of streets that are more inherently safe for walking.

In total, the downtown study area has approximately 30 percent more street length than the comparably sized area around Bradley Fair.

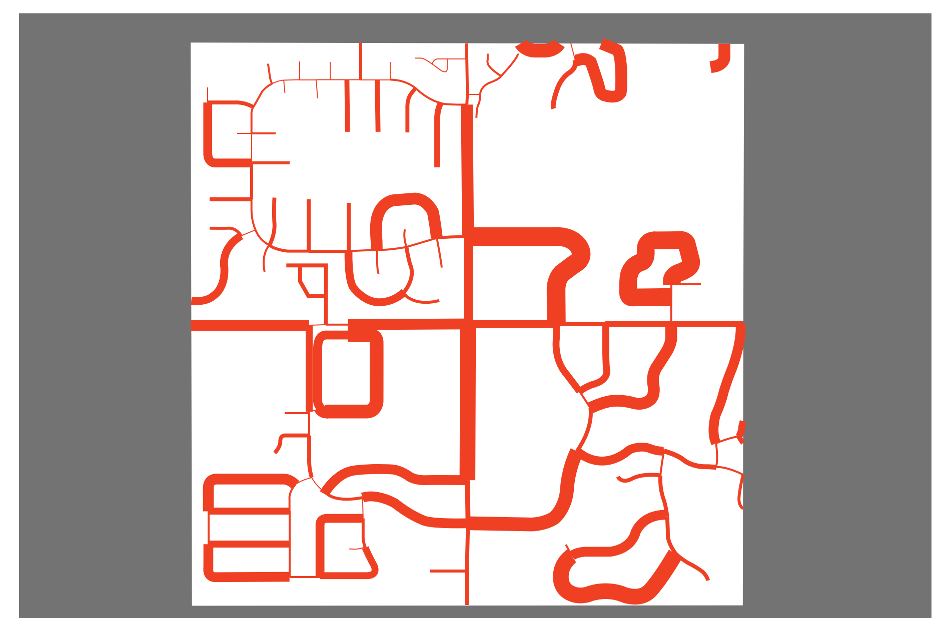


Figure 36: Block Length of Bradley Fair

Source: by author

For all of these reasons, areas with high connectivity and short block length are prime candidates for walkability. The best examples of these networks are often found in downtowns, which were established before the car became the universally accepted mode of travel. This is true in Wichita, where the downtown district has a largely intact gridded street network.

urban fabric

Urban fabric refers to street wall, typically from buildings, that enclose a street, giving it the feel of a finite space, similar to a living room. Many sources have noted that people, like animals, are comfortable in places that simultaneously provide prospect, or views of activity or opportunity, and refuge, or some degree of protection from the elements (Appleton, 1996). Ewing and Handy have established through empirical studies that consistent street wall and finite sight lines are among the most important features of a walkable street (2009). Ewing and Clemente site eight urban design qualities that contribute to a sense of safety, comfort, and interest. Among them are legibility, enclosure, human scale, transparency, complexity, and coherence (2013). Both of these studies extrapolate data from scenes rated by experts to discern the qualities that contribute to walkable neighborhoods.

Therefore, I have used urban fabric as a characteristic through which to narrow the scope of study, both to make the case for downtown, and to identify the strongest blocks within downtown.

visualizing urban fabric through spatial bleed diagrams

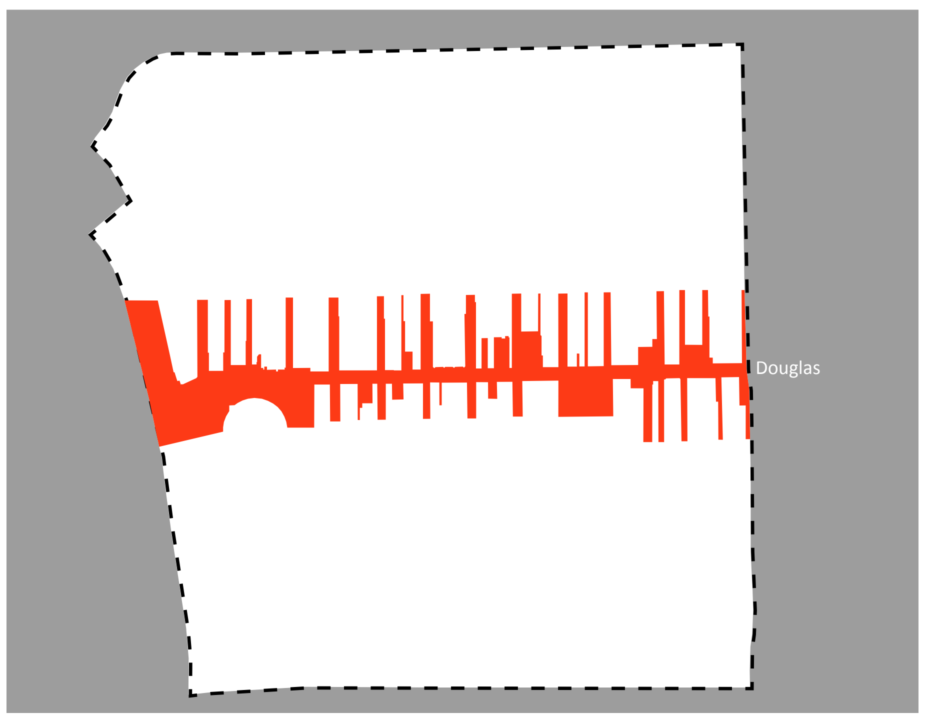


Figure 37: Spatial Bleed Diagram of Douglas Ave

Source: by author

These diagrams are one method I developed to illustrate urban fabric, the make-up of the building facades that enclose a street. If it is true that buildings help shape the space and contribute to pedestrian comfort, then poorly shaped spaces have the inverse effect.

In these diagrams, I illustrated the street space as a mass, rather than a void, a graphic technique often used to illustrate interior spaces (Zevi 1974). In these diagrams, voids in the enclosure allow the mass of the street to "bleed" laterally. I extended the space perpendicular from the study street to the closest building mass or public parallel street.

This type of diagram quickly illustrates the difference between downtown and Bradley Fair (figs 37-38).

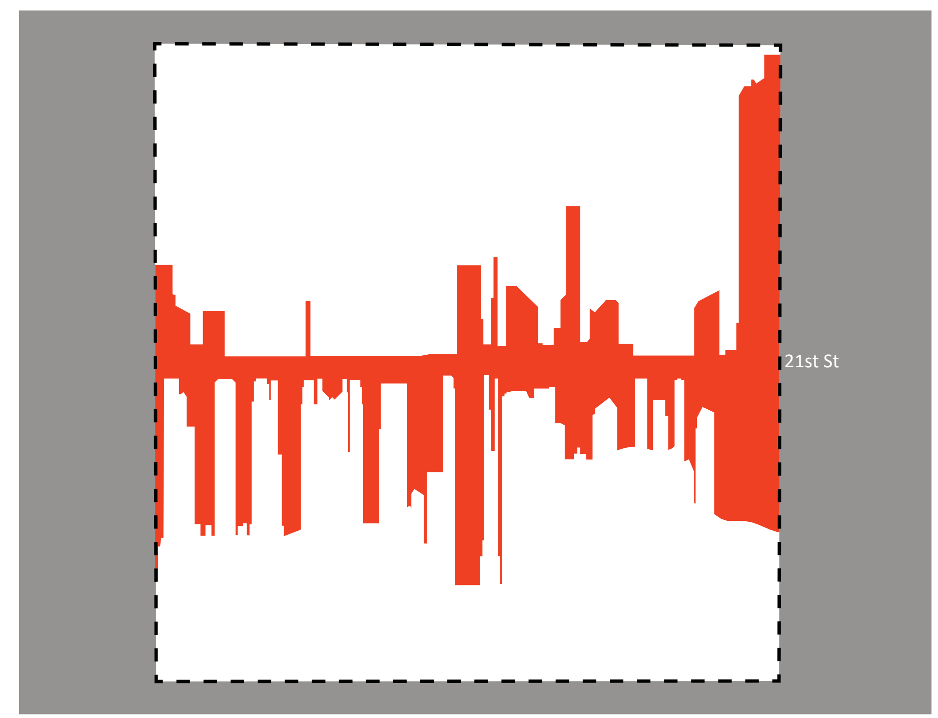


Figure 38: Spatial Bleed Diagram of 21st St. 1/2 mile east and west from Rock Rd.

Source: by author

The spatial bleed diagram of Bradley Fair illustrates the effect of poor urban fabric, which allows the street space to feel quite vast. There are several places along this street where one can conceivably see a half mile with no streets or buildings in between.

The one area in this diagram that appears strong is on the north side of the west half of this street. In fact the street is shaped by a 6' tall white brick wall, which is hardly an ideal way to shape a street comfortably for a pedestrian.

In summary, while this intersection is adjacent to a variety of shopping opportunities, plenty of housing, and even a golf course, none of it is built to the pedestrian scale. This is not a simple fix. For this reason, areas like this should not be the targets for walkability investment.

narrowing the study area

relationship to downtown attractions

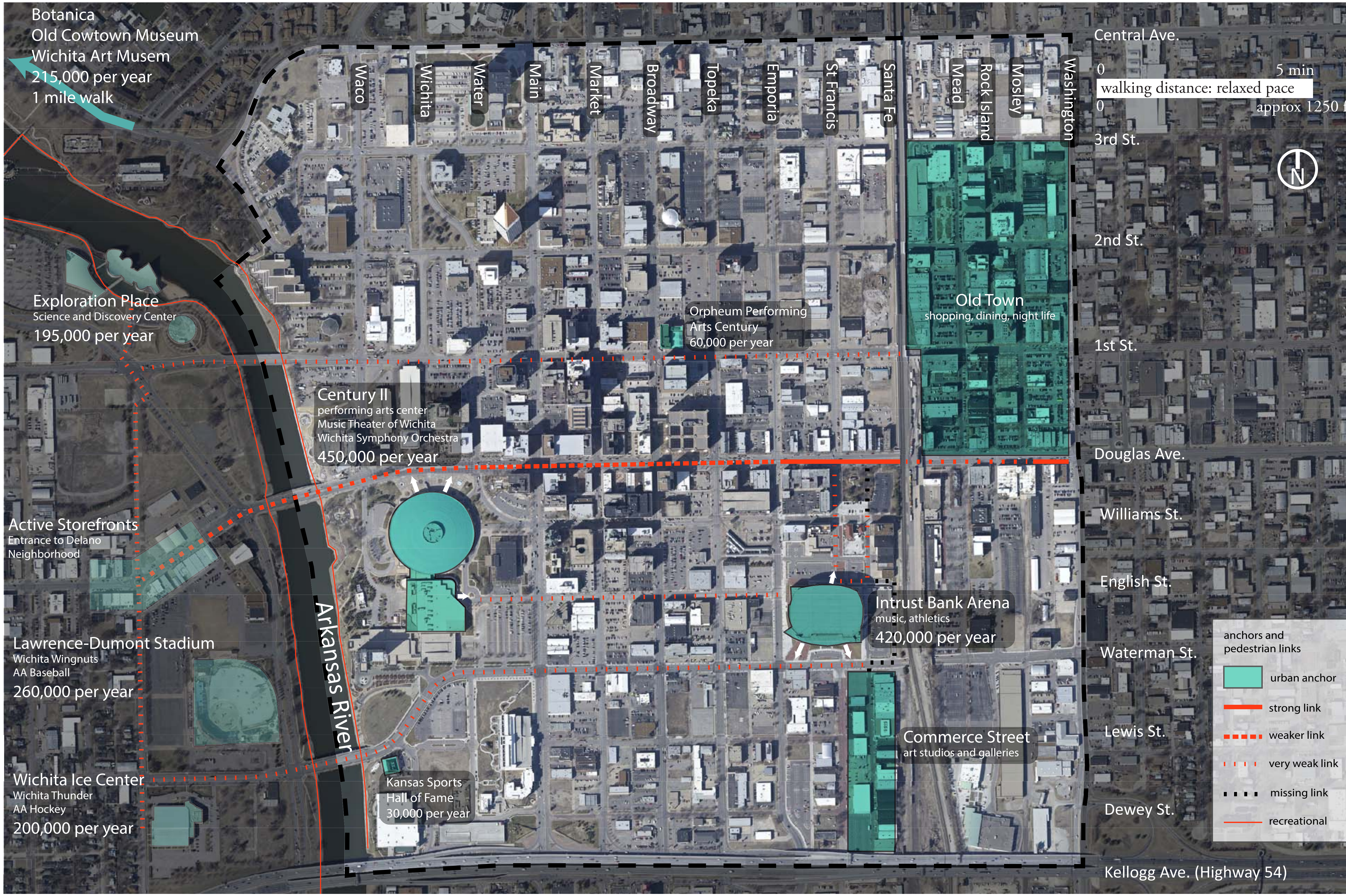
Wichita has invested significantly in developing the riverfront in recent years. Several museums line the river and a large sculptural piece sits at the confluence of the Arkansas and Little Arkansas Rivers, just north of this site. Bike and walking paths run adjacent to the river on both sides. Nearby are the city's minor league hockey and baseball arenas. Along both sides of the river are scenic and attractive walking and biking trails, which seem to be used primarily for recreation, and less for the utility of walking.

On the other side of downtown, the east side, are the newly constructed Intrust Bank Arena, which houses major sporting events and concerts, and Old Town, the most prominent restaurant, bar, and entertainment district.

The most prominent route to drive to downtown is via Kellogg Avenue on the south border. Although a few motels and fast food restaurants appear off the exits, the southern part of the study area is otherwise the most sparse and vacant.

Also noteworthy is Commerce Street along the southeast border of downtown. This street, lined continuously with buildings of a very old character, is home to many small scale art galleries and workshops. It appears that this street has been divided by the Intrust Bank Arena's loading dock.

This diagram infers logical pedestrian connections simply based on their relative attendance and vicinity to one another. The relative strength of these connections, as diagrammed, is based on personal observation of the urban fabric and occupancy of businesses along these streets. It appears that Douglas Avenue has the strongest urban fabric of any east to west street, is within two blocks of the three largest urban attractions in downtown: Century II, Intrust Bank Arena, and Old Town. Therefore, from a purely spatial perspective, it has the most potential to become a connecting spine between these attractions. A noteworthy feature is an elevated railroad corridor that limits the number of east to west connections and serves as a visual barrier.



existing urban attractions

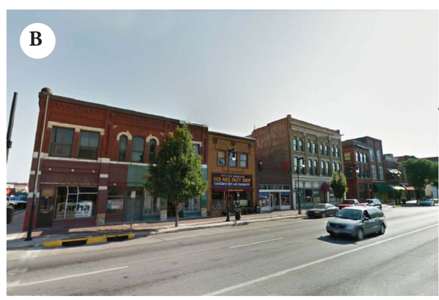


Figure 41: Strong District and Corridor

A. Old Town Source: by author
B. Douglas Ave. Source: Google Maps

In summary, several blocks are strong independently, but Douglas Avenue has the longest continuous stretch of significant activity. There are several very strong blocks in Old Town, but with weaker blocks in between. Commerce Street is one of the strongest blocks but is largely disconnected from the rest of the street network. As a whole, Old Town is the strongest district, but Douglas Avenue is the strongest corridor.

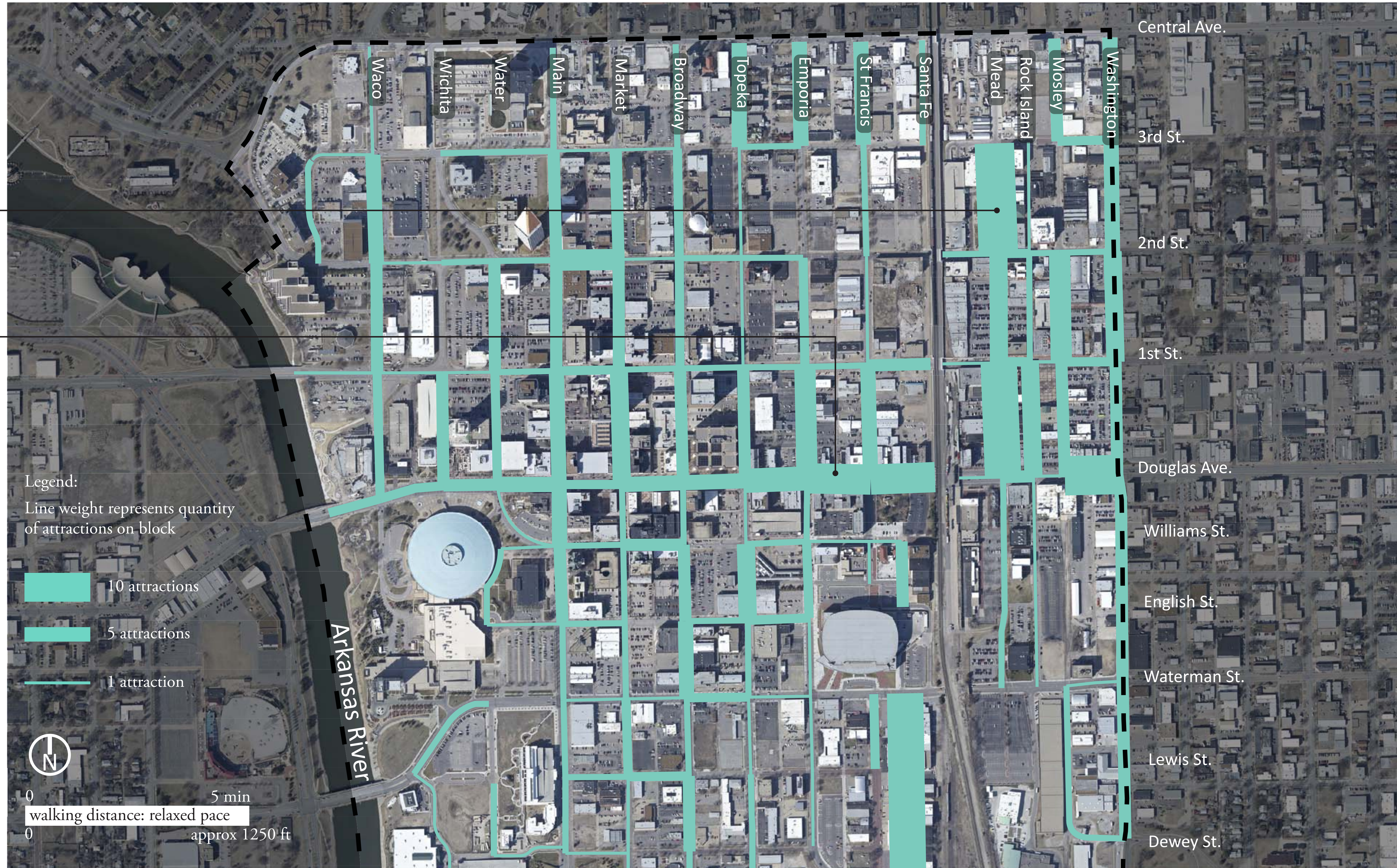


Figure 40: Existing Urban Attractions

Tallied from maps created by the Wichita Downtown Development Corporation

strengths and weaknesses of urban fabric of douglas avenue

Figure 43 illustrates a closer view of Douglas Avenue and the spatial bleed diagram described on page 56. This illustrates how the shape of buildings, or lack of buildings, forms the shape of the street, and thus how gaps weaken the definition of the street.

strong area

Figure 44: South on Emporia St. Across Douglas Ave.

Source: by author

Figure 43: Spatial Bleed Diagram of Douglas Ave.

Source: by author

weak area

Figure 42: Century II from Douglas Ave.

Source: by author

Century II is a beautiful building, but its sculptural quality creates a large void between the facade and the street, a void that serves as a parking lot (fig. 42).

strength and weakness

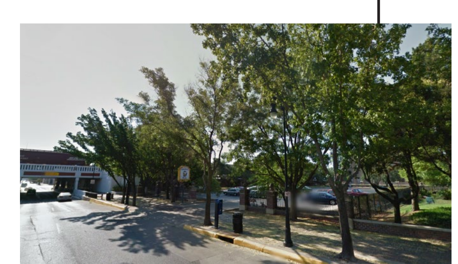


Figure 45: Naftzger Park from Douglas Ave.

Source: Google Maps

Naftzger Park, the only significant green space in the area, obscures a lack of building massing with a strong row of street trees (fig. 45). Parking lots along the southern edge of Old Town weaken the degree of enclosure on Douglas Avenue (fig. 46).

weak area

Figure 46: Parking Lot from Douglas Ave.

Source: Google Maps

other streets considered

2nd St

Strengths:

- more central path through Old Town
- closer to government buildings off site to north

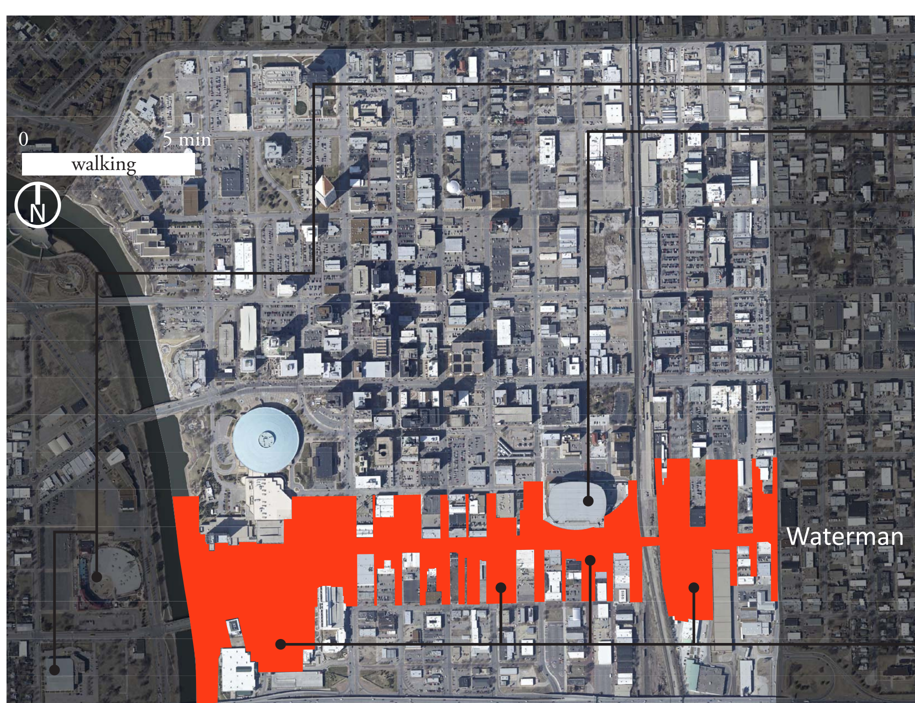
Weaknesses:

- no bridge over river
- weak urban fabric
- becomes collector street to the west

Figure 47: Spatial Bleed Diagram of 2nd St.

Source: by author

Waterman St



Strengths:

- adjacent to stadiums
- adjacent to Intrust Bank Arena

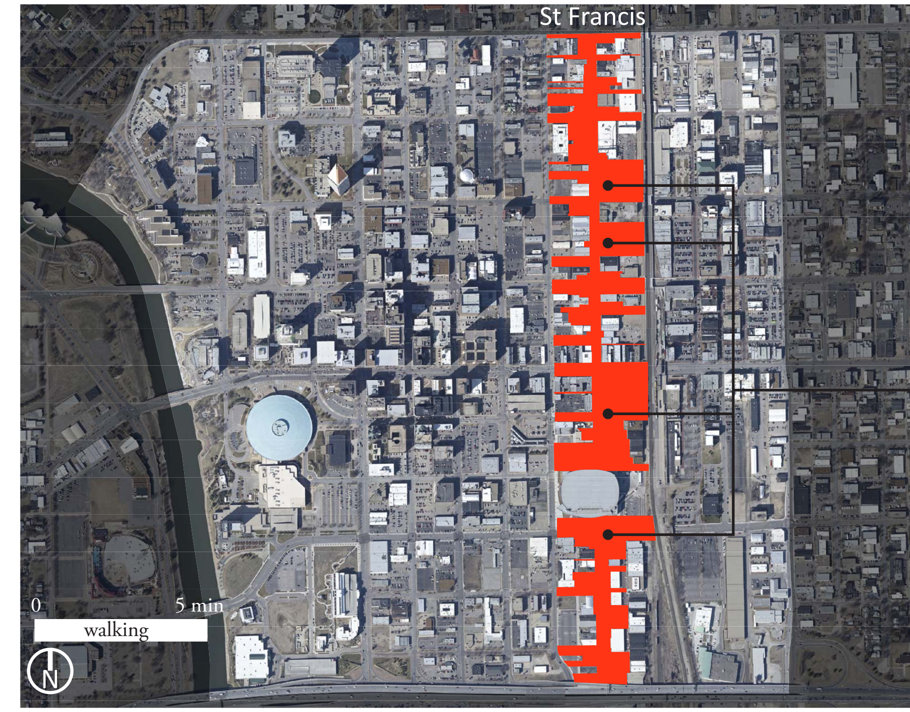
Weaknesses:

- far from museums
- very weak urban fabric

Figure 48: Spatial Bleed Diagram of Waterman St.

Source: by author

St Francis St



Strengths:

- terminates at Intrust Bank Arena twice
- passes through strongest area of Douglas Avenue

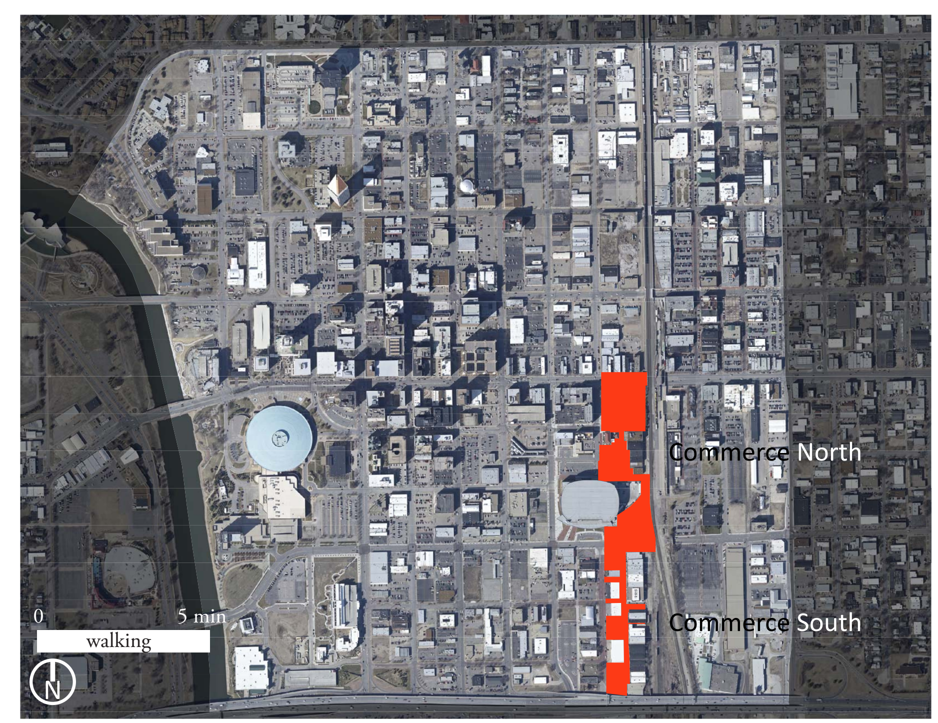
Weaknesses:

- is divided
- weak urban fabric

Figure 49: Spatial Bleed Diagram of St Francis St.

Source: by author

Commerce St.



Strengths:

- quality character and urban fabric on south half

Weaknesses:

- very weak connection
- weak urban fabric on north half where it is needed
- street does not connect to Douglas Avenue

Figure 50: Spatial Bleed Diagram of Commerce St.

Source: by author

a more thorough measure of urban fabric

process

To get a sense of the quality of urban fabric, I used Google Maps imagery and street views to estimate the percent of each block that is occupied at the first, second, and third floors. I also used ArcGIS to roughly estimate the square footage of the foreground and open space that weaken the feel of the street. This shows my process of estimating four components of urban fabric and how I compiled these values. For the foreground square footage, I normalized each block to the block with the most to give each a score from 1 to 100. Next, I combined these scores with a weight I felt appropriate and mapped the streets according to this composite score. This is a block in Old Town that got a composite score of 2.15, of a possible 3.1, which placed it in the top third of the streets downtown.

first floor | second floor | third floor | foreground space

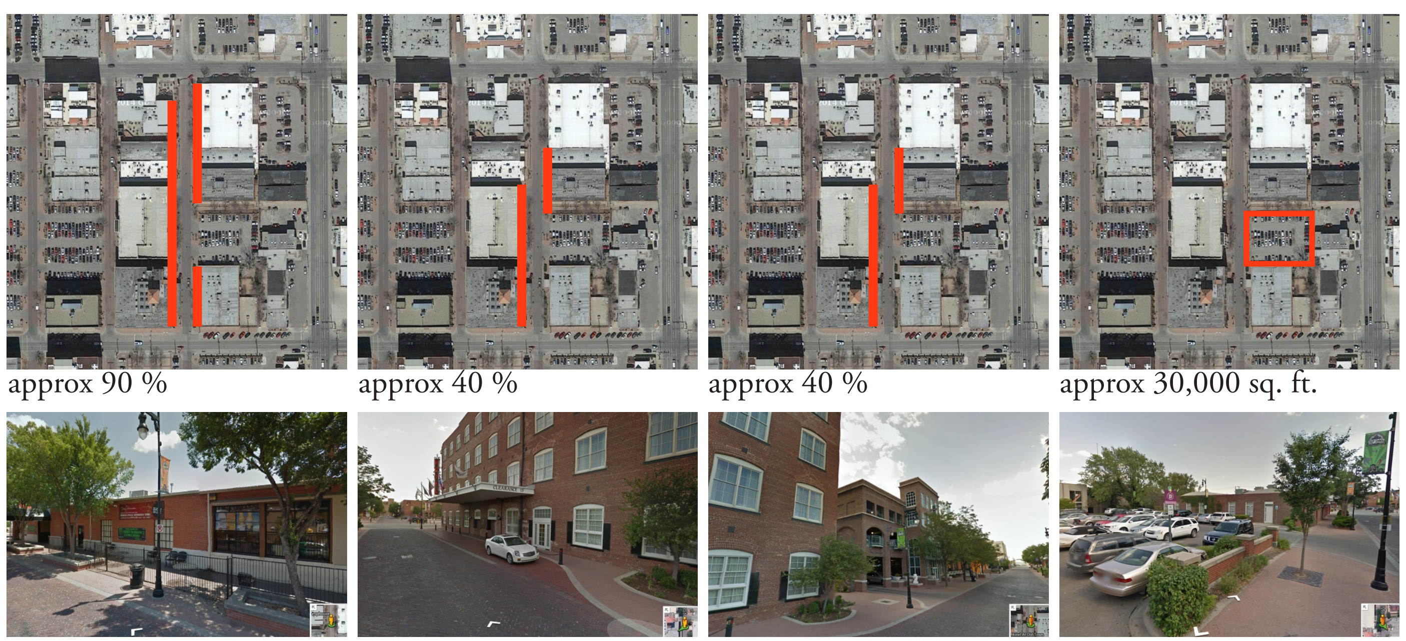


Figure 51: Process of Measuring Urban Fabric per Block

Source: by author
Photos: Google Maps

Formula for composite urban fabric score

.90 (1.0) + .40 (0.7) + .40 (0.6) + .91 (0.8)

Individually, these maps only tell part of the story. Some blocks are well framed at the street level but lack any buildings more than one story tall, particularly in warehouse districts like are found along the south end of downtown. Other blocks have quality three story buildings on one side of the street, but a parking lot on the other. A composite score of these four factors best describes the quality of urban fabric.

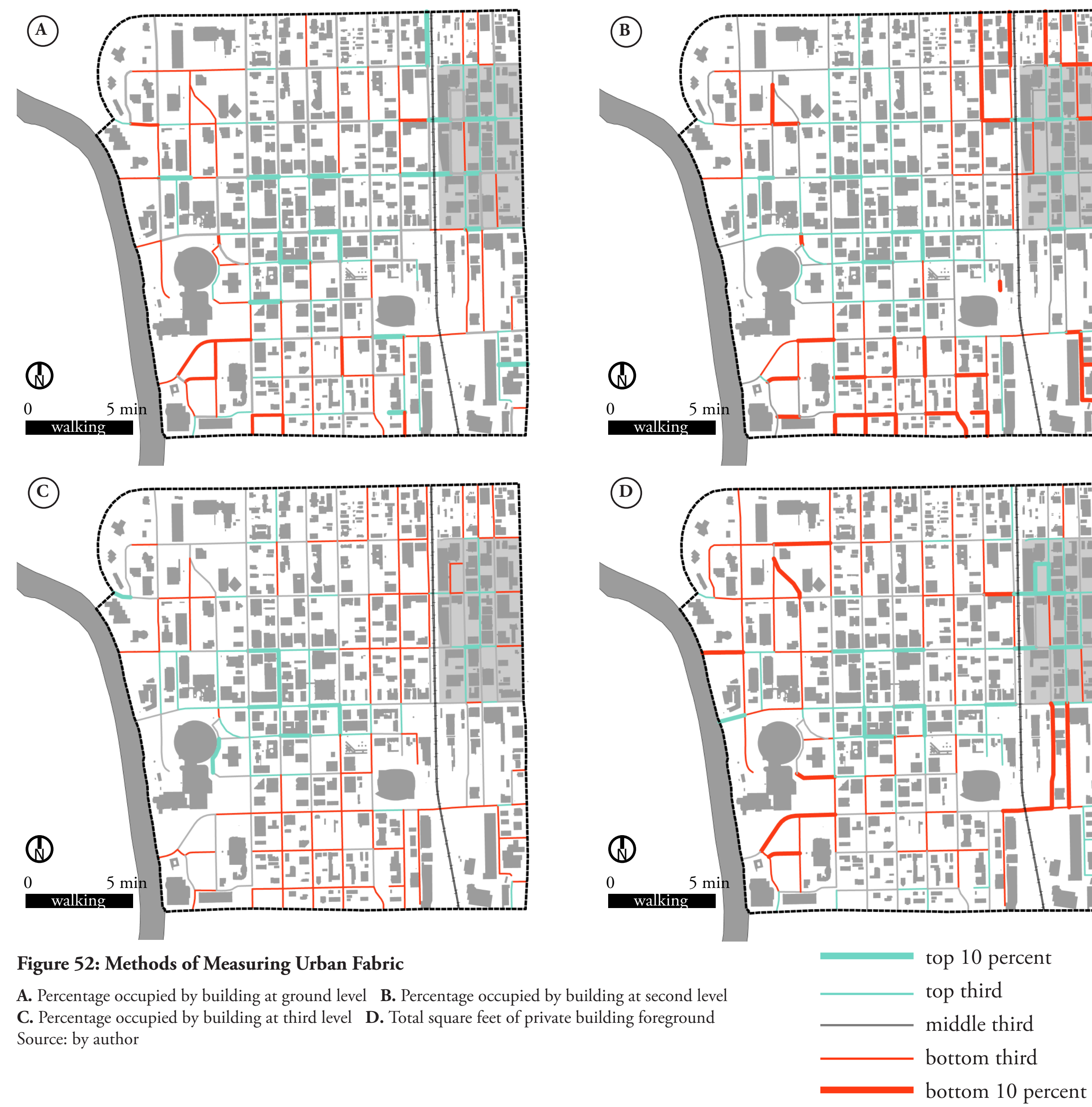


Figure 52: Methods of Measuring Urban Fabric

A. Percentage occupied by building at ground level **B.** Percentage occupied by building at second level
C. Percentage occupied by building at third level **D.** Total square feet of private building foreground
Source: by author

a thorough measure of urban fabric

Urban fabric, as established in the literature review, is one of the most important characteristics of a street to evaluate for walkability potential. Therefore, areas with strong urban fabric should be considered among the best candidates for walkability intervention based on existing potential. Figure 53 is a composite of the four measured qualities of urban fabric.

This diagram illustrates that there are two strong districts in terms of urban fabric: the east central core of downtown, which is centered on Douglas Avenue, and Old Town, the well established bar, restaurant, and entertainment district. In terms of connecting these two districts to one another, as well as to the major urban anchors downtown, the strongest corridors are 1st Street, Douglas Avenue, and William Street.

William Street holds the least promise as a connector due to the fact that it has finite ends and fails to connect to Old Town or the museums across the Arkansas River. 1st Street accomplishes both of these but is the further from Intrust Bank Arena and Century II, the biggest attractions downtown. Also, as a whole, the character of 1st Street, based on observation, is slightly less interesting and engaging than Douglas Avenue. For these reasons, Douglas Avenue, in terms of urban fabric and the ability to connect urban anchors, has the most potential for walkability of any street downtown.

composite urban fabric score

Figure 53: Composite Urban Fabric Score

Source: by author

narrowing the study area

selected streets for more in depth study

Figure 54: Selected Blocks for Further Study

Source: by author

Based on these exploratory diagramming exercises for downtown Wichita, I have determined that Douglas Avenue holds the most potential to become a pedestrian corridor that links the major downtown attractions. Douglas has the best quality of urban fabric of any street that spans all of downtown. Three blocks along Douglas in particular have occupancy rates that are among the highest of any block downtown. Douglas is without question the most appropriate walking route between Intrust Bank Arena and Old Town, which are only a five minute walk apart. Douglas is also centrally located and within two blocks of Old Town, Intrust Bank Arena, and Century II Performing Arts Center.

That said, Douglas Avenue has glaring weaknesses in terms of walkability. First, it forms the entrance to Old Town, yet two of the four blocks of Old Town have parking lots facing Douglas. This is a wasted opportunity for pedestrian friendly development.

Upon visiting the site, it is obvious that this impacts driving habits. Traffic speeds are higher on that stretch than anywhere else on Douglas. In five minutes of observation, I watched a man sprint across the street because there was no crosswalk, only to be honked at by a car who had to deal with the inconvenience of slowing down slightly.

Both the urban fabric and density of urban attractions begin to weaken as the pedestrian nears the Arkansas River, a critical stretch for connecting the downtown corridor to the bulk of Wichita's museums. Immediately across the river is a two block stretch of street lined with buildings with high potential for walkability. This serves as a gateway to the Delano neighborhood. Even rivers with quality sidewalks can be uninviting to cross. It's important that not to lengthen the crossing experience by wasting space against the river.

It is tempting to concentrate on Douglas Avenue alone, in an effort to keep improvements localized as this research suggests. However, another vital weak link in the overall walkability network is the connection from Intrust Bank Arena, downtowns largest event facility, and Douglas Avenue. It is unclear which street has the most potential to become this connecting link, so the three most likely options, Emporia Street, St. Francis Street, and Commerce Street will be further studied.

results and interpretation

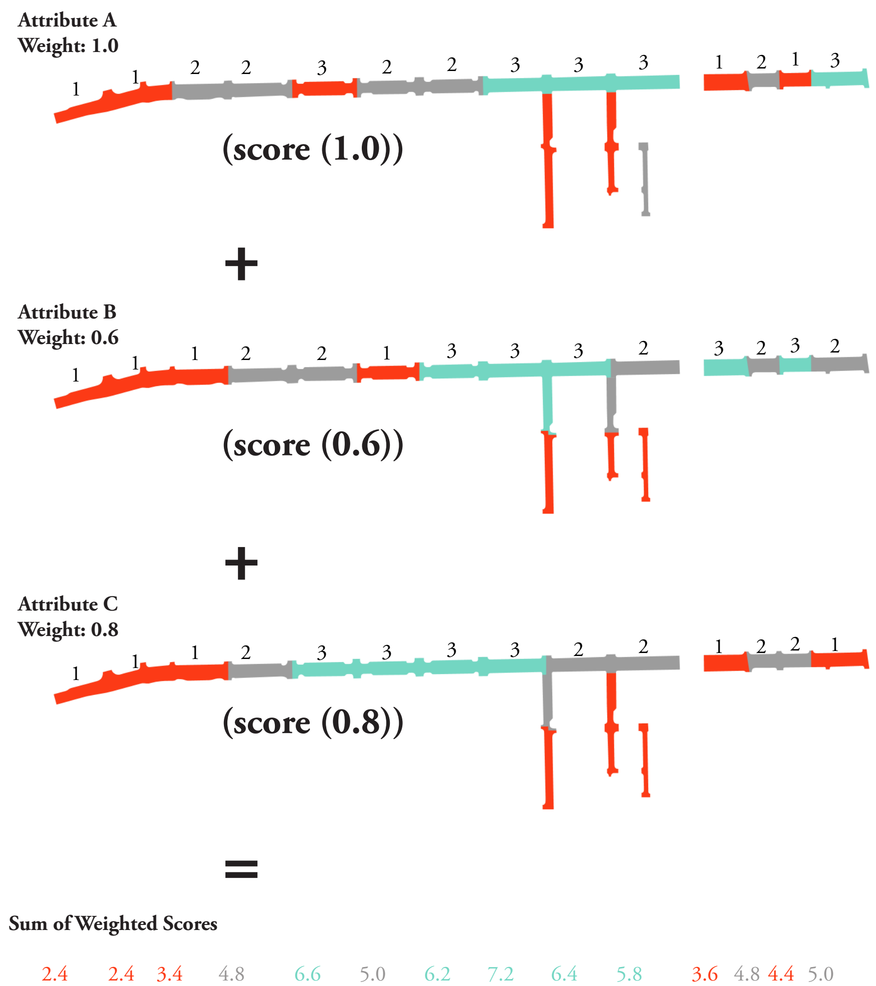
rating the project site by many qualities of walkability

example and naming system

process of creating composite maps

These maps show ratings by each individual attribute. Each block was categorized as either low, medium, or high, and thus a score of 1, 2, or 3. For these diagrams and all ensuing composites, teal represents the best blocks, gray the middle, and orange the weakest.

To create a composite score, I gave each of these scores a weight or multiplier, based on the relative importance of that attribute. I then divided the sums of those weighted scores roughly into thirds representing the top, middle, and bottom, and mapped each block accordingly.



composite scores

Figure 55: Process of Compiling Attributes into Composite Maps

Source: by author

characteristic 1 composite

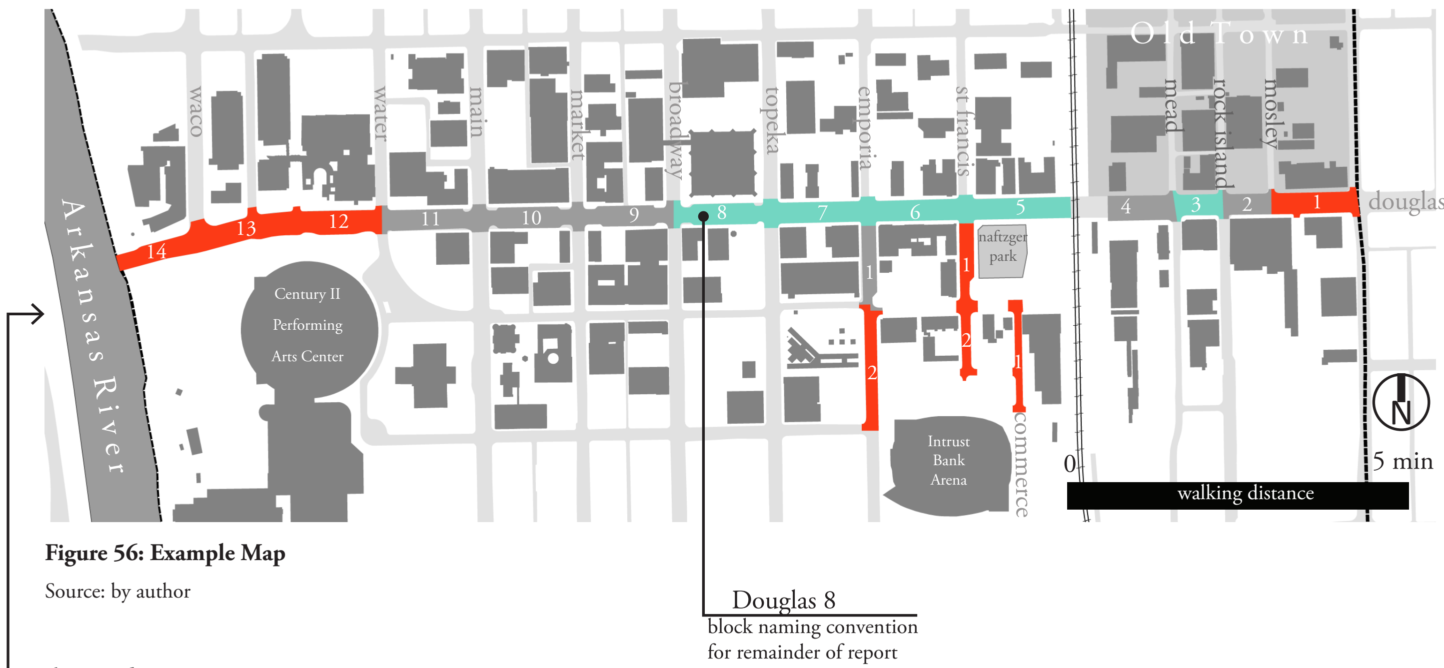


Figure 56: Example Map

Source: by author

legend

- high (good)
- medium
- low (bad)

Important Distinction:

Blocks rated as good are not necessarily being described as good overall blocks, only good in relationship to the rest of the study area. This is true of bad blocks as well. The thresholds were set to categorize each block as one of three groups: low, medium, or high.

accessibility: mixed uses (attractions)

attractions attributes

Mixed use neighborhoods, by definition contain different types of buildings mixed among each other. To measure this quality simply, I added up the number of occurrences on each block of the following: professional services, restaurants, night clubs, shopping, entertainment, museums, hotels, churches and parks. This does not necessarily measure the degree to which different types of businesses are mixed, but it does measure the quantity, which is one of the defining characteristics of mixed use development.

The first diagram (fig. 57 A) illustrates the number of businesses per block of in the study area. The strongest section is in the center of Douglas Avenue. The following three diagrams (B, C, and D) illustrate the total number of attractions within one, two, and three adjacent blocks. These diagrams illustrate the importance of adjacency. The strong areas are those within walking distance of the strong core represented in Figure 57 A.

Connectivity of streets also plays a big role in these values. Blocks that connect to more blocks have more opportunities to tally a high number of amenities within a three block walking distance. This concept is illustrated in figure 58 on the following page.

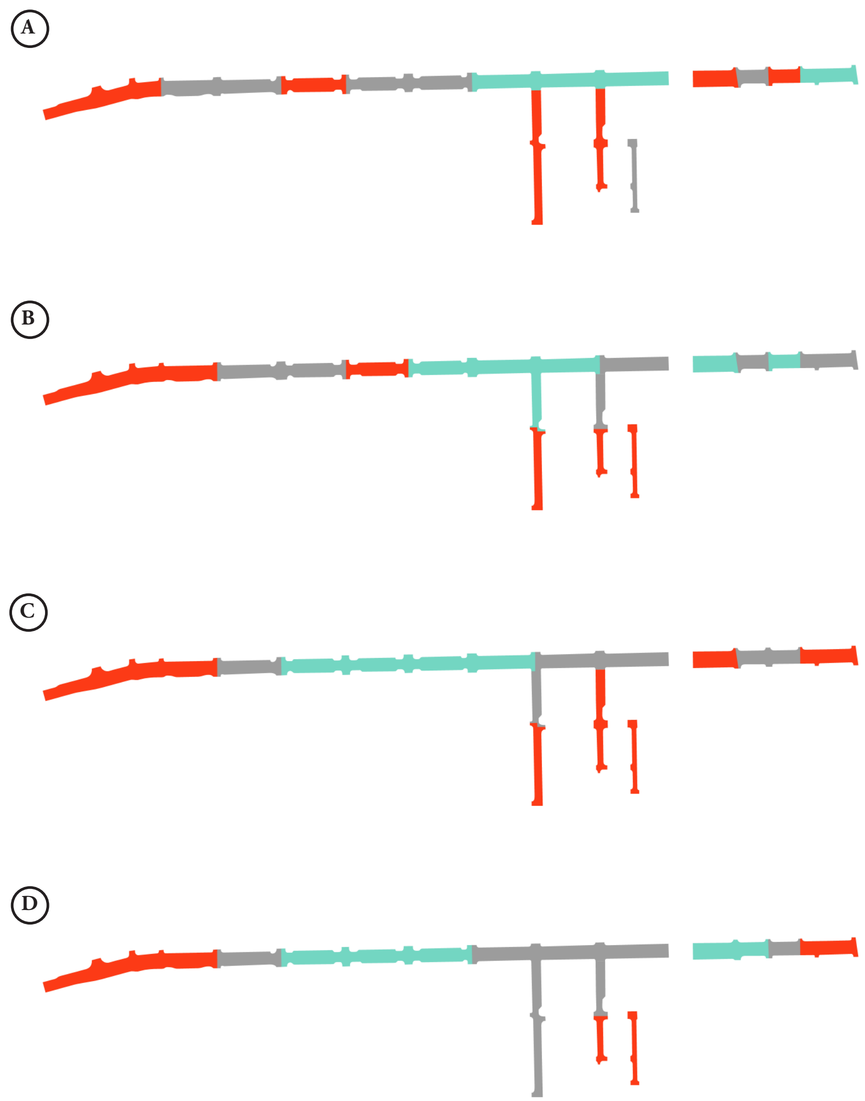


Figure 57: Attractions Attributes

A. Attractions on block **B.** Attractions within one adjacent block **C.** Attractions within two adjacent blocks **D.** Attractions within three adjacent blocks
Source: by author

The composite score gives the highest weight to the number of amenities on the block, with decreasing weight for the adjacent blocks. In Figure 58, the strength of the central stretch of Douglas Avenue is visible, with weaknesses at the ends and in the blocks south of Douglas.

This is promising if the city's goal is to connect Old Town to the central business district via Douglas Avenue. It appears that in terms of engaging building functions, there is very little activity between Douglas Avenue and Intrust Bank Arena, which drastically reduces the comfort of the walk.

It also appears that Douglas 2 and 4 are weak points in an otherwise strong east to west axis. If the goal is to connect Intrust Bank Arena to Old Town, those blocks could be improved upon.

attractions composite

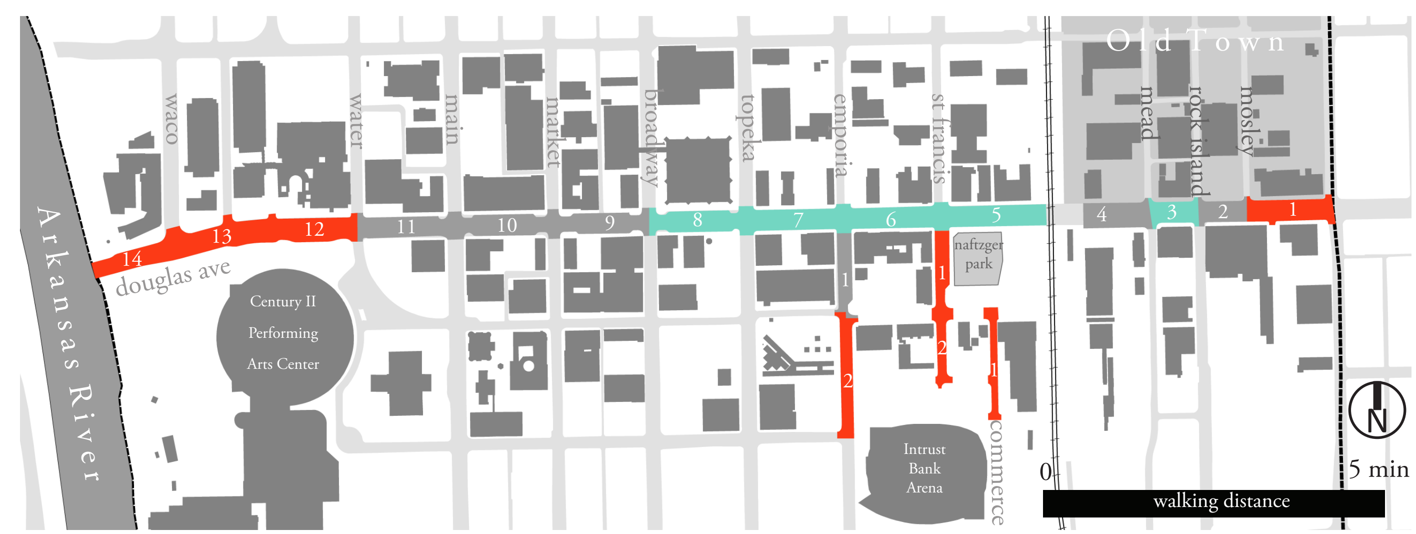


Figure 58: Attractions Composite

Source: by author

accessibility: mixed uses: (attractions)

the value of connectivity

I did not deliberately design a method to measure connectivity on a block by block basis. However, measuring the total number attractions within three blocks, I inadvertently illustrated the value of connectivity. Because the composite score depends on the cumulative number of attractions on the block, and within one, two and three adjacent blocks, the blocks with the highest scores tended to be the blocks that provided access to the most other blocks. Figure 59 illustrates this trend.

The problem with this result is that only attributes within the larger downtown study area are compiled into these values, thus attractions across the river and attractions to the east of Old Town are not considered. This is part of the reason that blocks on the end received weaker scores. However, this is not entirely unfair to these blocks. Crossing the river can be uninviting and the activity east of Old Town drops off significantly. So to a degree, walkable urban attractions do in fact end at these points.

However, measuring the study area in this way fails to value the river as an open space recreational amenity. See Limitations to Study (p. 122) for further discussion of why I chose to omit the river as an urban attraction.

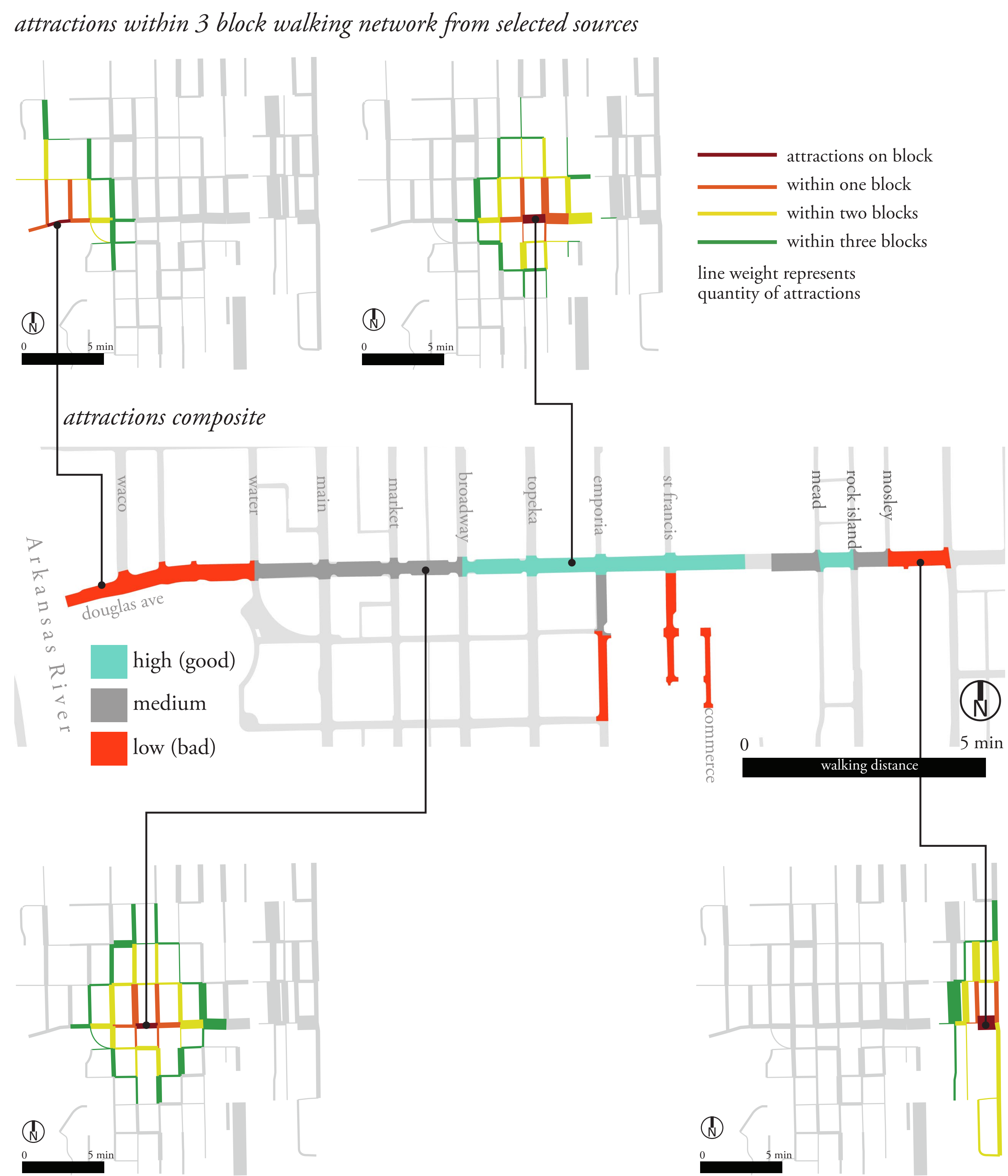


Figure 59: Attractions from Three Block Walking Network from Selected Blocks

Source: by author

accessibility: mixed uses: (housing)

In Figure 60, A represents the number of units on each block, which clearly illustrates where the largest complexes are. As is evident in the following two diagrams, the complexes are actually quite well spaced, as nearly all of the study area has a moderate amount of housing within a two block walk.

The exception is Douglas 9, which is just out of reach of the complexes on either end of the study. However, the WDDC seems aware of this gap, as their website describes a project in planning stages that would place 230 residential units on this block.

Of course, this study does not measure housing diversity, which the literature review established is very important to the health and sustainability of a neighborhood.

housing attributes

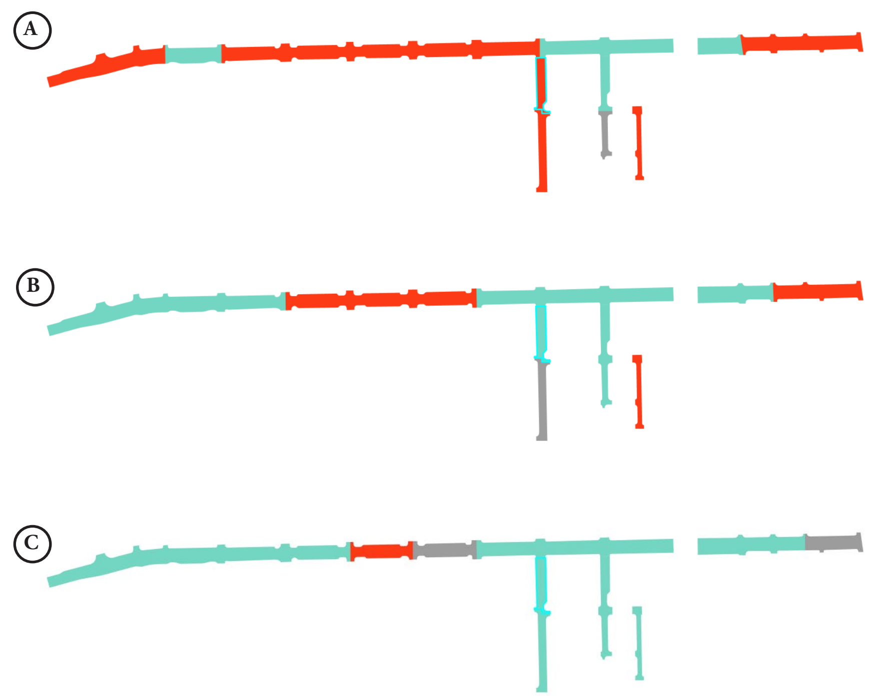


Figure 60: Attributes of Housing Composite

A. Housing Units on Block **B.** Housing units within one adjacent block **C.** Housing units within two adjacent blocks
Source: by author

Figure 61 illustrates the gap around Douglas 9 as well as on the easternmost two blocks of Douglas and Commerce St. The strongest section is right around Naftzger Park, which has housing units facing it from both streets.

Housing could logically be considered one of many components of mixed use. However, literature suggested that housing is often the most important missing component of a strong mixed use environment in America's downtowns. Therefore, I chose to illustrate housing individually, to see where it is missing in Wichita.

housing composite

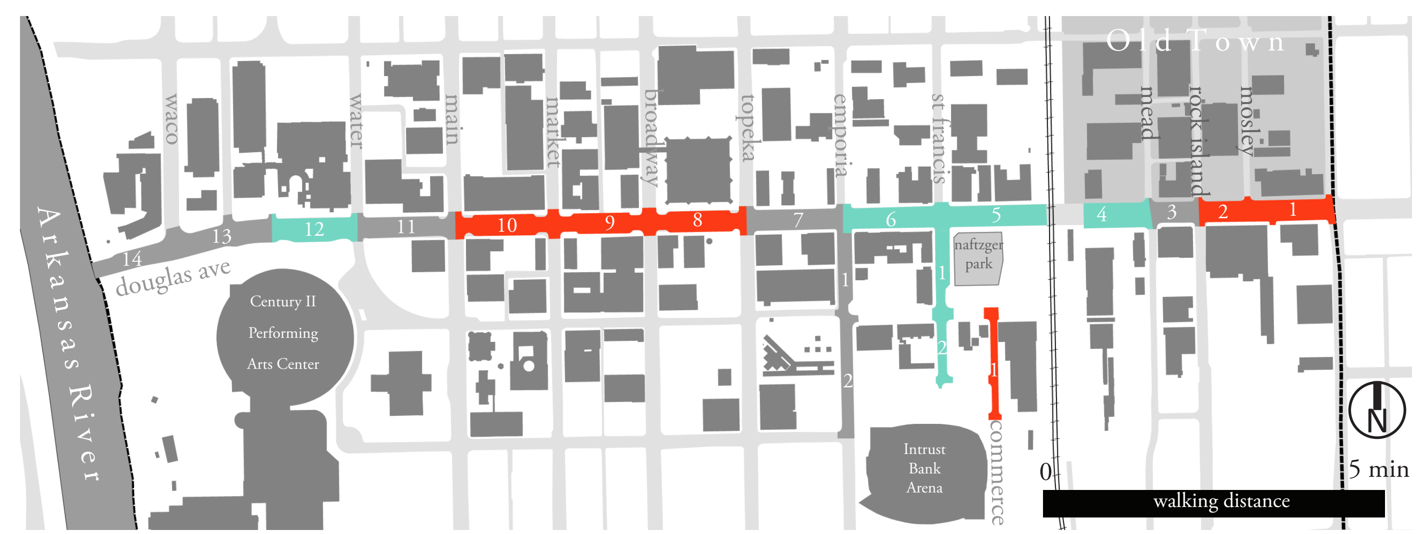


Figure 61: Housing Composite

Source: by author

accessibility: urban anchors

urban anchors attributes

Figure 62 illustrates the vicinity of each block to six different types of urban anchor including major employers, parking garages, grocery stores, shopping centers, schools, and event centers.

Schools and grocery stores were completely absent within four blocks of the study area, which represents two glaring weaknesses to the overall livability of downtown.

The largest employment district is just north of the strong segment visible in Figure 62 A, and is composed of several government and education facilities.

Parking is not an issue for this corridor, as nearly every block has two garages within four blocks. I walked through three of these garages on a weekday afternoon and found them less than half full.

There are no shopping malls in the area, but I considered the strongest block in Old Town to be a shopping center, which explains the strong area in Figure 62 D.

Figure 62 F essentially illustrates the area of influence of downtown's two major event centers: Century II and Intrust Bank Arena.

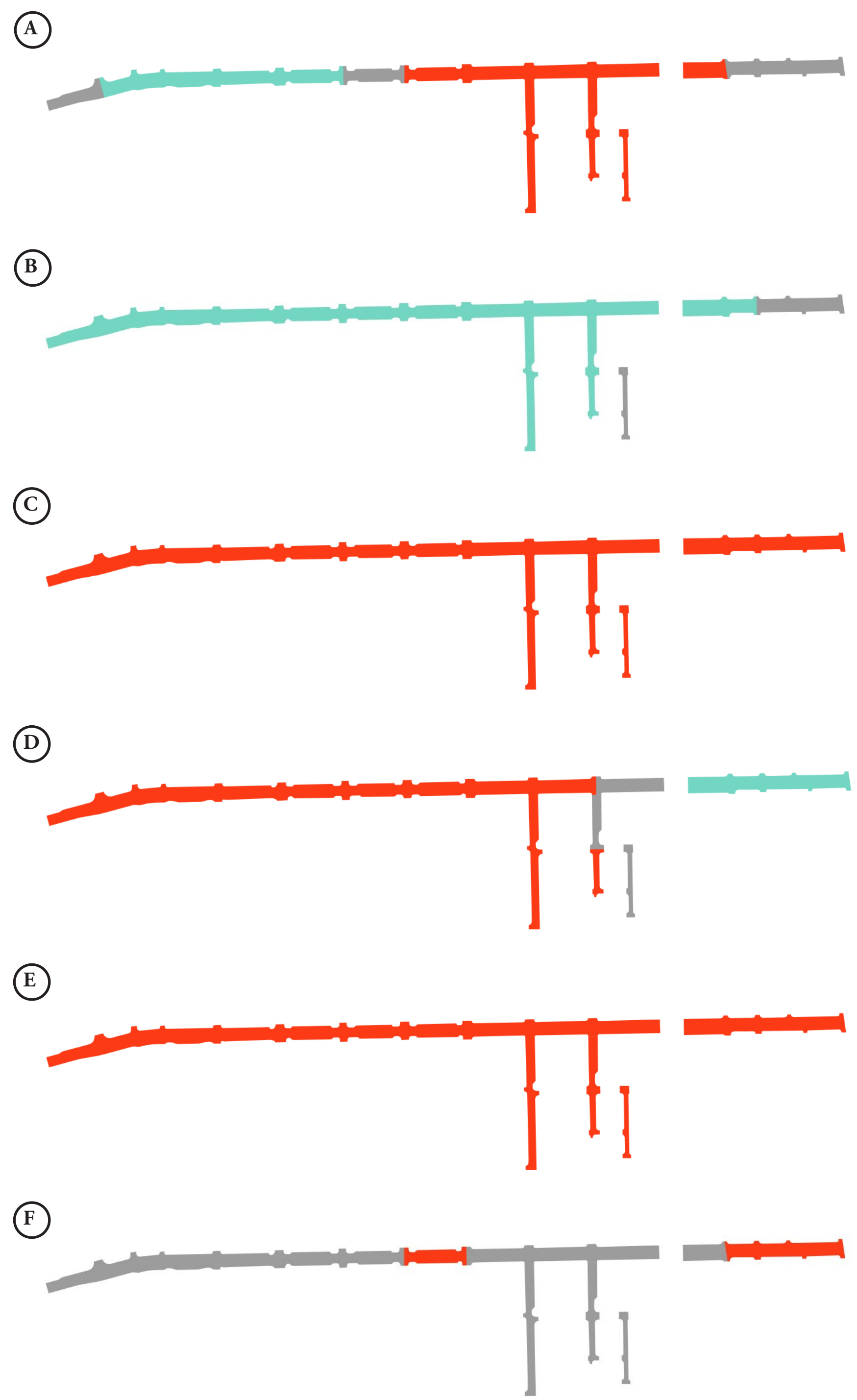


Figure 62: Urban Anchors Attributes

A. large employers within four blocks **B.** parking structures within four blocks **C.** grocery stores within four blocks **D.** shopping centers or districts within four blocks **E.** schools within four blocks **F.** event centers within three blocks

The urban anchors composite (fig. 63) is not especially valuable, because the maps of each attribute were largely uninformative as a comparative tool. The strength of the composite were Douglas blocks 10-13, which were only relatively strong in one attribute: relationship to large employers. This is because several large government buildings exist directly north of these blocks, outside of the study area. The composite has little value beyond this distinction.

urban anchors composite

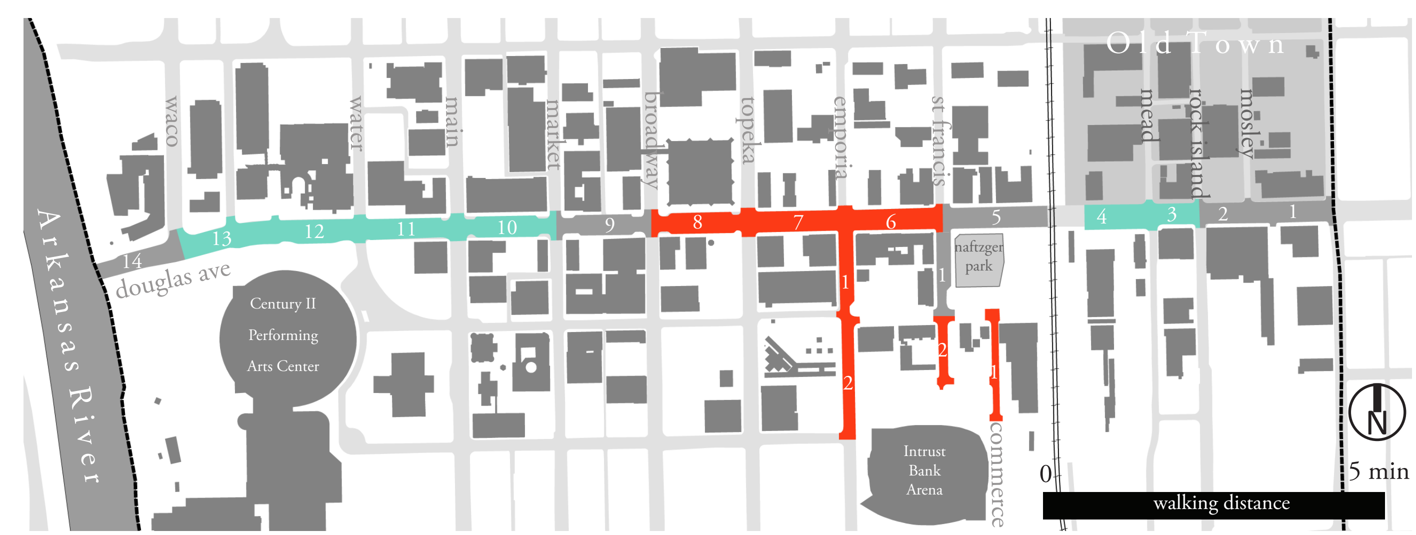


Figure 63: Urban Anchors Composite

Source: by author

accessibility: on street parking

This attribute simply measures the quantity of parking spaces, normalized to a 350' long block. The strongest blocks are those that have angled parking on them, which accommodates more spaces per linear foot. Interestingly, the thresholds for this category were set to award a high rating to a block that nearly all of its available curb space devoted to parallel parking. None of the blocks achieved this number without angled parking. Lost parallel parking opportunities can happen for a number of reasons including curb cuts for building and parking lot entrances, loading zones, and bus stops.

These thresholds were set to give a block a 'high' score if 85% of its spaces were occupied, which is the occupancy that cities should be shooting for, as described in the literature. The takeaway here is that every single block in this study area has significant available parking. This study was conducted on a weekday in the afternoon. Not one block had an 85% on street parking occupancy.

The conclusion here, as well as by the abundance of space in parking garages, is that parking is available downtown. Surface parking lots, particularly those that weaken the urban fabric of Douglas Ave, are not necessary to accommodate the current parking demand.

on street parking spaces

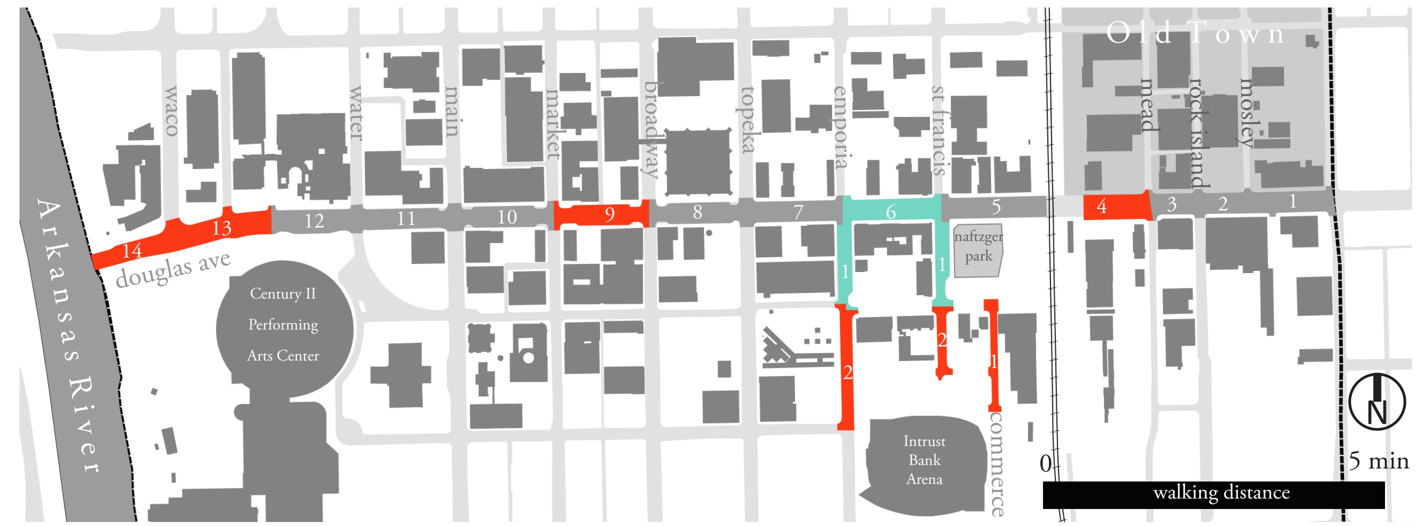


Figure 64: On Street Parking Spaces

Source: by author

occupied on street parking spaces

Figure 65: Occupied on Street Parking Spaces

Source: by author

accessibility: connection to transit

transit attributes

Relationship to public transit is not an issue for any of these blocks. With the city's primary bus station centrally located just one block south of Douglas and right in the center of downtown, almost every bus route in the city can be accessed in less than a six block walk from any point in this study area.

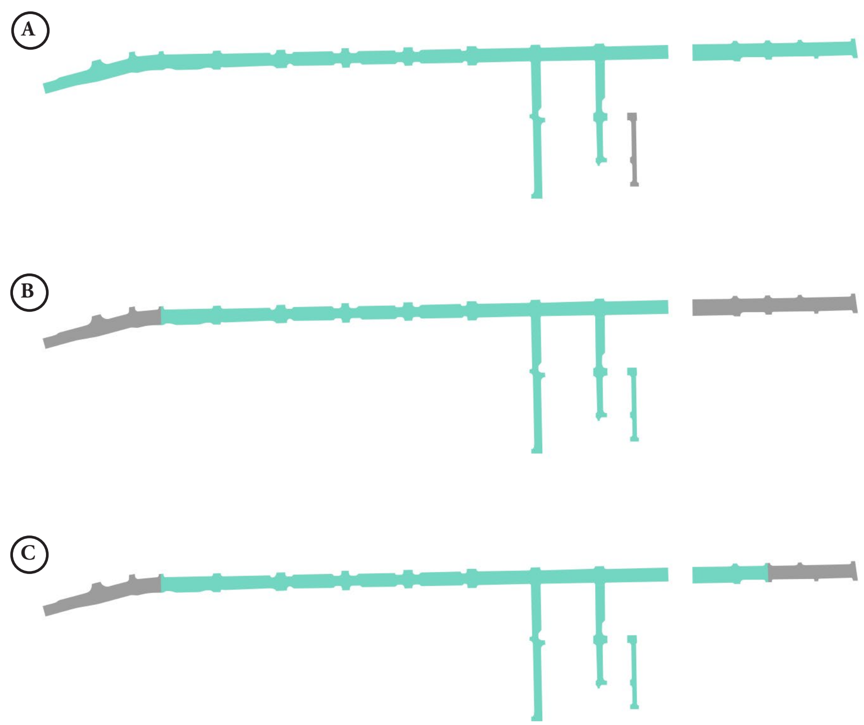


Figure 66: Transit Attributes

A. Walking blocks to nearest transit stop B. Transit trips per hour within three blocks C. Total number of routes within four blocks
Source: by author

This composite exaggerates the disparity between strong and weak blocks. There was very little difference. But the valuable takeaway is that Douglas Avenue, as well as the blocks connecting it to Intrust Bank Arena, all benefit from the proximity to downtown Wichita's central transit station, which provides access to many neighborhoods of the greater Wichita area.

transit composite

Figure 67: Transit Composite

Source: by author

accessibility: bike amenities

bike amenities attributes

The bicycle is an essential component of a robust multi-modal transportation system. To develop attributes to measure bike amenities, I drew some concepts from literature, but also from personal experience as an avid cyclist.

Cyclists generally avoid areas where routing options are limited due to lack of a well connected network. Cyclists of all comfort levels prefer low traffic streets over high traffic streets unless there is a separated lane or path for them. Douglas Ave. is one of very few options for east to west travel, which is not ideal for cyclists (C). It also provides very little extra room for cyclists on the outside lane (A). The western part of Douglas has stoplights at every intersection, which limits the motivation to speed, but these intersections are missing east of the railroad bridge (B).

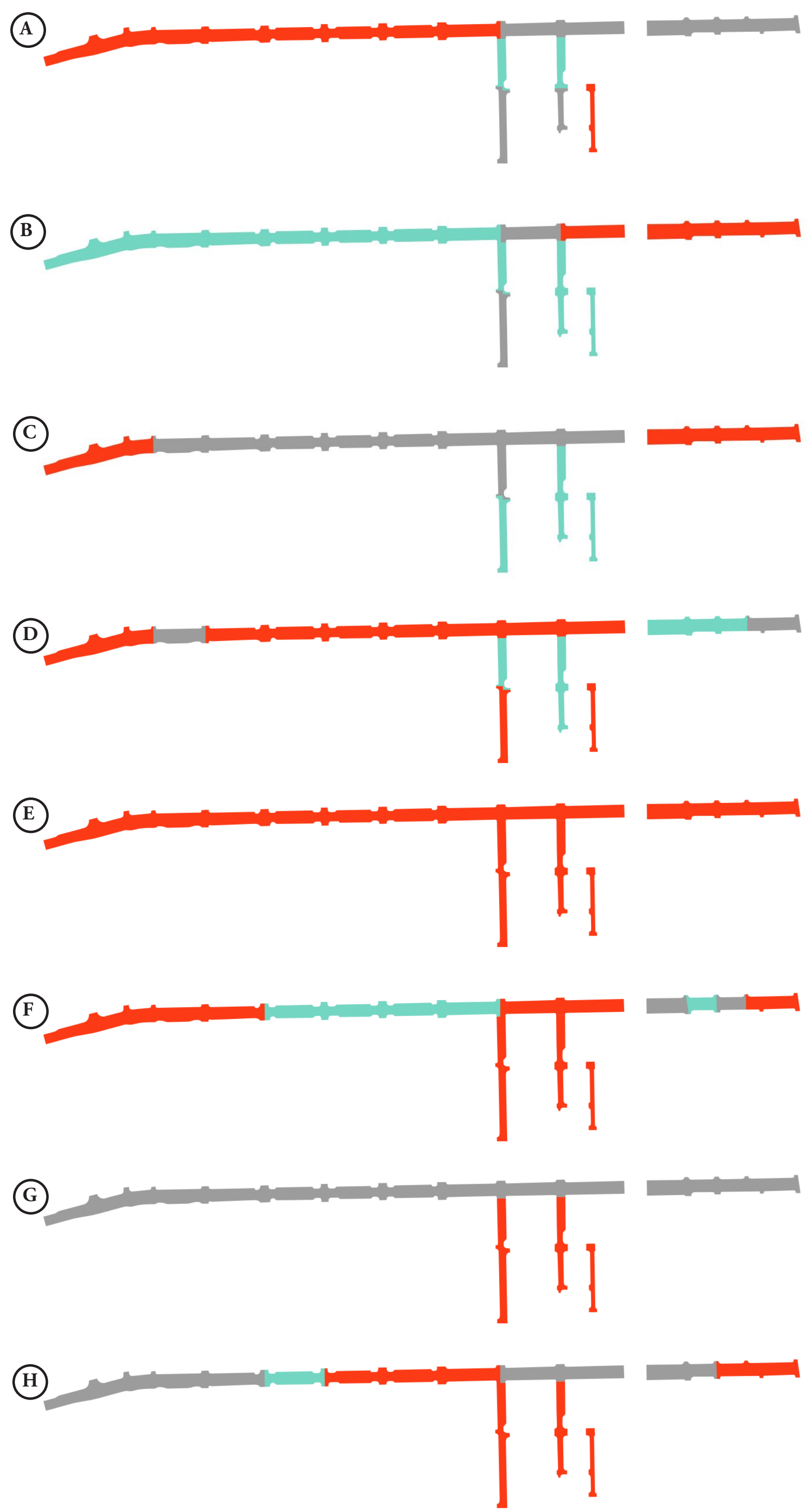


Figure 68: Bike Amenities Attributes

A. extra lane width **B.** unsignalled intersections on street **C.** parallel streets in vicinity **D.** block length **E.** bike lane **F.** bike racks **G.** posted speed limit **H.** cyclist count
Source: by author

This composite shows a surprisingly disjointed pattern of strengths and weaknesses that is difficult to make sense of. As a whole there are more weaknesses than strengths in terms of providing for bicycles. This is a missed opportunity, especially considering the network of separated trails along the Arkansas River. Douglas Avenue is one of only a few routes to connect these trails to Old Town.

I am a confident cyclist and would likely not ride on Douglas Avenue very often in its current state, based on my observation of traffic. A delineated bike lane would change that.

bike amenities composite

Figure 69: Bike Amenities Composite

Source: by author

safety: traffic speed

traffic speed attributes

Figure 71 illustrates the attributes that can contribute to speeding, as described in the literature.

Douglas has more drive lanes than the streets to the south of it, but those lanes are not as wide.

The shortest blocks are along the south side of Old Town, which also emerged as the strongest overall blocks in the composite score.

The only one way street in the study area is Emporia Street, which is northbound only and has two drive lanes, with parking on either side. South of the study area, there are actually three drive lanes, making the street somewhat of a freeway.

The complicating features visible in Figure 71 E are medians that divide driving lanes. The most notable example is the train bridge that divides the east and west Douglas Avenue, which is supported by columns that separate drive lanes (fig. 70). This undoubtedly forces the attention of the driver.

Figure 70: Douglas Avenue Underpass

Source: Google Maps

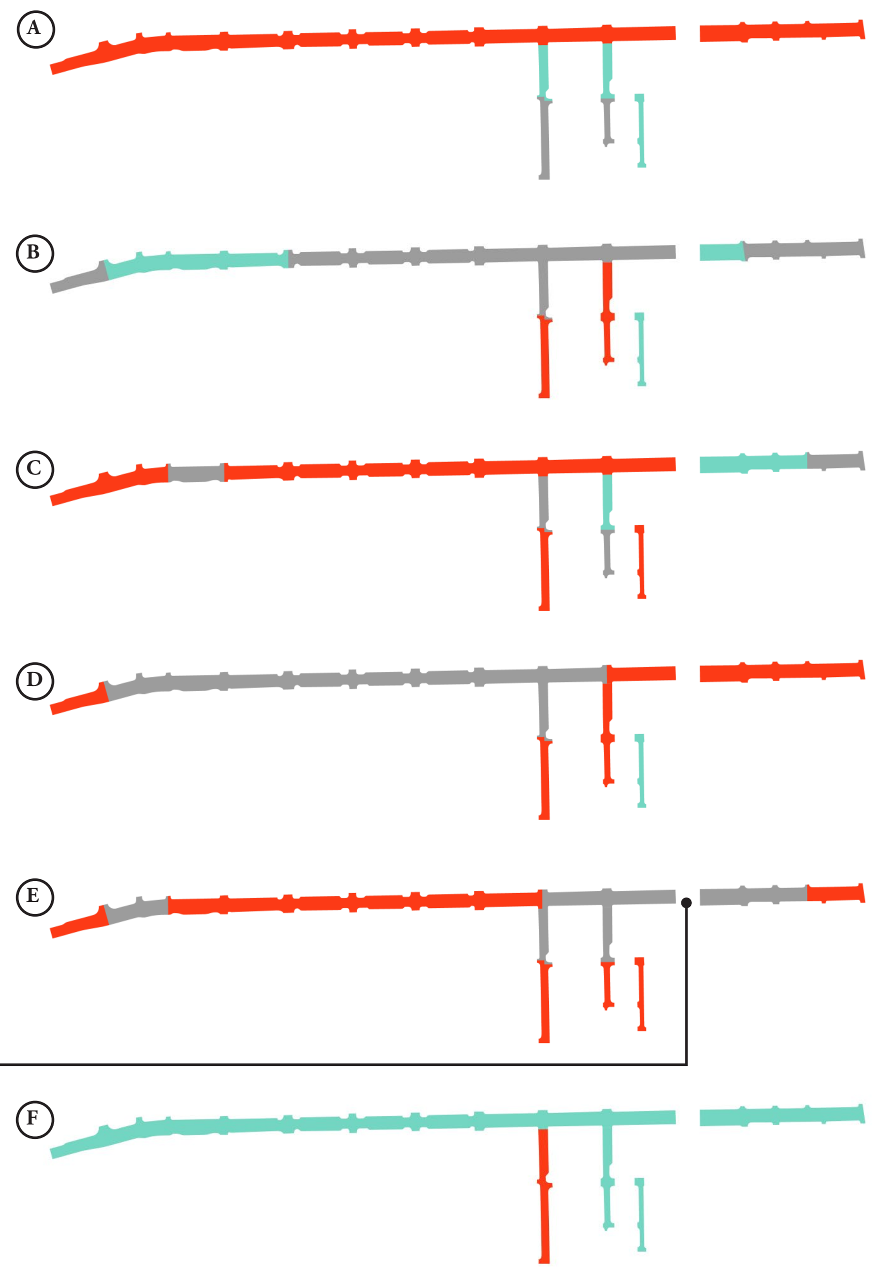


Figure 71: Traffic Speed Attributes

A. number of driving lanes **B.** width of driving lanes **C.** block length **D.** intersection type **E.** complicating road features **F.** one way or two way
Source: by author

Douglas blocks 2, 3, and 4 emerged as the strongest segment of the study area in terms of attributes contributing to traffic speed (fig. 72), primarily attributable to short block length, and the complicating feature of the divided drive lanes under the bridge. These are fundamental qualities unlikely of change, thus their strength represents a built in advantage in terms of walkability.

This is especially relevant as the subsequent diagram of sidewalks and crossings will reveal that these blocks do not capitalize on this inherent quality and instead allow these blocks to accommodate the fastest moving traffic that I observed in the study area.

One of the goals of this entire study was to compare three options to connect Intrust Bank Arena to Douglas Ave. This is one of a few diagrams that clearly illustrates the strength of one of these streets over the rest. Commerce Street, which is narrow and finite, and feels somewhat like a shared road space, provides very little opportunity to speed.

traffic speed composite

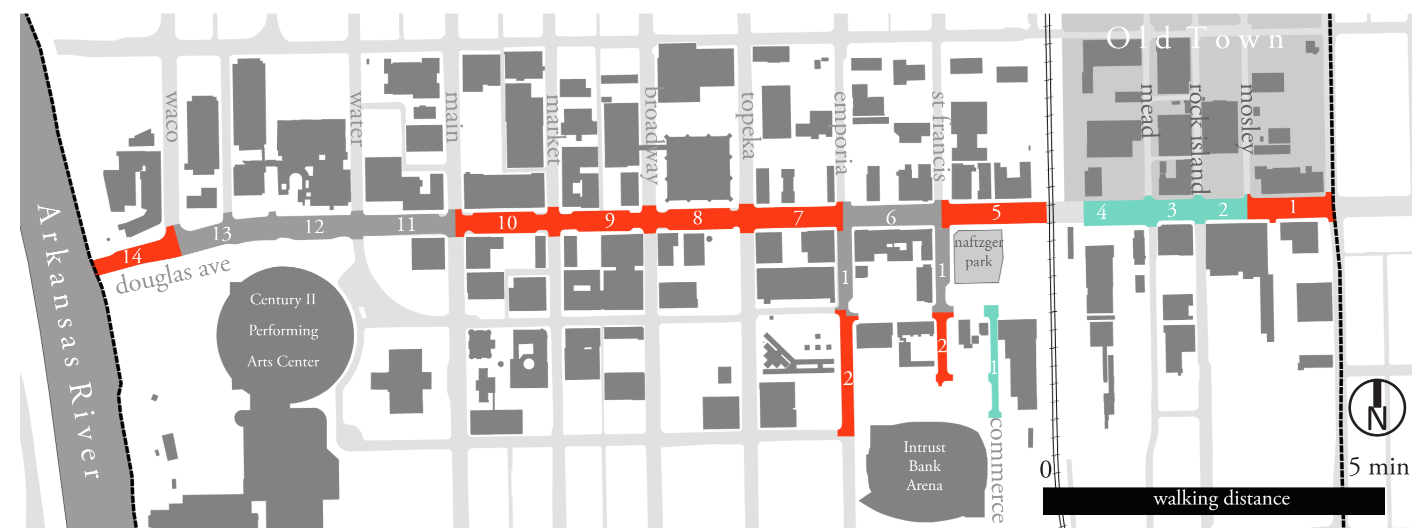


Figure 72: Traffic Speed Composite

Source: by author

safety: sidewalk and crossings

sidewalk and crossings attributes

The most telling attribute of Figure 73 is A: the number of crosswalks. Most blocks of the study area had at least two per block, except for the four blocks along the south edge of Old Town, which have only two crosswalks total and no stoplights between Washington Ave. and the railroad bridge.

There are some obvious strengths to the network of walking and crossing facilities downtown. Most intersections on Douglas Avenue have a walk signal that appears without pressing a button every 60 seconds (H), which makes crossing the street relatively approachable. There is also a strong network of very wide sidewalks: over seven feet of unobstructed walkway on nearly every street. The one exception is just east of the overpass, where the ADA accessible opening to the sidewalk is narrow and indirect. This should be addressed with the Union Station renovations. Also, most of the sidewalks on Douglas Avenue have relatively few curb cuts for parking lot entrances (E). This is a practice that should be valued and continued in future downtown development.

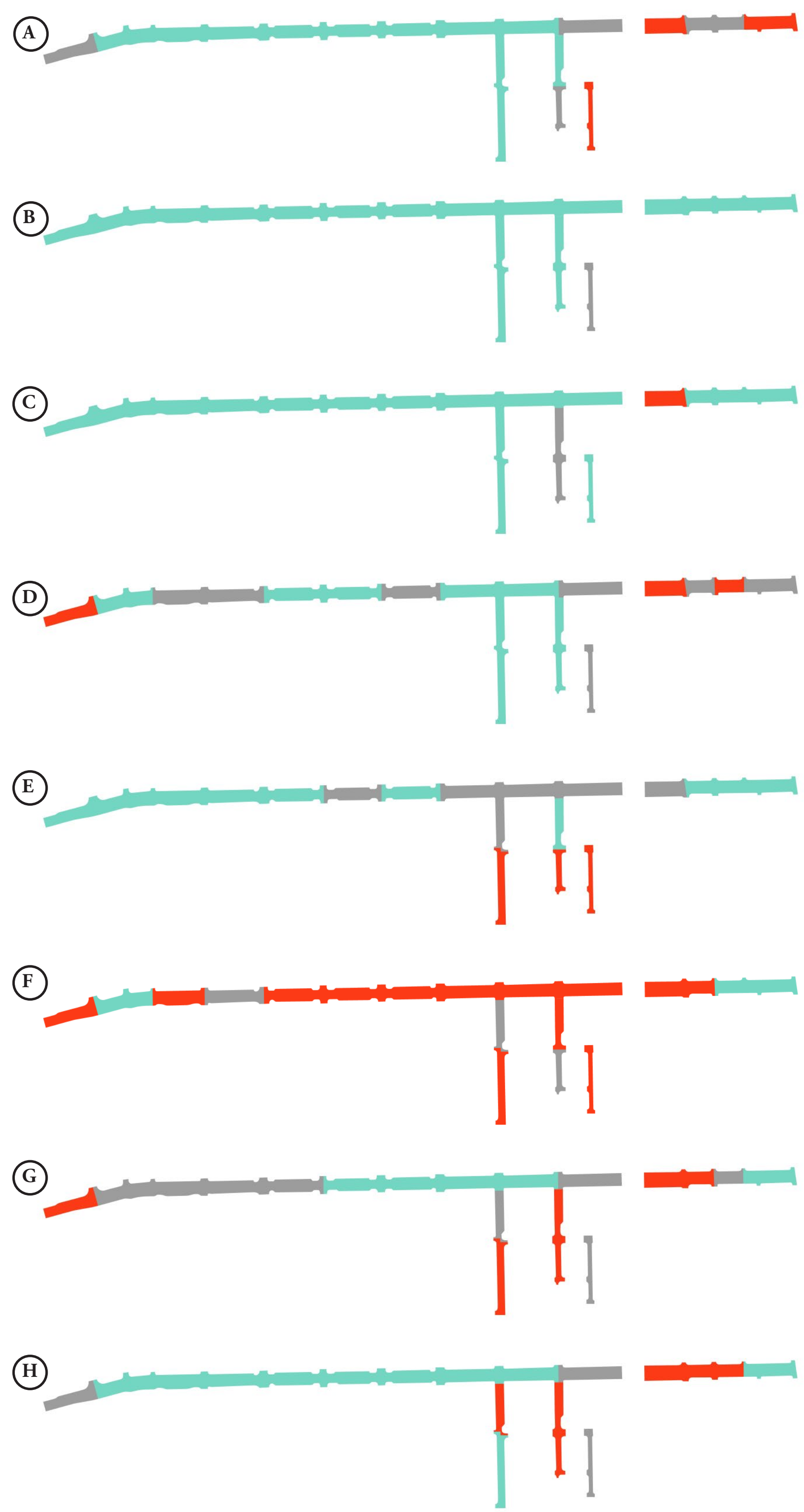


Figure 73: Sidewalk and Crossings Attributes

A. number of crosswalks **B.** number of sidewalks **C.** unobstructed sidewalk width **D.** ada access points **E.** number of car entrances **F.** parallel parking occupancy **G.** pedestrian count **H.** frequency of walk signal
Source: by author

Figure 74 clearly illustrates why the walk from Intrust Bank Arena to Old Town, which took me a flat five minutes in my site visit, seems long and arduous to visitors, particularly those who are less comfortable in urban settings. The poorest sidewalks and crossings in the study area are between these two important urban anchors.

As described in Figure 72, the south edge of Old Town on Douglas blocks 2-4 are well-positioned to keep traffic speed in check due to short block length and the complicating underpass. However, this potential is wasted by the fact that there are no stoplights at these intersections, creating the best opportunity to speed in the whole study area.

In twenty minutes of observation on block Douglas 4, I witnessed a man running across the street trying to dodge traffic while a driver honked in disgust for this five second inconvenience. This is a symptom of modal imbalance: where the street favors the car and nothing else. This weak section of street is a glaring problem in an otherwise quite strong system of crossings downtown. Unfortunately this weak segment of the street also occurs at a place where downtown can least afford weak crossings.

sidewalk and crossings composite

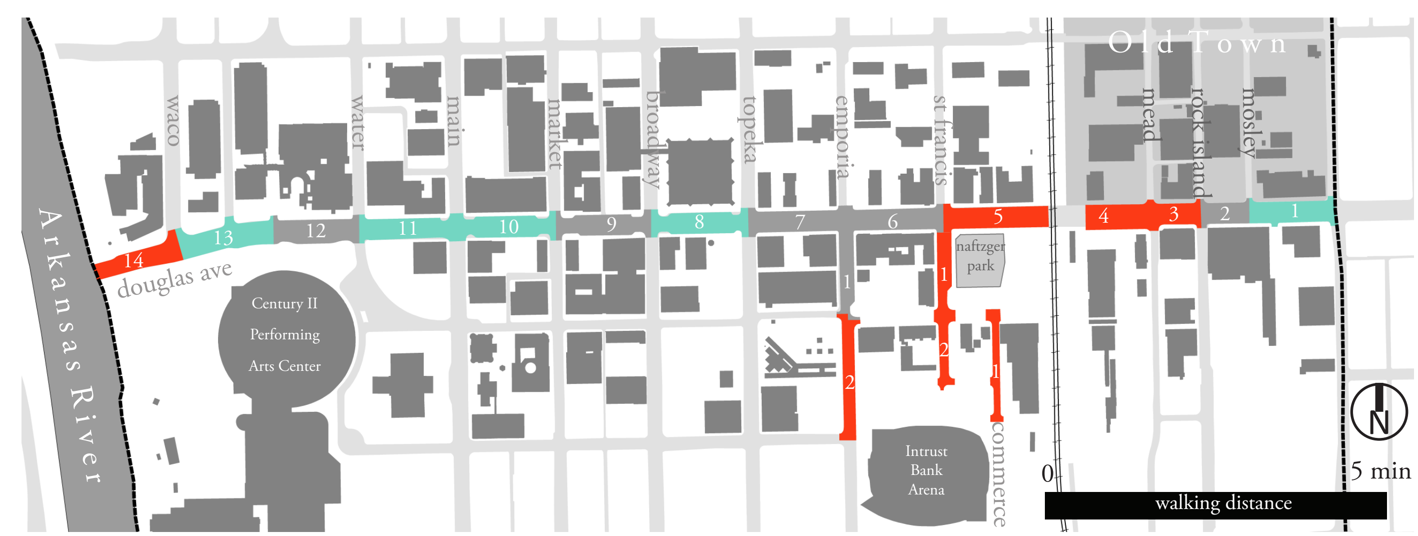


Figure 74: Sidewalk and Crossings Composite

Source: by author

comfort: urban fabric

urban fabric attributes

Urban fabric is typically described as the make-up of the buildings that frame a street giving the sense of enclosure necessary to make pedestrians comfortable. There is some dispute in literature as to how many stories contribute to this effect, but no dispute that the first floor is the most important. I measured urban fabric by the percent of each block occupied at the first, second, and third floor, as well as the total square footage of foreground. I described this process, which I conducted for the entire downtown area, in more detail in the "Narrowing the Scope of Study" section (p. 66).

Some streets are framed by buildings, but the buildings are far from the street. This foreground undermines their ability to shape the space to the pedestrian realm. Therefore, for the composite, the first floor occupancy was valued the most, followed by the foreground, and then the second and third floors.

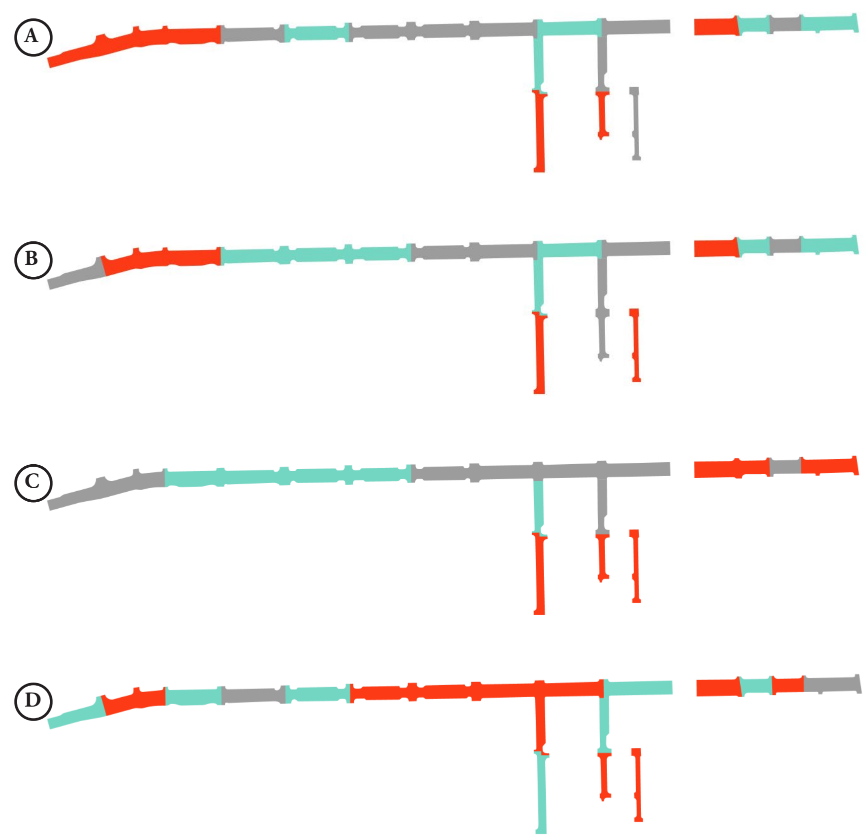


Figure 75: Attributes of Urban Fabric

A. Building occupancy first floor **B.** Building occupancy second floor **C.** Building occupancy third floor
D. Total square feet of private building foreground
Source: by author

This composite also reveals a disconnected pattern of strong areas relative to the middle. This is likely due to the fact that the strongest urban fabric at the second and third floors is on Douglas 8-11. This is considered the heart of the business district and has more tall buildings. However, some of the strongest blocks at the first floor are Douglas 1, 3, and 6, where there are no tall buildings but also very little vacant space.

It is clear that the poorest areas in terms of urban fabric are next to the sea of parking that surrounds Intrust Bank Arena. Other weak blocks are Douglas 13, which is framed by buildings but they all have large setbacks.

Douglas 5 is hurt by the fact that only half of the street is occupied, while the other half faces a park. This block along with Douglas 2 and 4 separate the highest quality blocks from one another, which limits their effectiveness. By cutting the areas of strong urban fabric into pieces, the sense of corridor is weakened.

urban fabric composite

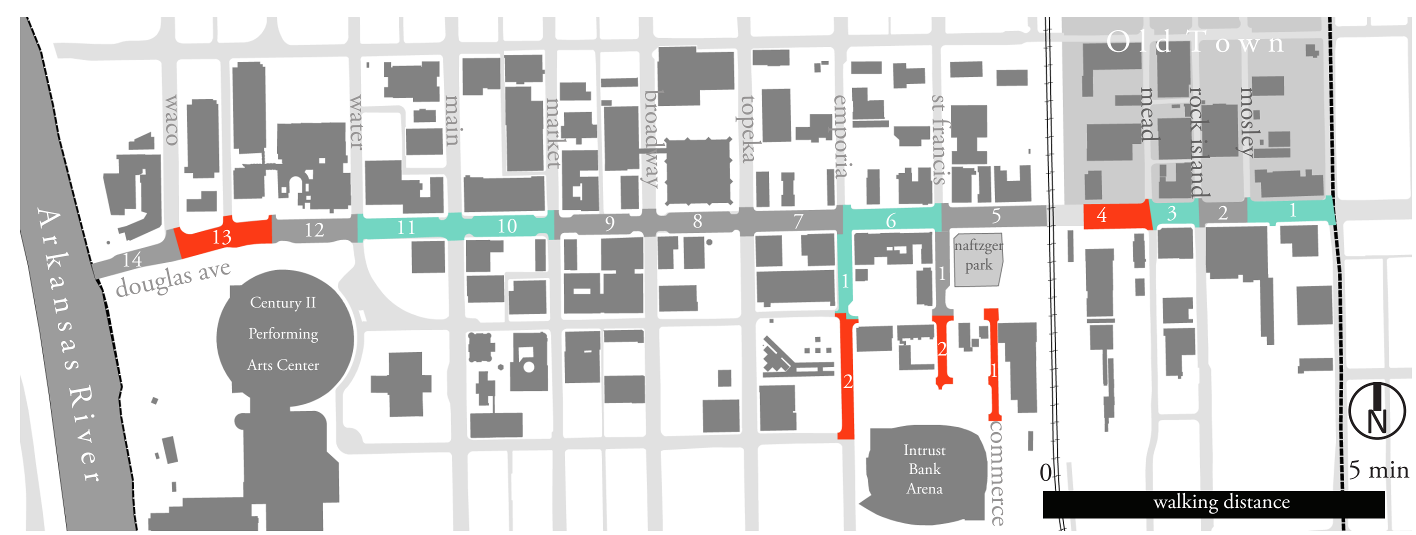


Figure 76: Urban Fabric Composite

Source: by author

comfort: amenities

amenities attributes

The amenities that provide basic comfort to pedestrians are largely unrelated and independent of one another. The are also one of the simpler aspects of a street to repair to make it more walkable.

Much of Douglas Avenue is flanked by somewhat mature street trees, although a few blocks in the center have room for improvement (A).

Outdoor dining opportunities are pretty few and far between (D), although much of Douglas Avenue is well equipped with benches (E).

A nice detail is the scattering of sculpture along Douglas Avenue, which were often talked about by passersby in my site visit (F).

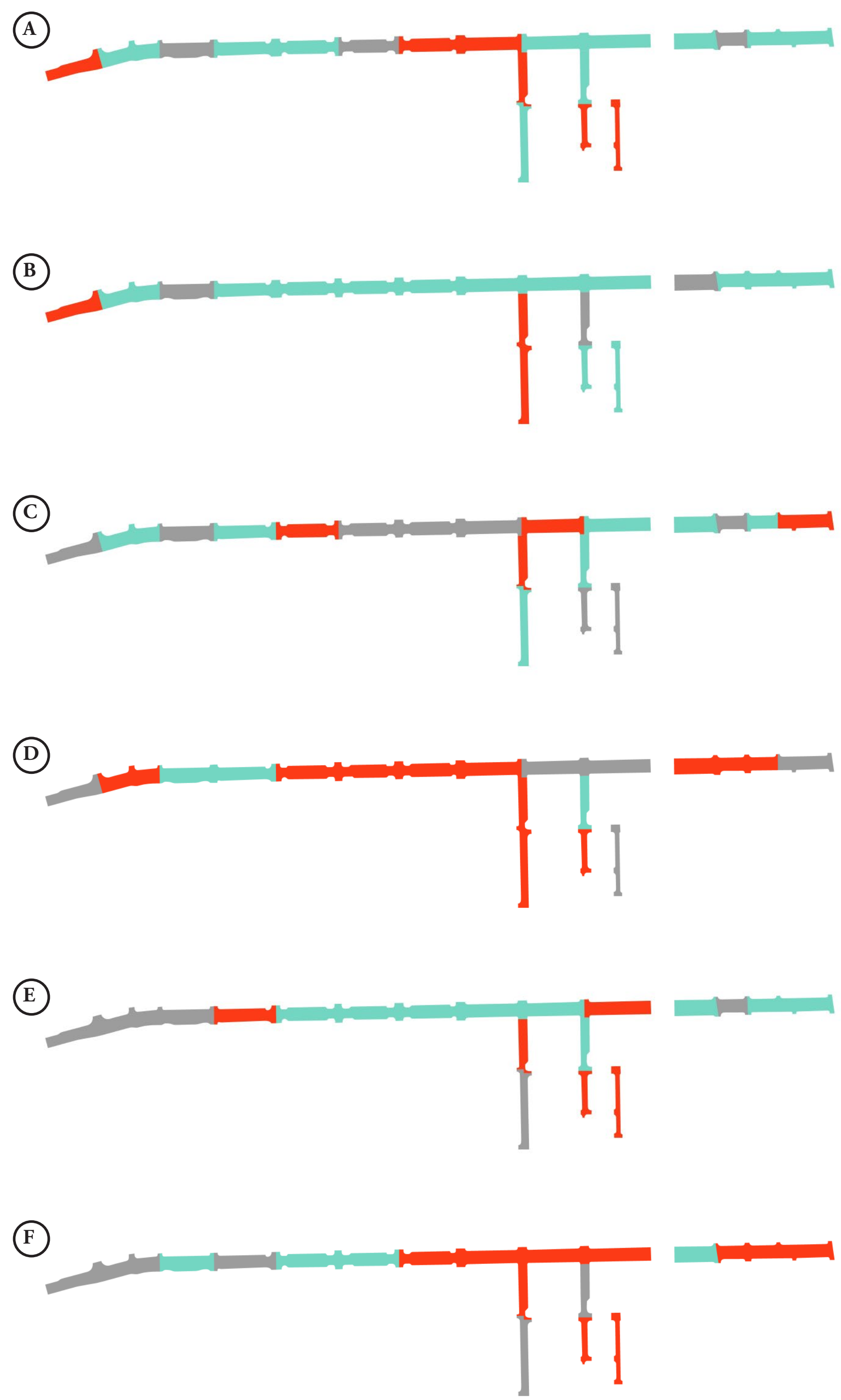


Figure 77: Amenities Attributes

A. number of trees **B.** maturity of trees **C.** other landscape elements **D.** outdoor dining opportunities **E.** seating opportunities **F.** other inviting features (sculpture for example)
Source: by author

Figure 78 is another composite map in which the attributes conflict with one another to create a disjointed pattern of strengths and weaknesses. Interestingly, Douglas 2 and 4, which have revealed numerous issues in previous diagrams, emerged as strong blocks in this diagram, due to street trees, landscape elements, and benches. It is possible that these amenities partially mask what could be an even poorer street environment.

amenities composite

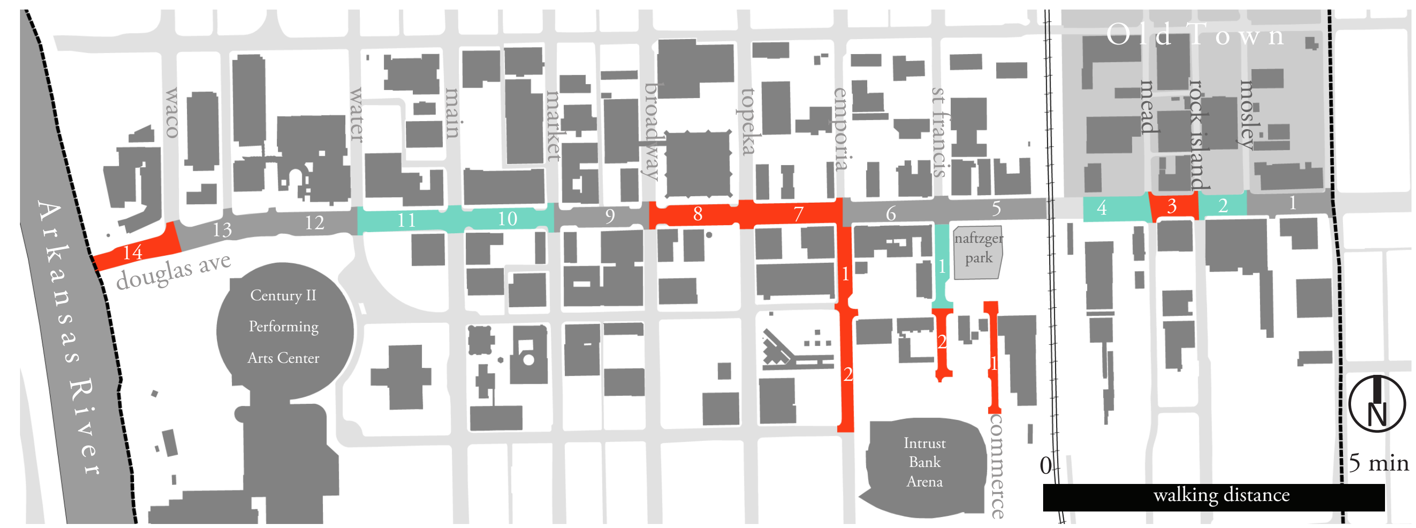


Figure 78: Amenities Composite

Source: by author

comfort: engaging facades

engaging facades attributes

These diagrams complete the story that urban fabric only partially tells. The urban fabric study assigns the same value to a blank wall, which is cold and uninviting, as an active storefront, which is interesting and engaging.

The number of front doors (A) is a reflection of mixed use, but also better describes how that appears from the street. Transparency is also very important, as it allows pedestrians to make a connection with their surroundings (B). Window shopping slows down the pace of pedestrians which can make the sidewalk more inviting to other pedestrians. There is a loose correlation between these qualities, as reflected in the diagrams. These qualities, along with architectural variety (C), the depth of entrances (D), and the overall interest (E) are the extensions of the urban fabric, the way that buildings interact with people.

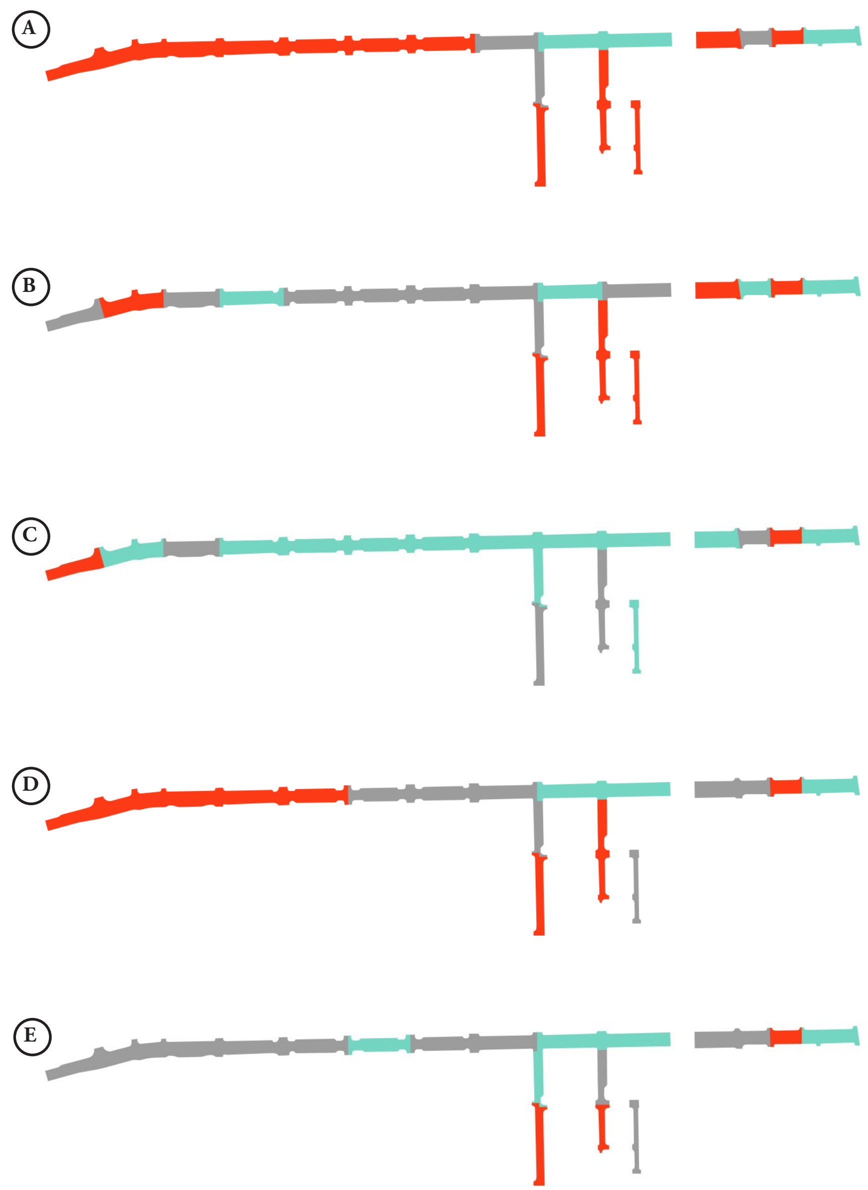


Figure 79: Engaging Facades Attributes

A. number of front doors **B.** percent of block transparent **C.** distinct architectural styles **D.** recessed entrances **E.** interest level of surface (opinion)
Source: by author

The strongest blocks of Douglas Avenue are blocks 1, 5, and 6 while the poorest are next to the Arkansas River. Emporia 1 appears as one of the stronger blocks to the south of Douglas Avenue, but Commerce Street is the strongest of the three blocks immediately adjacent to Intrust Bank Arena. Douglas 2 and 4 appear as weaker blocks, as they have in other diagrams due to lack of urban fabric, but this also reveals that Douglas 3 a medium strength block despite being occupied by buildings on both sides.

engaging facades composite

Figure 80: Amenities Composite

Source: by author

composite scores

composites by category

Figure 81 represents composite maps from other composite maps divided into three broad categories: accessibility, safety, and comfort.

In terms of accessibility, the strongest blocks are in the center of Douglas Avenue, as well as St. Francis 1, likely due to a high degree of mixed use. The weakest blocks are near the ends and near Intrust Bank Arena.

In terms of safety, this same central corridor of Douglas Avenue contains some of the weakest blocks in the study area.

The most comfortable blocks are somewhat scattered, with three to four segments of strong streets separated by weak ones.

This study has revealed that the blocks south of Douglas Avenue and the blocks near the Arkansas River are weak in many ways. However, Douglas Avenue blocks 2, 4, and 5 are weak only in select categories, most of which seem to be relatively easily repaired.

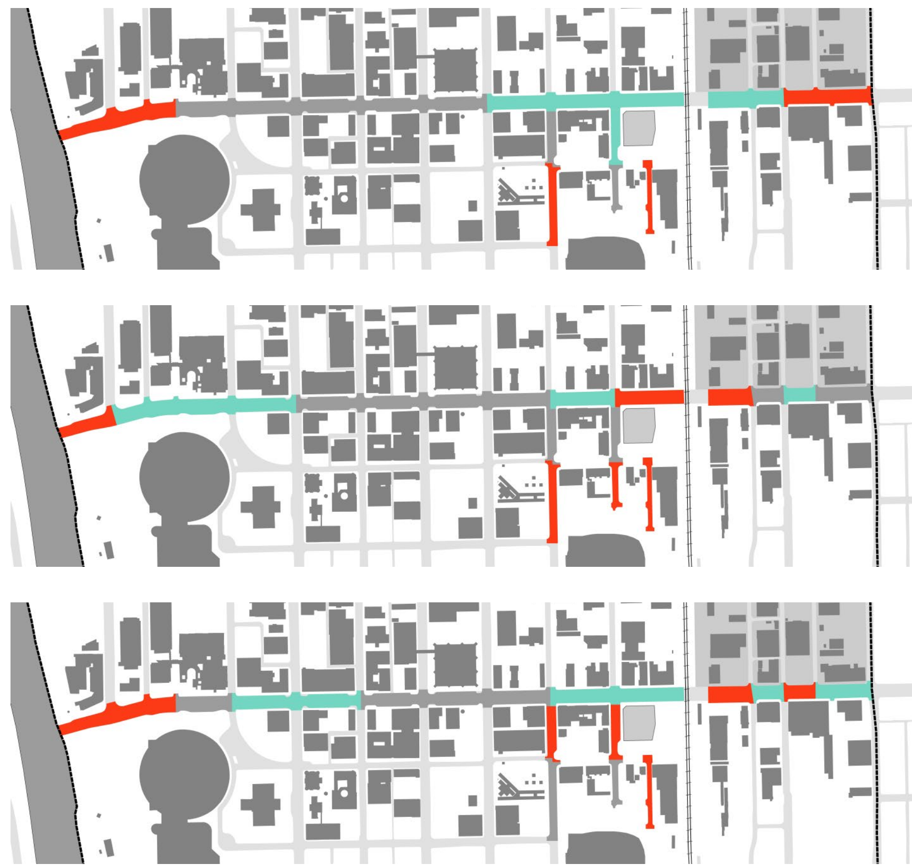


Figure 81: Composites by Category

A. accessibility **B.** safety **C.** comfort

Source: by author

qualities and weights

(mixed use [attractions]* (1.0))
(mixed use [housing]* (.7))
(urban anchors* (.7))
(transit* (.6))
+ (bike amenities* (.6))
(accessibility composite* (1.0))

+

(traffic speed* (1.0))
(sidewalk and crossings* (.8))
+
(safety composite* (.9))

+

(urban fabric* (1.0))
(amenities* (.3))
(engaging facades* (.5))
+
(comfort composite* (.8))

=

Figure 82: Process of Compiling Composites

Source: by author

* normalized

Figure 83 is the composite map of all the characteristics that I measured. This illustrates the relative strength of the center of Douglas Avenue as well as through the central business district. This also concludes that some of the weakest blocks are around Intrust Bank Arena, and near the Arkansas River. Perhaps the most fascinating aspect of this composite is the alternating strong and weak blocks between Douglas 2 and Douglas 5. Most of the conditions that make the weak blocks weak stems from a lack of urban fabric.

This study failed to clearly identify one of the streets south of Douglas Avenue as having more walkability potential than the others. I chose to concentrate interventions on Commerce Street due to it having more development potential, as I explain in the "Recommendations" section beginning on page 100.

overall composite

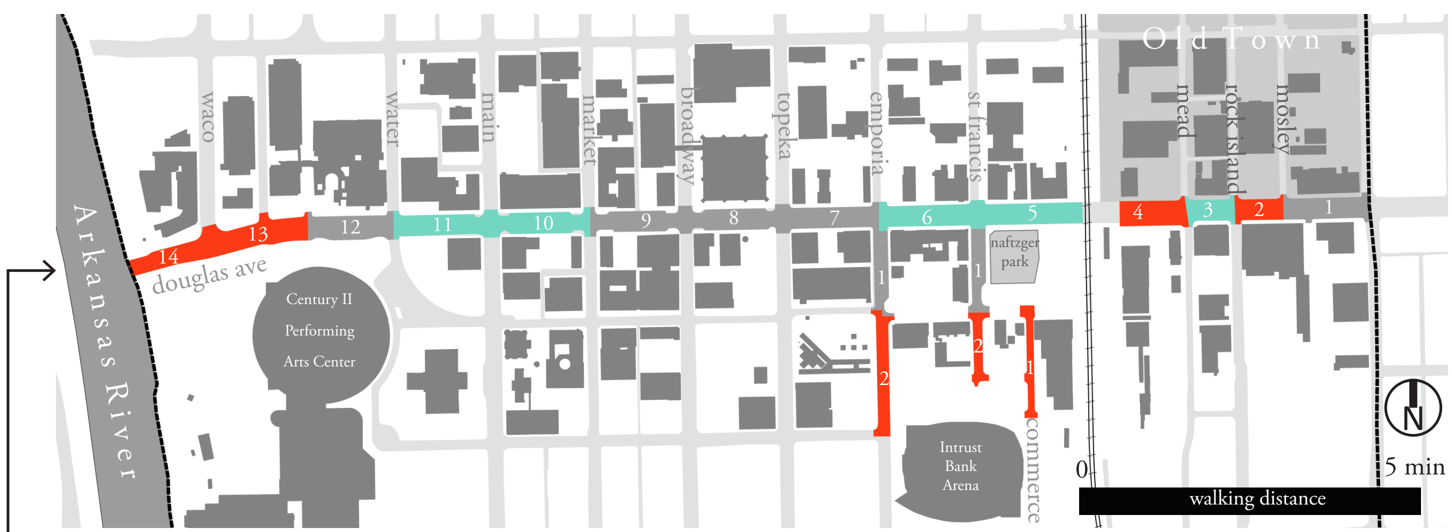


Figure 83: Overall Composite

Source: by author

normalizing values

To create composite scores from other composite scores, I normalized the source composites and then applied a new weight so that the resulting values would reflect the importance of the category, rather than the number of attributes that composed it (Fig. 82). Another method would simply have been to use the ratings of 1, 2, or 3 that I assigned to each of these categories based on their composite values relative to one another. However, this would have disproportionately separated high values from medium values and medium values from low values. The full table of results that I used for my calculations can be found in Appendix 2: collected and computed walkability values.

recommendations
strategy to improve walkability

goals — *strategies*

Improve connection between Old Town and Douglas Avenue

1. Infill lots on south side of Old Town
  place parking across the street

2. Traffic signals and crosswalks on Douglas Avenue
  on south side of Old Town

3. Improve pedestrian quality of bridge *

4. Restore activity in Union Station *
  bring activity and street wall up to street edge

Create modal balance on Douglas Avenue

5. Road diet for Douglas Avenue
  reduce to one lane each direction with turning lane

6. Bike lanes: all of Douglas Avenue
  with street gained by road diet

Improve connection between Douglas Avenue and Intrust Bank Arena

7. Turn parking lot along park into a sidewalk

8. Use remainder of parking lot to hold future food trucks
  recreate pop-up park

9. Infill parking lot on south side of park

10. Infill parking adjacent to Intrust Bank Arena

Improve connections beyond study area

11. Remove the barricade dividing Commerce Street

12. Improve urban fabric along Century II
  trees, temporary landscape, or structure

* currently in development

sites of intervention

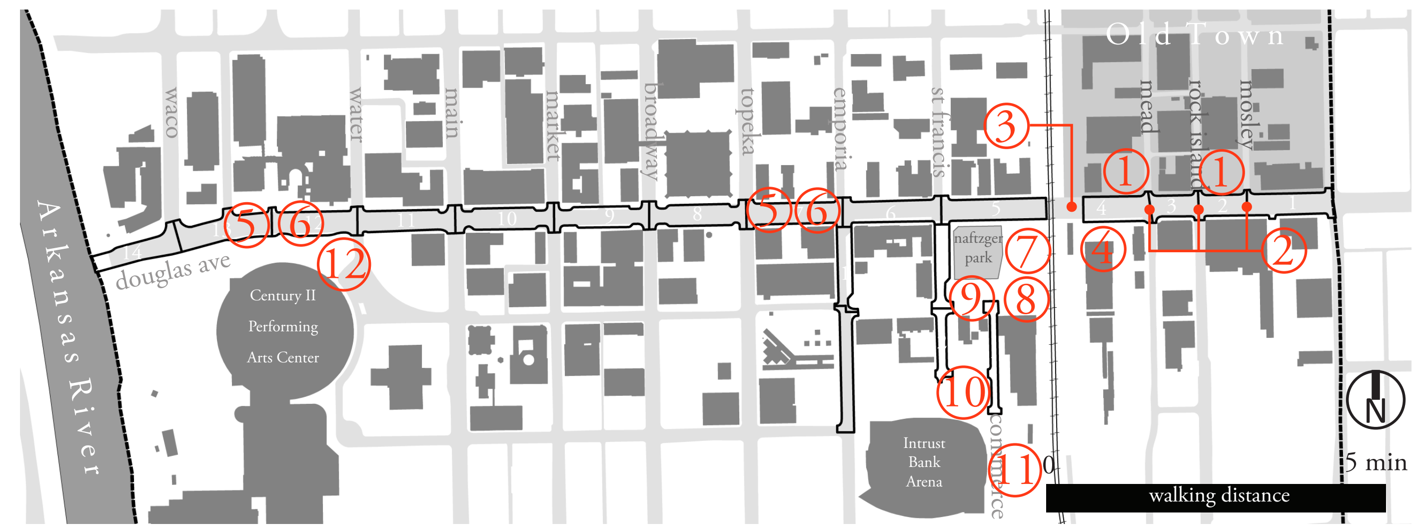


Figure 84: Locations of Suggested Improvements
Source: by author

infill strategy

Many of the weaknesses of the study area were derived from a lack of urban fabric in important locations. These weak points lessen the effectiveness of the adjacent strong blocks, thus it is important to infill these spaces with buildings that engage with the pedestrian.

The most important infill is in the two empty lots on the south side of Old Town. These lots make the street feel wide and decrease the interest level of the street, which both contribute, along with a lack of traffic signals, to driving speed. As established earlier in this report there are many parking garages and parallel parking spaces on the street that have room to accommodate this loss of parking. I also propose a road diet that will provide additional on street parking.

Union Station is not ideal in terms of urban fabric due to a large building setback. However, the building is historic and is staged to be renovated to house several businesses and restore the once grand character of the facade. I propose something permeable at the street level to contribute to degree of enclosure without minimal obstruction of access or views of the future Union Station. This could be a colonnade, street trees, planters, or seating elements. I represented this as a simple colonnade.

The second priority for infill is in the block with Naftzger Park and along Commerce Street. These structures will improve the urban fabric of Douglas Avenue and Commerce Street, and extend Commerce Street to and along the edge of what is currently an unaccessible side of Naftzger Park. This will capitalize on the value of Naftzger Park as an asset to downtown, rather than a void or obstacle. A pedestrian corridor will connect Commerce Street to Douglass Avenue and provide and interaction with Naftzger Park. Food trucks can be used along this walkway to increase the activity of the corridor.

These buildings are represented as simple masses, but should be composed of a variety of buildings with diverse functions. They should include restaurants, public services, housing. Ideally, one of them should be a grocery store and another should be a school, both of which are absent downtown, and could significantly contribute to the livability of a neighborhood. I did not design program for any of these buildings, but rather portrayed them as diverse in character and function, oriented toward the street, and composed of transparent and engaging facades, all of which are qualities that were stressed in the literature and confirmed in this report.

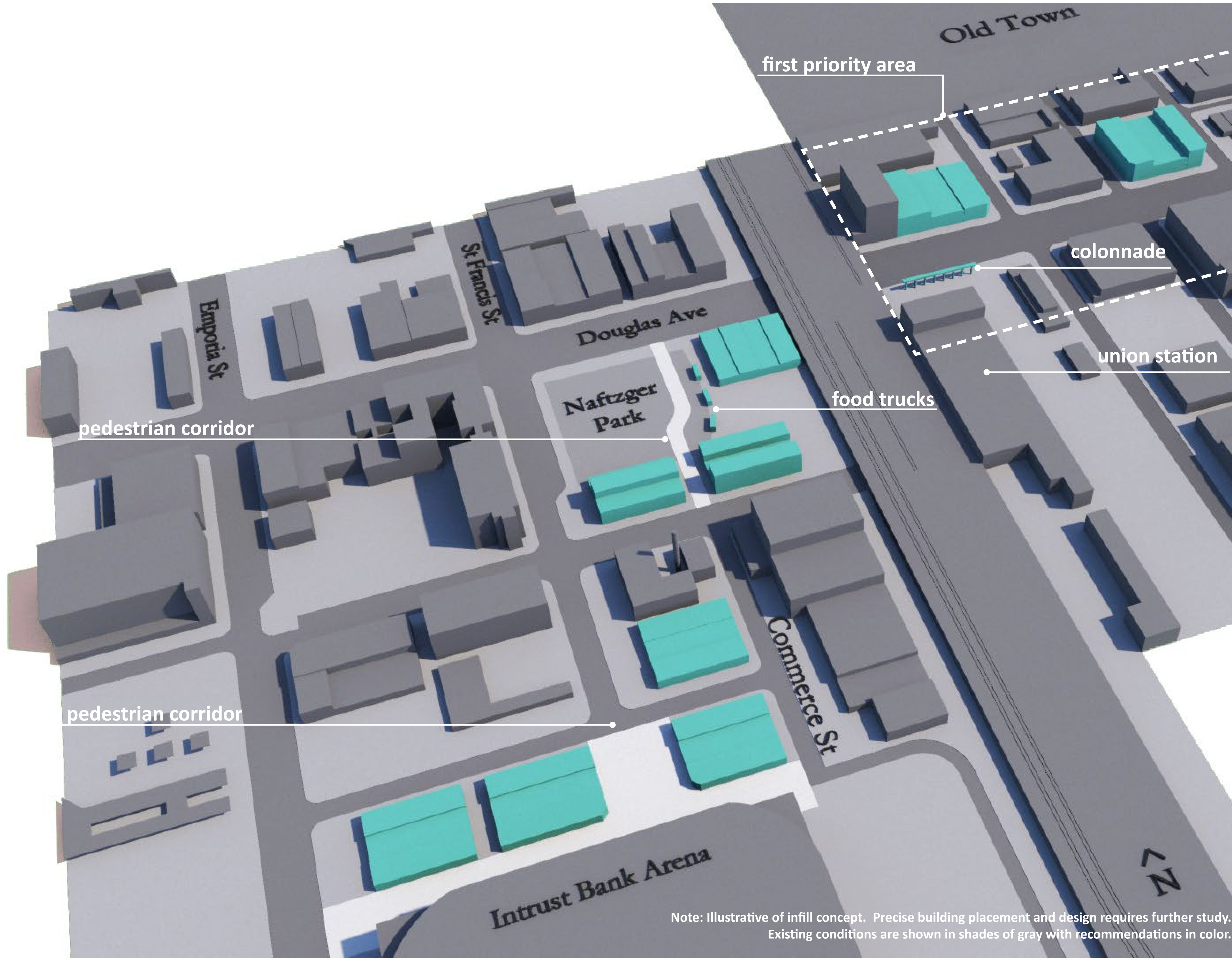


Figure 85: Infill Strategy

Source: by author

douglas avenue road diet (1) and intersection additions

The primary goal of my proposal to give Douglas Avenue a road diet, is to restore modal balance to the street, particularly along the southern edge of Old Town. Modal balance means that the street accommodates all modes of transportation rather than just the car. This goal can be accomplished in two ways: by increasing the amenities for pedestrians and bicycles, and by slowing traffic speed. Currently, most of Douglas Avenue is composed of four drive lanes, one turning lane, and parallel parking on both sides. I have proposed two different road diet plans to restore balance through the delineation of the street: neither require the majority of the curb to be reconstructed.

The first road diet proposal (figs. 86-88) is more modest and eliminates the center turning lane to make room for two bike lanes. Parallel parking will be retained on both sides of the street, and intersections will improved by bump-outs that occupy the parallel parking lane, reducing the crossing distance for pedestrians.

The most important component of both of these road diets is the addition of traffic signals and crosswalks at three currently unsignalled intersections.

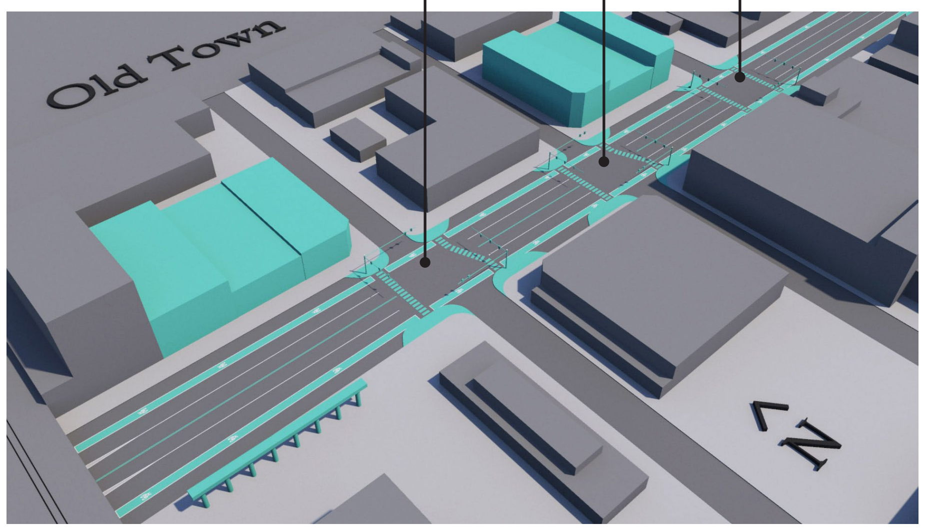


Figure 87: Road Diet 1: Douglas Ave. East of Bridge

Source: by author

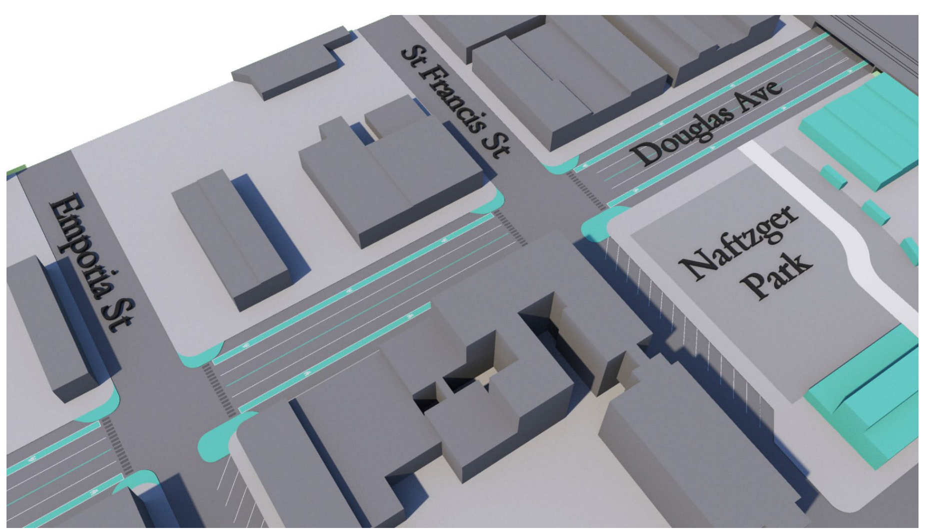


Figure 86: Road Diet 1: Douglas Ave. West of Bridge

Source: by author

West of the bridge, Douglas Avenue is less problematic. Every intersection from the bridge to the Arkansas River has stoplights, crosswalks, and walk signals. Some blocks, west of this diagram, already have the bump-outs that occupy the parallel park lane at intersections, reducing crossing distances. I propose adding those bump-outs to every intersection on Douglas Avenue to further shift the modal balance from the car to the pedestrian.

Aside from that, Douglas Avenue is only missing a bike lane, the space for which is created by eliminating the turning lane.

road diet 1: more modest

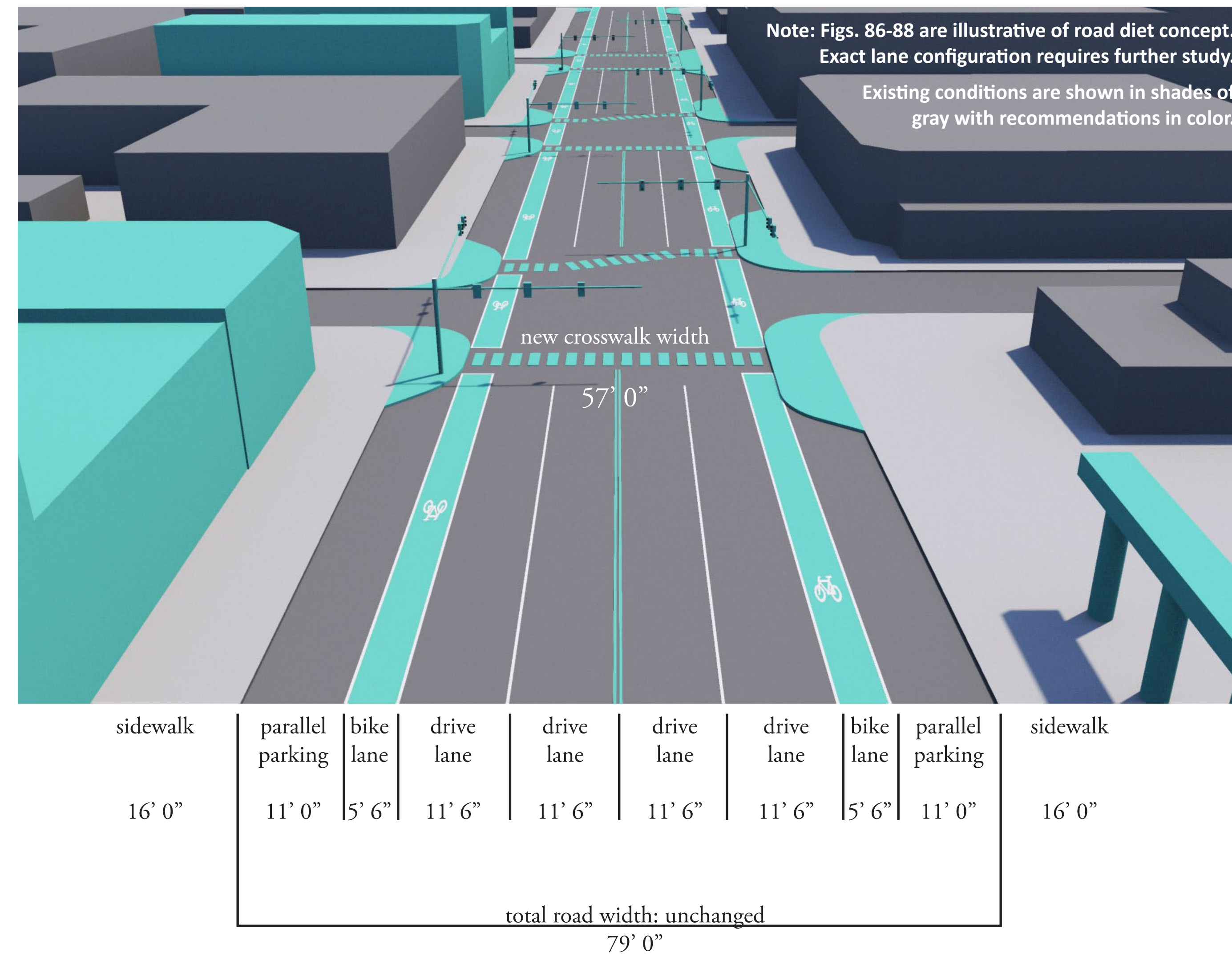


Figure 88: Road Diet 1: Douglas Ave. Road Diet 1 Street Delineation

Source: by author

douglas avenue road diet (2) and intersection additions

The second road diet (figs. 89-91) is slightly more drastic, eliminating two drive lanes instead of one turning lane. This road diet incorporates the same bike lanes, but uses angled parking instead of parallel parking. Because angled parking occupies more street width, the bulbouts at the intersections must be wider, thus further reducing the crossing distance for pedestrians.

Angled parking provides more parking per linear foot than parallel parking and may be more approachable to drivers, encouraging them to park on the street instead of in surface lots.

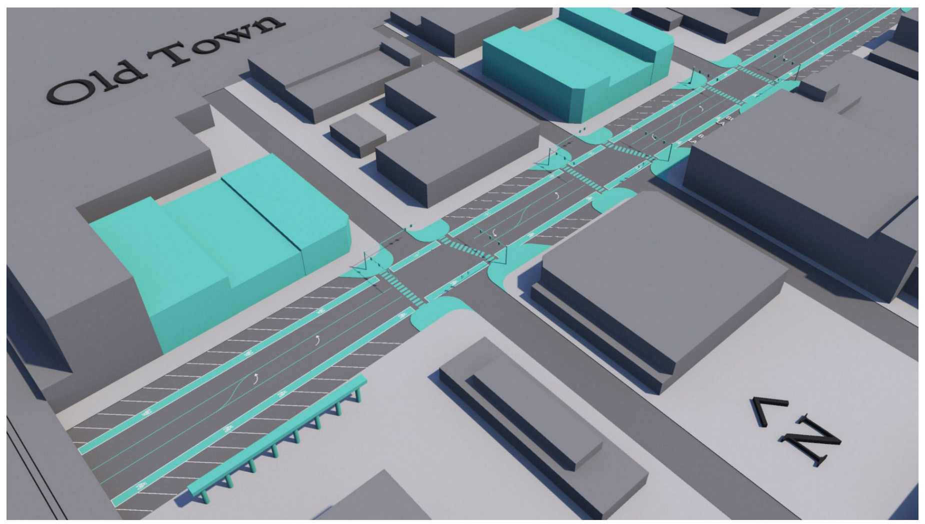


Figure 90: Road Diet 2: Douglas Ave. East of Bridge

Source: by author

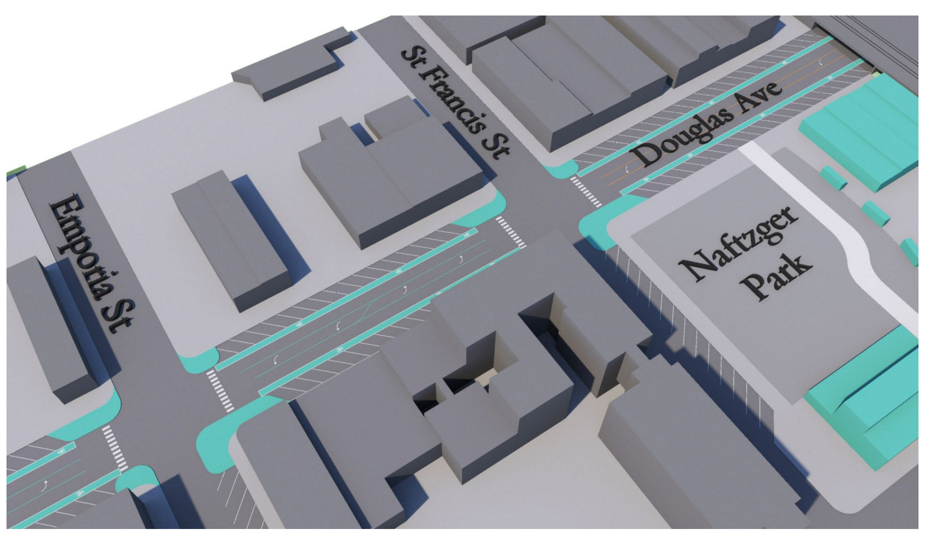


Figure 89: Road Diet 2: Douglas Ave. West of Bridge

Source: by author

This road diet would be my preference for several reasons. One lane of through traffic in each direction would reduce the ability to speed. Larger bump-outs mean that crossing Douglas Avenue becomes quite manageable. Finally, angled parking provides many approachable parking opportunities right next to Old Town and what is soon to be an active Union Station.

road diet 2: more drastic

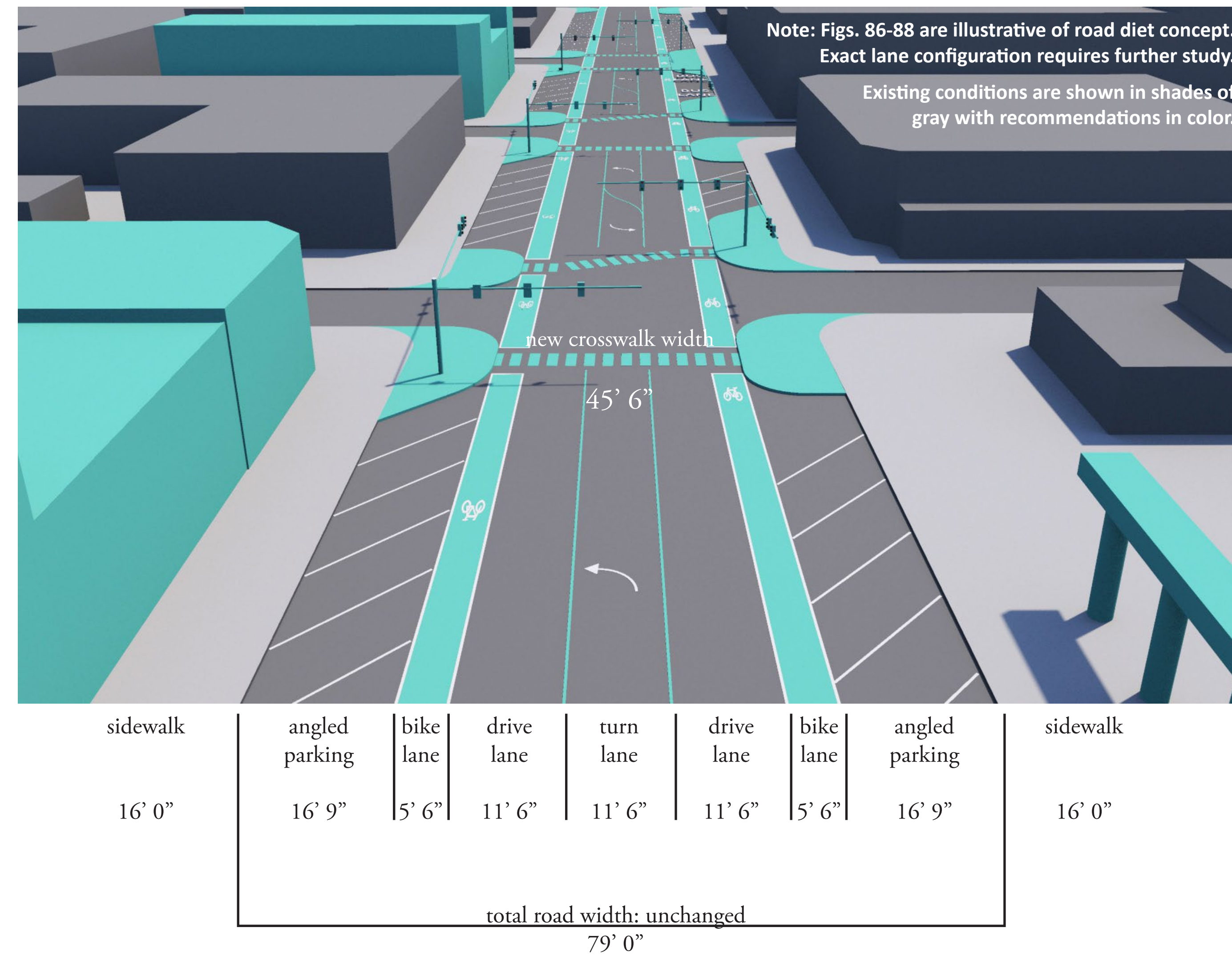


Figure 91: Road Diet 2: Douglas Ave. Road Diet 2 Street Delineation

Source: by author

naftzger park and commerce street concept

In more than one instance, I have heard Naftzger Park described in an unfavorable manner, by local merchants and professionals. I got the sense that those who don't live downtown don't go in the park because they are afraid of encounters with homeless people. In the design charrette, more than one person worried that more park and plaza space provided too many places of refuge for homeless people. Aside from the ridiculous notion that outdoor spaces "produce" homeless people, I also struggle to believe that Wichita has any more homeless than comparable cities. I was never approached by a stranger in two days of site visits.

I see this perception as a terrible waste of a very charming park on a block that has the potential to carry more foot traffic than any other in Wichita. In walkable cities, homeless people are merely one component of an active and vibrant street scene. In walkable cities, people take advantage of great park space in the center of the activity. Part of this problem in Wichita is merely cultural: people unwilling to accept that homeless are but one component of cities. In fact, this culture may vary significantly even within the city of Wichita. To contrast the negative perceptions of Naftzger Park, some residents of downtown Wichita have indicated that they like to take young children to this park and consider it among the most comfortable spaces downtown (Glastetter 2015). Part of the problem may be a lack of street life in general, making those living on the street more noticeable. But the other part of the problem is the design of the park itself. There is a degree of enclosure on the St. Francis Street and Douglas Avenue sides that allows views in, but perhaps suggests too much enclosure. In fact, the main entrance has metal gates that I believe send the wrong message.

The more significant problem is the degree of enclosure on the back two sides of the park, which is both fenced off and surrounded by shrubs. Wichita needs to shed the poor reputation of Naftzger Park, by opening it up and making it more accessible from all sides. Though this report advocates for sense of enclosure, it is likely that Naftzger Park has too much. This problem is described in William H. Whyte's *The Social Life of Small Urban Spaces* as a common but critical mistake of many parks.

For these reasons, I propose a pedestrian corridor through the center of this block, forming a very open edge to Naftzger Park. This corridor should be well lit, unobstructed by structure or vegetation, and incorporate colorful elements, engaging sculpture, and comfortable seating that provides just the right amount of refuge. To further activate this pedestrian corridor, I propose food trucks, modest seating spaces, and planters that double as bar tops for people to eat on. This space would be comparable to the Creative Placemaking group's proposed pop-up park.

As a whole, the goal of this pedestrian space is to repair a crucial missing connection in the pedestrian network and to activate Naftzger Park, a valuable asset, to make it work for the city instead of against it.

Figure 92: Aerial of Naftzger Park Block

Source: by author

naftzger park and commerce street concept

This concept (fig. 93) illustrates the character of the elements to be incorporated into this pedestrian walkway. Food trucks engage with the walkway through playfully connecting seating space. Seating incorporates colorful elements. There are two types of tree planters: shade trees for the seating space, and ornamentals for the center of the walkway. These planters double as informal bar top space for patrons of the food trucks. The large seating space is actually in a similar location to a current seating space, but the enclosure and accessibility issues resolved. Food trucks would also provide more of a reason for this seating space to exist.

Terminating the axis of Commerce Street and activating the largest seating space is a piece of sculpture incorporating light. This sculptural concept was created by Creative Placemaking teammate Nicholas Mercado and incorporates light inside the sphere, which shines out through holes in the sphere onto the ground plane and surrounding buildings. This light source could change colors or even move to create more interest. The sculpture is open below, allowing for pedestrian movement through the structure itself.

This is not a descriptive design layout for this space, but merely a portrayal of concepts that are necessary to achieve the walkability goals for this space.

Figure 93: Aerial of Naftzger Park Pedestrian Corridor

Source: by author
Sculpture Concept: by Nicholas Mercado, used with permission

street view exiting intrust bank arena

As described in the infill strategy (fig. 85), I am not proposing specific program for any of these buildings, but merely suggesting that the character and character and function be diverse, engaging, and oriented to the street, similar to what is already present on several blocks of Douglas Avenue. The following perspectives portray how the visual character of the street is improved by mending the holes in the urban fabric.

Figure 94: Existing Street View Exiting Intrust Bank Arena

Photo: by author

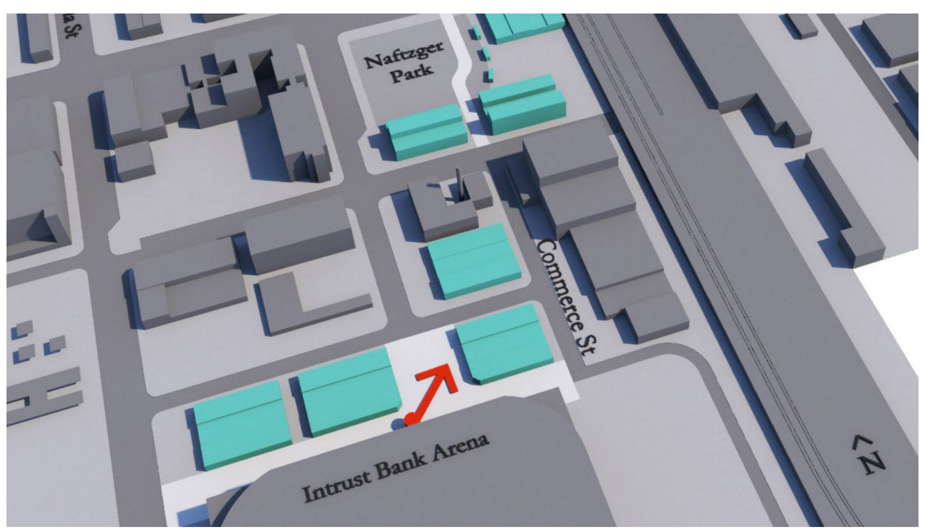


Figure 95: Location of Perspective

Source: by author

Figure 96: Building Infill Concept

Source: by author

street view from commerce st

This perspective illustrates the concept of extending Commerce Street, as a pedestrian corridor, through the middle of this block along the edge of Naftzger Park. As is visible in Figure 97, the back of the park is enclosed and uninviting. In this concept, a sculptural piece that incorporates light art, designed by teammate Nicholas Mercado, serves as the visual terminus for Commerce Street, but the pedestrian corridor continues through the space.

Figure 97: Existing Street View of Naftzger Park from Commerce St.

Photo: by author

Figure 98: Location of Perspective

Source: by author

Figure 99: Building Infill and Pedestrian Corridor Concept

Source: by author
Sculpture concept: by Nicholas Mercado, used with permission

street view of douglas avenue along old town

Figure 102 represents car traffic stopping as pedestrians cross an intersection that currently more closely resembles a freeway than a complete street (fig. 100). I represented this scene and the following scene using my second, more drastic road diet with angled parking. It is important to note that Douglas Avenue, even with these changes, would continue to carry heavy traffic relative to neighboring streets. Therefore, it is important that the bike lane be highly visible to provide the necessary degree of comfort.

Figure 100: Existing Street View of Douglas Ave. Facing East with Entrance to Old Town

Source: Google Maps

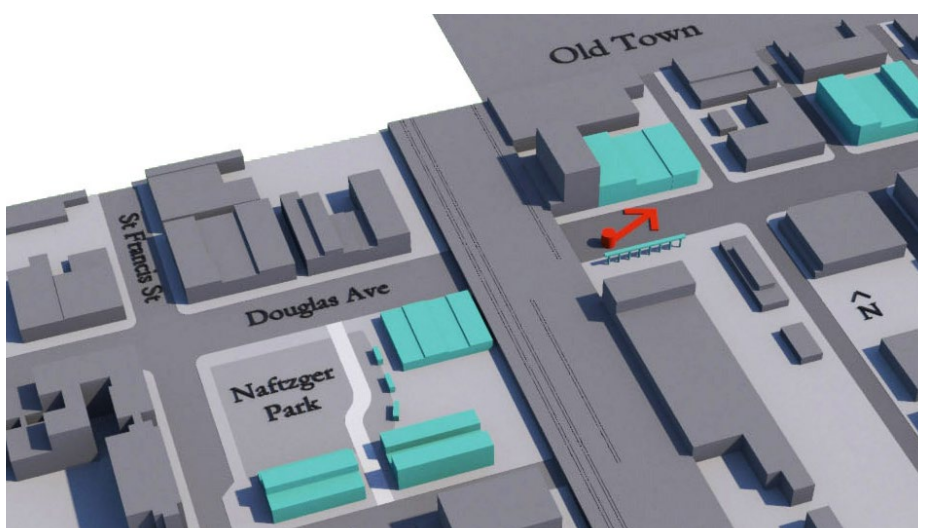


Figure 101: Location of Perspective

Source: by author

Figure 102: Building Infill and Road Diet Concept

Source: by author

street view of douglas avenue along naftzger park

This current condition (fig. 103) is not the absolute worst example of urban fabric in the study area. A strong row of street trees do a decent job of obscuring this gap. However, an absurdly large parking lot facing Douglas Avenue at perhaps the most important intersection in Wichita is a wasted opportunity typical of the problems described in this report. Engaging buildings here will strengthen the character and comfort of the street and encourage pedestrians to continue under the bridge to Old Town.

Figure 103: Existing Street View of Douglas Ave. Facing East with Naftzger Park on Right

Source: Google Maps

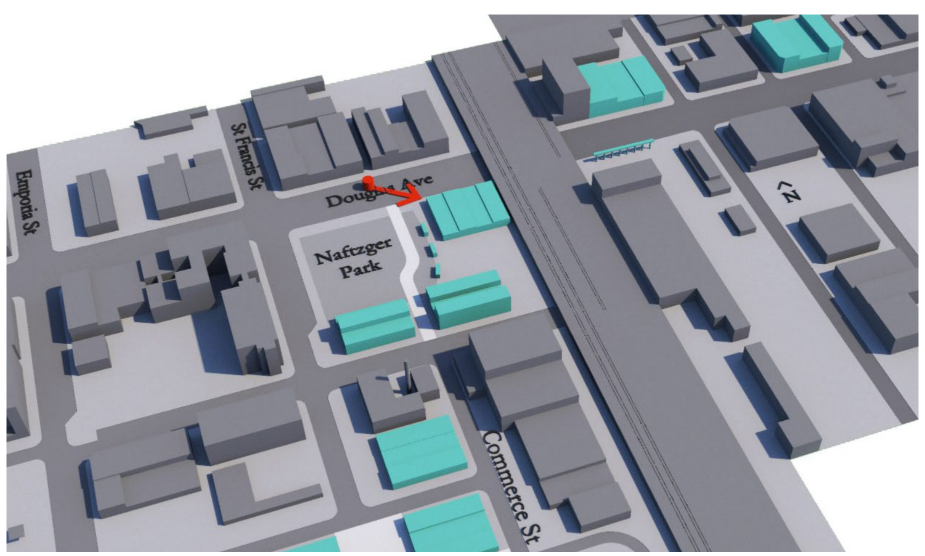


Figure 104: Location of Perspective

Source: by author

Figure 105: Building Infill, Road Diet, and Pedestrian Corridor Concept

Source: by author

conclusions and reflections

conclusions

I established through connectivity and block length diagrams that downtown has more potential for walkability than comparably sized seemingly mixed use neighborhoods that are designed for the car. I illustrated that Douglas Avenue has more walkability potential than any other corridor downtown based on the relationship to urban anchors, the quantity of existing amenities, and multiple studies of urban fabric. Therefore, I selected Douglas Avenue to study in further depth to determine its strengths and weaknesses. I included three potential streets, Emporia Street, St Francis Street, and Commerce Street, to this further study to evaluate which has the most potential to form a strong connection from Douglas Avenue to Intrust Bank Arena. I can conclude that Commerce Street seems to have the most advantages, but disparity from the other streets is somewhat negligible: all of them present a number of problems for walkability.

Within Douglas Avenue, there are certainly stronger streets and weaker streets. The stronger streets, in general seem to be the four to five blocks in the center of the study area, with the weakest blocks near the ends. However, one common trend among the resulting maps was an alternation between strong blocks and weak blocks along the southern edge of Old Town. Most of this stems from two fundamental problems: a lack of urban fabric on two of those blocks, and a lack of pedestrian crossing amenities at the three most important intersections east of the railroad bridge.

In terms of accessibility, the central section of Douglas Avenue is the strongest, in large part due to a high degree of connectivity to other streets. This makes this district very approachable to walking, cycling, and public transportation. As a corridor, Douglas Avenue is quite accessible to transit users, but not very accessible to bicycles due to narrow streets, a lack of alternative routes, and blocks of unregulated car traffic.

This is great news, because most of these issues are relatively simple to fix. To repair the many issues stemming from gaps in the urban fabric, I proposed mixed use infill in several places, with the most important along the southern edge of Old Town. My conceptual design proposal also includes a road diet that would require minimal construction but would help restore modal balance to Douglas Avenue and drastically increase the ability of Douglas Avenue to connect urban anchors for pedestrians.

urban triage and the walkability rubric

The walkability rubric taught me a lot about the corridor, but was not as valuable of an urban triage instrument as I originally intended. It simply provided too much data from too many categories and with too many conflicting results to conclude without question that one block has more walkability potential than another. The bigger contribution from the walkability rubric was illustrating strengths and weaknesses and their relationship to one another.

At the beginning of the project, when I was developing the walkability rubric, I assumed that it would serve as the primary instrument of urban triage. However, as I realized it's strengths and limitations, and the massive importance of specific qualities like block length, connectivity, and urban fabric, the study began to divide into two parts. The first part of the study became the "Narrowing the Study Area" chapter of this report. This narrowing process, which was composed primarily of an urban fabric study and supplemented by an inventory of attractions and relationships to urban anchors, became the primary instrument of urban triage. These studies allowed me to narrow the study area down to a much more manageable size.

The walkability rubric served as a secondary analysis tool to understand the details of the narrowed study area. Because the rubric illustrated relative strengths and weaknesses, it was valuable for developing a design strategy to capitalize on the strengths and resolve the weaknesses of the study are defined by the 'urban triage.'

limitations to study

the impact of weights and thresholds

A possible limitation of this study is the impact of thresholds and weights. I created the thresholds to distinguish strong blocks from weak blocks based on my observed perception of the scope of possible values for the study area. There are a number of more empirical methods that could be employed to establish these thresholds, which could yield different results.

The weights that I assigned to each attribute were based on my understanding of the importance of each attribute. For example, I assigned the highest weights to the degree of mixed use, and the quality of urban fabric, which appeared frequently in literature. I did not have the capacity in this study to conduct a sensitivity analysis to explore different values for these weights.

empirical support for conclusions about safety

To provide a stronger argument for the conclusions that I made about weak points in the network in terms of pedestrian safety, traffic speed and accident data would be a valuable resource. Despite numerous communications with a Wichita traffic engineer, I was unable to acquire such data.

design beyond conceptual

In this report, I was only able to develop conceptual recommendations for building infill, road diets, and the pedestrian link incorporating relocated elements from the Douglas Avenue pop-up park. I felt that it was essential to portray the diverse and varied character of buildings, but did not program buildings individually. Further study would be necessary to determine the precise program and placement of these buildings.

Also, I communicated road diet concepts to illustrate how many lanes could be incorporated into the existing street, based on two different configurations. However, there are many possible iterations of these basic concepts, particularly in terms of design and placement of the bike lanes. Design of these elements should be based on the needs of users, which would require further research than I could accommodate in this report.

test the pop-up park site for walkability impact

I had hoped that this study could confirm or deny the validity of the site selected for the pop-up park. However, comparing the potential influence of the park on the proposed site compared to other potential sites would have required extensive more calculations and an exhaustive set of maps to illustrate. It is clear that the pop-up park will contribute some degree of street life, program elements, and comfort amenities, that are essential to accommodate pedestrians, but its potential value was difficult to quantify in this study. Measuring the impact of such a park, and future replications of the park, could be its own research project.

recommendations for future research

sensitivity analysis and case study based thresholds

To expand upon this study, a sensitivity analysis would be an valuable way to explore how different weights would affect results. This would dispel any misconception that the researcher presumes to have chosen the correct weight for each attribute without testing different weights.

To establish thresholds that are more empirically based, researchers recreating this study could use case studies of cities with more pedestrian friendly streets. For example, to determine what is considered "good" in terms of housing options within a three block radius, those thresholds could be derived from the housing make-up of comparably sized cities that are much more successful in terms of walkability.

empirical data for road diet design

The sources that I synthesized to understand the contributors of walkability were mostly written by planning experts, who do site empirical data often to support their claims. However, I did not use empirical data of the relationship between pedestrian safety and road width, urban fabric, or street trees as a primary source. This kind of support could be necessary to justify an actual road diet.

explore methods to measure the value of the river

The Arkansas River could be considered an urban attraction, as it provides scenic views, recreational trails, and a significant amount of foot traffic. For the purpose of this study, I chose to measure qualities that contribute to walking for utility, rather than walking for recreation. As Frumkin, Frank, and Jackson describe, walking for utility provides a mechanism for people to integrate exercise into their daily routine, rather than having to make exercise an event (2004). Therefore, I largely ignored the benefits of high quality trails along the river, and the scenic value of the river.

However, the river is certainly an amenity, and one that should be valued. To build upon this study, a researcher should develop additional characteristics to measure and value the qualities that contribute to recreational walking, as well as functional walking.

post-occupancy study of the impact of pop-up park

The Creative Placemaking group, as well as the WDDC, have operated under the assumption that a pop-up park on Douglas Avenue will improve the character, street life, and sense of ownership for the block and throughout downtown Wichita. Due to construction delays, we were unable to test this through post-occupancy studies and interviews. To make the case for recreating pop-up parks in catalyst sites around downtown, future researchers should attempt to quantify the impact of such a park, as well as the impact of future parks, in order to gauge the role of the selected site.

value and significance

First and foremost, this study confirms the value of several downtown projects that are currently in planning or development stages. This includes housing developments on Douglas Avenue between Market and Broadway, where housing is most needed, renovations to the dark and uninviting underpass that divides Douglas Avenue, and redevelopment of Union Station, which currently wastes prime real estate adjacent to Old Town, Douglas Avenue, and Intrust Bank Arena.

In terms of the pop-up park, this study identified a prime location to serve as a future location for the planned pop-up park to be relocated. If the state of downtown is similar to its current state in three to five years when the pop-up park comes to the end of it's life, Naftzger Park and the adjacent parking lot are an excellent place to replicate the space.

I conducted the entirety of my individual research project on walkability potential without influence from the Wichita Downtown Development Corporation. Therefore, these findings represent an independent report on the state of downtown, which could provide the WDDC with an additional source to support it's efforts to develop downtown. These findings may have even revealed strengths and weaknesses that the WDDC was unaware of.

Finally, this report provides conceptual design concepts, which could be used as a selling tool to entice desired developers or adjust the design concepts of developers that may not contribute to the walkability of downtown.

This report helps make the case for smaller units of development over large ones for a variety of reasons. It can be tempting to allow developers to purchase and develop large piece of land in hopes of quickly turning blight into high quality, attractive structures. However, if large buildings only contribute one use, their contribution to walkability will be limited. This report clearly illustrates the value of diversity in terms of building use and its users to the walkability of a city.

Finally, in terms of studying downtowns as a whole, this study was quite effective in narrowing the scope of study and comparing one block to another by many attributes, which is an excellent way to understand relative strengths and weaknesses. This can help cities develop a concentrated and precise strategy to promote walkability.

applying the method used in this study

The following is an outline of steps to apply my methods, noting a few details that I would change, were I to recreate the study myself. The important distinction is that urban fabric, connectivity, and block length should be emphasized in the urban triage, and removed from the block by block analysis.

I. Urban Triage

- **A. Establish a Broad Study Area**
  - **1. compare downtown to other potentially walkable districts**
  - **2. compare block length, connectivity, and urban fabric**
- **B. Narrow the Study Area**
  - **1. measure and map urban fabric**
    per process on pages 66-69
  - **2. measure and map connectivity**
    by link node ratio
    per process on pages 76-77
  - **3. measure and map block length**

2. Block by Block Analysis

- **A. Create Walkability Rubric**
  - **1. comparable to rubric on page 49**
  - **2. omit qualities already studied in urban triage**
- **B. Apply Rubric on Narrowed Study Area**

3. Identify Blocks with most Walkability Potential

4. Develop Improvement Strategy to Resolve Weaknesses

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appendix 1
teammate abstracts: working versions from october 2014

The Wichita Biking Experience
Danielle DeOrsey

When it comes to urban revitalization, human happiness and well-being is often overlooked. Cities are dominated by automobiles and pedestrian-oriented design is only now beginning to become a part of the urban revitalization conversation. Wichita, Kansas, like many other mid-sized, American cities, prioritizes the car at the cost of the pedestrian. In Wichita, lack of emphasis on cycling may have prevented an increase in bicycling as a major form of transportation. It is widely known that inadequate bicycling infrastructure causes a sense of feeling unsafe in streets, which ultimately prevents cycling (Cripton, 2009).

Wichita, Kansas is now in a period of growth in implementation of cycling infrastructure called for in the city's ten-year bicycle master plan (Wichita Bicycle Master Plan, 2013). Douglas Avenue provides the major traffic flow through the East and West sides of downtown as well as hosts the majority of amenities in downtown. Currently, Douglas Avenue has planned only minimal bicycle infrastructure, shared lane symbols painted on the street. This lack of focus on the pedestrian and bicyclist only continues the auto-dominated downtown core. The missed opportunity shown on Douglas Avenue proves the need for a re-envisioned strategy based upon the understanding of current needs.

This study documents what a small group of people who bike in or through downtown Wichita on a regular basis experience while they are biking. In particular, this study focuses upon the participant's thoughts and experiences while bicycling. The researcher's study aims to better understand the current bicycle experience in the context of five participants' regular bike routes in order to make a successful transition to a more bicycle friendly downtown core and ultimately encourage increased regular bicycling.

The researcher hypothesizes that understanding the lived biking experience of Downtown Wichita will help to develop design and policy strategies and recommendations that address current streetscape issues and opportunities as they occur in daily life.

Placemaking in Socially Resilient Site Design
Abigail Glastetter

Placemaking for Socially Resilient Site Design is a project focused on clarifying and characterizing social resilience. This project used ethnographic methods to answer the question: what qualities of place affect the downtown community's desires for a temporary landscape in Wichita, Kansas? Through literature review this project further defined what social resilience meant at the site scale. Social resilience was operationalized as social systems ability to maintain function while promoting social trust, reciprocity, collaboration, and character between networks of varying scales (Putnam 1995).

Literature review provided the foundational knowledge on creative placemaking; which is a design strategy used to improve community prosperity through a sense of place and imageability (Artscape 2014). Place is determined by a user's surroundings, and more importantly the memory of social engagement on site (Fleming 2007). Creative placemaking design strategies are valuable and specific to location. Therefore, it was imperative I incorporated ethnographic research methods to answer my focus question. Ethnographic research investigates cultural patterns and themes expressed or observed by a community (LeCompte et al. 1991). This form of research is unconventional for the typical site design process in landscape architecture. However, it proved to be most effective in determining the most successful site use and organization. The ethnographic research allowed me to inventory and document user's most desirable site needs and programming through the stakeholder design charrette and individual interviews.

In November 2014 the Wichita Downtown Development Cooperation requested our team as a partner in developing a temporary landscape for downtown Wichita, Kansas. The site was already selected with the intention of becoming Douglas Avenue Pop-Up Park. Funding for this project was awarded to the WDDC in the form of a $146,025 grant from the Knight Foundation.

Using an iterative community feedback process with five ethnographic interviews I reevaluated the WDDC's initial Pop-Up Park plan resulting from a community charrette. Recurring themes from interviews were identity crisis, outdoor preference, lack of residential amenities, negative perception of active and public transit, downtown lifestyle, Wichita: a place for families and lack of nighttime activation. Using the recurring interview themes, I proposed a plan conducive to social resilience.

teammate abstracts

Creating a Typology of Temporary Landscapes

Rachel Fox

Temporary landscapes are an emerging project type with in the field of landscape architecture. Pop-up parks, parklets, and temporary art installations have been gaining media attention and changing notions of open space. Landscape architects need to take a more active role in the planning, design, and execution of these temporary landscapes. Peter Bishop describes temporary land use as "an intentional phase" where the "time-limited nature of the use is generally explicit" (Bishop 2012, 5). This research refines Bishop's definition by stating temporary landscapes must be intentionally time limited designs of open space. Currently the unorganized variety of projects has impeded landscape architects' ability to evaluate and learn from these spaces. This research project seeks to understand and synthesize different characteristics of temporary landscapes. A typology was developed by identifying key themes in literature, composing a carefully curated series of precedent studies, participating in the development of a temporary pop-up park in Wichita, Kansas, and developing a series of diagrams that identify the relationships between temporal types. The products of this research will help planners and designers develop more successful and intentional temporary landscapes.

A Framework for Site-Informed Light Art Installations

Nicholas Mercado

The purpose of this study is to investigate and design public light art installations. The investigation consisted of evaluating select examples of public light installations, in order to develop an informing typology, and designing two site-specific light art installations: one in Wichita, Kansas, and the other, in Midtown Denver, Colorado. Though public light art is found in most cities, its potential is often lost or unrecognized. In certain cases, public art is described as 'plop art,' which is plopped senselessly without much regard to context or experiential qualities. This project seeks to explore the different types of public light art and to find what approach or qualities should be considered when designing public light art.

My methodology included artistic research & making, an apprenticeship to an artist, a precedent study, development of a light typology, an analysis of site and context, and establishing a design matrix for two design projects. Each of these methods were undertaken in order to effectively address my research question: What 'type' of public light art is most appropriate for a specific site and how does it relate to creative placemaking.

This project overlaps with a collective project group entitled 'Creative Place-Making,' which is made up of other fifth-year MLA students with an underlying interest in art and design as place-making tools. Each student in the group addressed the site in Wichita, Kansas in a unique way. I addressed this site as a temporary landscape, and designed an interactive light installation. In contrast, I addressed the Denver, Colorado site as a long term landscape, and designed a sculptural illuminating gateway. Each of these light art installations were informed by a particular set of characteristics that make each design site-specific.

appendix 2

collected and computed walkability values

category	characteristic	attribute	Thresholds			Weight	Code
			Low (1)	Med (2)	High (3)		
accessibility	mixed uses	Public Attractions on block	0-2	3-5	6+	1.0	Att/Blk
		within 1 adjacent blocks (6 total)	0-11	12-23	24+	0.9	Att/1blk
		within 2 adjacent blocks (22 total)	0-30	31-60	61+	0.8	Att/2blk
		within 3 adjacent blocks (46 total)	0-45	46-90	91+	0.7	Att/3blk
		Est Housing Units on block	0-8	8-20	21+	1.0	Hou/Blk
		within 1 adjacent block	0-15	16-30	31+	0.9	Hou/1blk
		within 2 adjacent blocks	0-32	33-80	81+	0.8	Hou/2blk
	urban anchors	Large Employers (75+) within 4 blocks	0	1-3	4+	1.0	LgEmp
		Parking Structures within 4 blocks	0	1	2+	1.0	PkStr
		Grocers within 4 blocks	0	1	2+	1.0	Groc
		Major Shopping within 4 blocks	0	1	2+	1.0	Shopp
		(4+ stores within 1 block)					
		Major Schools within 4 blocks	0	1	2+	1.0	School
		Major Event Centers within 3 adj blocks	0	1	2+	1.0	EventCtr
	on street parking *	# of Street Parking Spaces	0-9	10-16	17+	0.5	PkSpac
		# of Occupied Parking Spaces	0-7	8-13	14+	0.5	PkOcc
	connection to transit	Walking Blocks to Nearest Transit Stop	3+	under 3	on block	0.5	TranBlk
		Transit routes per hour within 3 blocks	0-4	5-8	9+	0.5	TranRou
		# of Routes within 4 block walk	0-2	3-5	6+	0.5	TranNum
	amenities for bikes	width beyond 12' of outside lane	under 2'	2-4'	4' +	0.6	ExtWid
		Unsignalled inters. 1/4 mi both directions	5+	3-4	0-2	0.8	UnsInt
		Parallel Streets within 1000'	0-1	1-3	4+	0.8	ParSt
		Block Length	350'+	300-350'	<300'	1.0	BlkLng
		Bike Lane or Separated Path	0	0	1	0.6	BkLn
		Bike Racks	0	1	2+	0.5	BkRk
		Posted Traffic Speed	35+	25-30	0-20	0.8	SpLim
		Cyclists: count per 5 min	0	1	2+	0.5	CycCou
safety	traffic speed	Posted Speed Limit	35 +	25-30	20 or -	1.0	SpLim
		Number of Driving Lanes	4+	3	2	0.8	DrLan
		Width of Driving Lanes	14' +	12-13'	up to 11'	0.8	LanWid
		Block Length	350'+	300-350'	< 300'	0.8	BlkLng
		Intersection Type	Gr Wave Lt	Light	Stop Sgn	0.6	IntTyp
		Complicating Road Features	0	1	2+	0.8	CompFea
		One Way Streets	yes		no	0.7	OwTw
	crossings	Number of Crosswalks	0	1	2	0.5	CxWlk
		Sidewalks	None/gaps	1	2	0.6	Sw
		Unobstructed Sidewalk Width	less than 5'	5-7'	7' +	0.6	SwWid
		ADA access points	0-3	4	5+	0.5	Ada
		Number of Car Entrances	4+	2-3	0-1	0.9	CurCut
		Parallel Parking Occupancy	under 50%	50-75%	75% +	0.5	ParPkOcc
		Pedestrians: count per 5 min	0	1-3	4+	0.6	PedCou
		Frequency of 'Walk' Signal	91+ sec, none	61-90 sec	< 60 s	0.5	FrqWalkSig
comfort	urban fabric	% of street level occupied by bldg.	under 50%	50-80%	80% +	1.0	BldgFir
		% of street occupied at 2nd level	under 40%	40-70%	70% +	0.9	BldgSec
		% of street occupied at 3rd level	under 30%	30-60%	60% +	0.8	BldgThi
		Total sq ft of building foreground	5000 +	1k-5k	< 1000	1.0	BldgFore
	amenities *	Number of Trees	0-4	5-8	8+	1.0	Tre
		Maturity	0-15'	15-25'	25+ '	1.0	Mat
		additional landscape Beds	0-1	1-2	3+	0.5	Lan
		Outdoor Dining opportunities	0	1	2+	0.8	OuDin
		Built in Benches	0	1	2+	0.7	Ben
		Other Inviting Features	0	1	2 +	0.5	OthInv
	engaging facades	Number of Front Doors*	0-6	7-12	13+	1.0	FrDoor
		% of block transparent	0-30%	30-70%	70% +	1.0	Transp
		Number of Different Arch. Styles	1	2	3+	1.0	ArchSty
		Recessed Entrances	0-5	6-10	11+	1.0	RecEnt
		Interest Level of Surface (opinion)	Low	Med	High	1.0	Interest
* normalized for 350' block							

Figure 106: Rubric and Key
Source: by author

appendix 2

collected and computed walkability values

Block	Att/Blk	Att/Blk Rat	Att/1blk	Att/1blk Rat	Att/2blk	Att/2blk Rat	Att/3blk	Att/3blk Rat
Douglas 1	13	3	26	2	59	1	88	1
Douglas 2	1	1	29	3	72	2	107	2
Douglas 3	4	2	27	2	67	2	128	3
Douglas 4	1	1	29	3	62	1	127	3
Douglas 5	10	3	26	2	72	2	117	2
Douglas 6	10	3	42	3	73	2	124	2
Douglas 7	8	3	37	3	80	3	123	2
Douglas 8	5	2	29	3	85	3	156	3
Douglas 9	5	2	27	1	81	3	158	3
Douglas 10	3	1	31	2	78	3	140	3
Douglas 11	5	2	26	2	67	2	117	2
Douglas 12	4	2	20	1	54	1	95	1
Douglas 13	3	1	17	1	33	1	67	1
Douglas 14	3	1	9	1	23	1	39	1
Emporia 2	3	1	12	1	52	1	109	2
Emporia 1	2	1	33	3	77	2	117	2
St Francis 2	1	1	3	1	36	1	73	1
St Francis 1	0	1	28	2	62	1	108	2
Commerce 1	4	2	6	1	7	1	32	1

Att Comp	Att Comp Norm	Att Rat	Hou/Blk	Hou/1blk	Hou/2blk	HouComp	HouNorm	HouRat
6.30	0.66	1	1	1	2	3.50	0.43	1
6.70	0.71	2	1	1	3	4.30	0.53	1
7.50	0.79	3	1	3	3	6.10	0.75	2
6.60	0.69	2	3	3	3	8.10	1.00	3
7.80	0.82	3	3	3	3	8.10	1.00	3
8.70	0.92	3	3	3	3	8.10	1.00	3
9.50	1.00	3	1	3	3	6.10	0.75	2
9.20	0.97	3	1	1	2	3.50	0.43	1
7.40	0.78	2	1	1	1	2.70	0.33	1
7.30	0.77	2	1	1	3	4.30	0.53	1
6.80	0.72	2	1	3	3	6.10	0.75	2
4.40	0.46	1	3	3	3	8.10	1.00	3
3.40	0.36	1	1	3	3	6.10	0.75	2
3.40	0.36	1	1	3	3	6.10	0.75	2
4.10	0.43	1	1	2	3	5.20	0.64	2
6.70	0.71	2	1	3	3	6.10	0.75	2
3.40	0.36	1	2	3	3	7.10	0.88	3
5.00	0.53	1	3	3	3	8.10	1.00	3
4.40	0.46	1	1	1	3	4.30	0.53	1

Block	LgEmp	PkStr	Groc	Shopp	School	EventCtr	UrbAnchComp	UrbAnchNorm	UrbAnchRat
Douglas 1	2	2	1	3	1	1	10.00	0.91	2
Douglas 2	2	2	1	3	1	1	10.00	0.91	2
Douglas 3	2	3	1	3	1	1	11.00	1.00	3
Douglas 4	1	3	1	3	1	2	11.00	1.00	3
Douglas 5	1	3	1	2	1	2	10.00	0.91	2
Douglas 6	1	3	1	1	1	2	9.00	0.82	1
Douglas 7	1	3	1	1	1	2	9.00	0.82	1
Douglas 8	1	3	1	1	1	1	8.00	0.73	1
Douglas 9	2	3	1	1	1	2	10.00	0.91	2
Douglas 10	3	3	1	1	1	2	11.00	1.00	3
Douglas 11	3	3	1	1	1	2	11.00	1.00	3
Douglas 12	3	3	1	1	1	2	11.00	1.00	3
Douglas 13	3	3	1	1	1	2	11.00	1.00	3
Douglas 14	2	3	1	1	1	2	10.00	0.91	2
Emporia 2	1	3	1	1	1	2	9.00	0.82	1
Emporia 1	1	3	1	1	1	2	9.00	0.82	1
St Francis 2	1	3	1	1	1	2	9.00	0.82	1
St Francis 1	1	3	1	2	1	2	10.00	0.91	2
Commerce 1	1	2	1	2	1	2	9.00	0.82	1

PkSpac	PkOcc	TranBlk	TranRou	TranNum	TranComp	TranNorm	TranRat
2	2	3	2	2	7	0.78	1
2	2	3	2	2	7	0.78	1
2	1	3	2	3	8	0.89	2
1	1	3	2	3	8	0.89	2
2	1	3	3	3	9	1.00	3
3	2	3	3	3	9	1.00	3
2	1	3	3	3	9	1.00	3
2	1	3	3	3	9	1.00	3
1	1	3	3	3	9	1.00	3
2	1	3	3	3	9	1.00	3
2	1	3	3	3	9	1.00	3
2	1	3	3	3	9	1.00	3
1	1	3	2	2	7	0.78	1
1	1	3	2	2	7	0.78	1
1	1	3	3	3	9	1.00	3
3	2	3	3	3	9	1.00	3
1	1	3	3	3	9	1.00	3
3	1	3	3	3	9	1.00	3
1	1	2	3	3	8	0.89	2

appendix 2

collected and computed walkability values

Block	ExtWid	UnsInt	ParSt	BlkLng	BkLn	BkRk	SpLim	CycCou	BikComp	BikNorm	BikRat
Douglas 1	2	1	1	2	1	1	2	1	8.00	0.67	1
Douglas 2	2	1	1	3	1	2	2	1	9.50	0.79	2
Douglas 3	2	1	1	3	1	3	2	2	10.50	0.88	3
Douglas 4	2	1	1	3	1	2	2	2	10.00	0.83	2
Douglas 5	2	1	2	1	1	1	2	2	8.30	0.69	1
Douglas 6	2	2	2	1	1	1	2	2	9.10	0.76	2
Douglas 7	1	3	2	1	1	3	2	1	9.80	0.82	2
Douglas 8	1	3	2	1	1	3	2	1	9.80	0.82	2
Douglas 9	1	3	2	1	1	3	2	1	9.80	0.82	2
Douglas 10	1	3	2	1	1	3	2	3	10.80	0.90	3
Douglas 11	1	3	2	1	1	1	2	2	9.30	0.78	2
Douglas 12	1	3	2	2	1	1	2	2	10.30	0.86	3
Douglas 13	1	3	1	1	1	1	2	2	8.50	0.71	1
Douglas 14	1	3	1	1	1	1	2	2	8.50	0.71	1
Emporia 2	2	2	3	1	1	1	1	1	8.60	0.72	1
Emporia 1	3	3	2	3	1	1	1	1	11.20	0.93	3
St Francis 2	2	3	3	3	1	1	1	1	11.40	0.95	3
St Francis 1	3	3	3	3	1	1	1	1	12.00	1.00	3
Commerce 1	1	3	3	1	1	1	1	1	8.80	0.73	1

SpLim	DrLan	LanWid	BlkLng	IntTyp	CompFea	OwTw	TrafSpComp	TrafSpNorm	TrafSpRat
2	1	2	2	1	1	3	7.70	0.65	1
2	1	2	3	1	2	3	9.80	0.82	3
2	1	2	3	1	2	3	10.80	0.91	3
2	1	3	3	1	2	3	10.80	0.91	3
2	1	2	1	1	2	3	9.80	0.82	1
2	1	2	1	2	2	3	10.60	0.89	2
2	1	2	1	2	1	3	9.90	0.83	1
2	1	2	1	2	1	3	9.90	0.83	1
2	1	2	1	2	1	3	9.90	0.83	1
2	1	2	1	2	1	3	9.90	0.83	1
2	1	3	1	2	1	3	9.90	0.83	2
2	1	3	2	2	1	3	11.30	0.95	2
2	1	3	1	2	2	3	7.80	0.66	2
2	1	2	1	1	1	3	7.10	0.60	1
1	2	1	1	1	1	1	10.70	0.90	1
1	3	2	2	2	2	1	14.20	1.19	2
1	2	1	2	1	1	3	13.50	1.13	1
1	3	1	3	1	2	3	15.80	1.33	2
1	3	3	1	3	1	3	9.70	0.82	3

Block	CxWlk	Sw	SwWid	Ada	CurCut	ParPkOcc	PedCou	FrqWalkSig	CxComp	CxNorm	CxRat
Douglas 1	1	3	3	2	3	3	3	3	12.60	0.93	3
Douglas 2	2	3	3	1	3	3	2	1	11.00	0.81	2
Douglas 3	2	3	3	2	3	1	1	1	9.90	0.73	1
Douglas 4	1	3	1	1	2	1	1	1	6.80	0.50	1
Douglas 5	2	3	3	2	2	1	2	2	10.10	0.75	1
Douglas 6	3	3	3	3	2	1	3	3	12.20	0.90	2
Douglas 7	3	3	3	3	2	1	3	3	12.20	0.90	2
Douglas 8	3	3	3	2	3	1	3	3	12.60	0.93	3
Douglas 9	3	3	3	3	2	1	3	3	12.20	0.90	2
Douglas 10	3	3	3	3	3	1	2	3	12.50	0.93	3
Douglas 11	3	3	3	2	3	2	2	3	12.50	0.93	3
Douglas 12	3	3	3	2	3	1	2	3	12.00	0.89	2
Douglas 13	3	3	3	3	3	3	2	3	13.50	1.00	3
Douglas 14	2	3	3	1	3	1	1	2	9.90	0.73	1
Emporia 2	3	3	3	3	1	1	1	3	10.10	0.75	1
Emporia 1	3	3	3	3	2	2	2	1	11.10	0.82	2
St Francis 2	2	3	2	3	1	2	1	1	8.50	0.63	1
St Francis 1	3	3	2	3	3	1	1	1	10.30	0.76	1
Commerce 1	1	2	3	2	1	1	2	2	8.10	0.60	1

BldgFir	BldgSec	BldgThi	BldgFore	UrbFabComp	UrbFabNorm	UrbFabRat
3	3	1	2	8.30	0.77	3
2	2	2	1	6.30	0.58	2
3	3	1	3	9.20	0.85	3
1	1	1	1	3.60	0.33	1
2	2	2	3	8.10	0.75	2
3	3	2	1	8.20	0.76	3
2	2	2	1	6.30	0.58	2
2	2	2	1	6.30	0.58	2
2	3	3	1	8.00	0.74	2
3	3	3	3	10.80	1.00	3
2	3	3	2	8.90	0.82	3
1	1	3	3	7.00	0.65	2
1	1	2	1	4.40	0.41	1
1	2	2	3	7.10	0.66	2
1	1	1	3	5.40	0.50	1
3	3	3	1	9.00	0.83	3
1	2	1	1	4.50	0.42	1
2	2	2	3	8.10	0.75	2
2	1	1	1	4.60	0.43	1

appendix 2

collected and computed walkability values

Block	Tre	Mat	Lan	OuDin	Ben	OthInv	AmComp	AmNorm	AmRat
Douglas 1	3	3	1	2	3	1	10.70	0.89	2
Douglas 2	3	3	3	1	3	1	10.90	0.91	3
Douglas 3	2	3	2	1	2	1	8.70	0.73	1
Douglas 4	3	2	3	1	3	3	10.90	0.91	3
Douglas 5	3	3	3	2	1	1	10.30	0.86	2
Douglas 6	3	3	1	2	3	1	10.70	0.89	2
Douglas 7	1	3	2	1	3	1	8.40	0.70	1
Douglas 8	1	3	2	1	3	1	8.40	0.70	1
Douglas 9	2	3	2	1	3	3	10.40	0.87	2
Douglas 10	3	3	1	1	3	3	10.90	0.91	3
Douglas 11	3	3	3	3	1	2	11.60	0.97	3
Douglas 12	2	2	2	3	2	3	10.30	0.86	2
Douglas 13	3	3	3	1	2	2	10.70	0.89	2
Douglas 14	1	1	2	2	2	2	7.00	0.58	1
Emporia 2	3	1	3	1	2	2	8.70	0.73	1
Emporia 1	1	1	1	1	1	1	4.50	0.38	1
St Francis 2	1	3	2	1	1	1	7.00	0.58	1
St Francis 1	3	2	3	3	3	2	12.00	1.00	3
Commerce 1	1	3	2	2	1	1	7.80	0.65	1

FrDoor	Transp	ArchSty	RecEnt	Intrest	FacComp	FacNorm	FacRat
3	3	3	3	3	15.00	1.00	3
1	1	1	1	1	5.00	0.33	1
2	3	2	2	2	11.00	0.73	2
1	1	3	2	2	9.00	0.60	2
3	2	3	3	3	14.00	0.93	3
3	3	3	3	3	15.00	1.00	3
2	2	3	2	2	11.00	0.73	2
1	2	3	2	2	10.00	0.67	2
1	2	3	2	3	11.00	0.73	2
1	2	3	1	2	9.00	0.60	2
1	3	3	1	2	10.00	0.67	2
1	2	2	1	2	8.00	0.53	1
1	1	3	1	2	8.00	0.53	1
1	2	1	1	2	7.00	0.47	1
1	1	2	1	1	6.00	0.40	1
2	2	3	2	3	12.00	0.80	3
1	1	2	1	1	6.00	0.40	1
1	1	2	1	2	7.00	0.47	1
1	1	3	2	2	9.00	0.60	2

Block	AccessComp	AccessNorm	AccessRat	SafeComp	SafeNorm	SafeRat
Douglas 1	2.47	0.76	1	1.39	0.81	2
Douglas 2	2.65	0.82	1	1.48	0.86	3
Douglas 3	3.07	0.95	3	1.49	0.87	2
Douglas 4	3.13	0.97	3	1.31	0.76	1
Douglas 5	3.17	0.98	3	1.42	0.83	1
Douglas 6	3.24	1.00	3	1.61	0.94	3
Douglas 7	3.19	0.98	3	1.55	0.90	2
Douglas 8	2.87	0.89	2	1.58	0.92	2
Douglas 9	2.74	0.85	2	1.55	0.90	2
Douglas 10	2.98	0.92	2	1.57	0.91	2
Douglas 11	3.01	0.93	2	1.57	0.91	3
Douglas 12	2.98	0.92	2	1.66	0.97	3
Douglas 13	2.48	0.76	1	1.46	0.85	3
Douglas 14	2.41	0.74	1	1.18	0.69	1
Emporia 2	2.48	0.77	1	1.50	0.87	1
Emporia 1	2.97	0.92	2	1.85	1.08	2
St Francis 2	2.71	0.84	2	1.64	0.95	1
St Francis 1	3.06	0.95	3	1.94	1.13	2
Commerce 1	2.38	0.73	1	1.30	0.75	1

ComfComp	ComfNorm	ComfRat	TotalComp	TotalRat
1.54	0.98	3	2.27	2
1.02	0.65	1	2.11	1
1.44	0.91	3	2.46	3
0.91	0.58	1	2.11	1
1.47	0.94	3	2.47	3
1.53	0.97	3	2.62	3
1.16	0.74	2	2.39	2
1.13	0.72	2	2.29	2
1.37	0.87	2	2.36	2
1.57	1.00	3	2.54	3
1.45	0.92	3	2.49	3
1.17	0.75	2	2.39	2
0.94	0.60	1	2.01	1
1.07	0.68	1	1.91	1
0.92	0.58	1	2.02	1
1.35	0.86	2	2.57	2
0.79	0.50	1	2.10	1
1.28	0.82	2	2.61	2
0.92	0.59	1	1.88	1