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Wound/ Healing/ Scar: an Urban School

Heather R. Stone
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Heather R. Stone entitled "Wound/ Healing/ Scar: an Urban School." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Architecture, with a major in Architecture.

Theodore E. Shelton, Major Professor

We have read this thesis and recommend its acceptance:

Scott W. Wall, Marleen K. Davis

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Accepted for the Council:

Carolyn R. Hodges

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wound/healing/scar:
an urban school

A thesis presented for the
Master of Architecture Degree
University of Tennessee, Knoxville

Heather R. Stone
August 2007

DEDICATION

This thesis is dedicated to my family. Thank you for the support, encouragement, and the thousands of prayers that have been offered up for me during the last three and a half years. Your love and belief in me has kept me sane!

"Not to us, O Lord, not to us but to your name be the glory, because of Your love and faithfulness."
Psalm 115:1

ACKNOWLEDGEMENTS

I would like to extend a special thank you to Ted Shelton for serving as my primary advisor during this project. When others wavered, you continued to believe in my work. I value highly your thoughts and critiques, and am very grateful that you were willing to work with me on this thesis.

I would also like to thank my classmates for letting me be their "mom" these last few years. Thanks for the many laughs, for keeping me company all of those late nights in the studio, and for continually challenging me to push myself.

abstract

The American city contains large brownfields and urban wastelands, remnants of our industrial past. The sprawling and unchecked development of our cities combined with short-sighted zoning laws and vast industrial infrastructure created these gashes in the post-industrial landscape. Old rail yards, industrial processes, abandoned buildings, interstates, and abandoned riverfronts and wharves wound the urban landscape, and the reactionary response is to clear the site and start over. Yet as Carol Burns states, there is no such thing as a "clear" site- all sites contain permanent imprints of past and present events. This thesis posits that architecture possesses the power to heal the wounds left by these damaging actions by constructing on the site buildings that reconnect the old and the new in a manner that regenerates the site. These constructed sites begin to heal the wound while leaving an architectural "scar" on the site.

figure 1: scar
See image credits for list of all sources.

This thesis addresses the social and ecological wounds left on the city of Knoxville by the interstate system. I will demonstrate how architectural scars can activate the residual spaces around and below the interstates that once divided the city, re-stitching the urban landscape. The program explores the potential for healing the social and ecological wounds through the insertion of a community elementary and middle school as a scar.

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Introduction

The remains of our industrial past litter our urban landscapes. Abandoned factories with unknown contaminations fester on the edge of once vibrant communities. Industrial wastelands bar access to riverfronts. Interstates rip through the urban fabric, splitting neighborhoods in two. Contaminated brownfields sit devoid of any life. Cities across the country, indeed through most of the western world are struggling to find safe and productive ways to reuse these sites and fill in these gaps in the urban fabric.

In order to heal these wounds, cities must rethink the way they approach and design urban spaces. Planners must reexamine issues such as functional zoning, transportation, density, and land use to identify the healthiest way for each city to reclaim abandoned industrial spaces and reconnect their urban fabric. Designers must realize that the city is a system of interdependent pieces; to act on one is to affect the whole. Wounds to this urban organism can occur in many ways, and our response as architects can be just as varied. Our response should not be, despite what kind of wound occurs, to clear the site. By constructing an architectural scar on the site, the wound becomes an important part of our collective memory. It can shape and inform the way we use our public spaces, and affect our future decisions.

scar: a fault or blemish remaining as a trace of some former condition or resulting from some particular cause; trace of a healed wound, sore, or burn; a mark or trace indicating the point of attachment of some structure that has been removed; the fibrous connective tissue of which scars are formed (OED)

Specifically, such sites wound the urban fabric in two ways: ecologically and socially. While many other types of wounds exist - cultural, economical, and aesthetic to name a few - it is beyond the scope of this paper to address them all. Ecological and social wounds allow one to examine the interaction of people and the interaction of organisms within the urban environment. By focusing on two particular wounds and the architectural process that can heal them, the potential applications to other kinds of wounds becomes apparent. This project examines the wounds existing in the city of Knoxville, specifically those between the city center and the first ring neighborhoods. It then examines the development of these wounds and explores the potential for healing through the insertion of a community elementary and middle school as a scar.

social: capable of being associated or united to others; marked or characterized by mutual intercourse, friendliness or geniality; united by some common tie; of a room, building, etc suited for friendly intercourse or association (OED)

ecological: the science of the economy of animals and plants; that branch of biology which deals with the relations of living organisms to their surroundings, their habitats, and modes of life, etc. (OED)


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"The scientist Francis Bacon set the stage... by declaring that scientific knowledge justifies a technological supremacy over nature and, since Man is the only species capable of exercising this option, it must be ordained by God. After 1850, there was no retreat from this position.... As a result, most architecture rooted in the industrial tradition could now be regarded as hostile to the best interest of people in the year 2010."

James Wines (231)

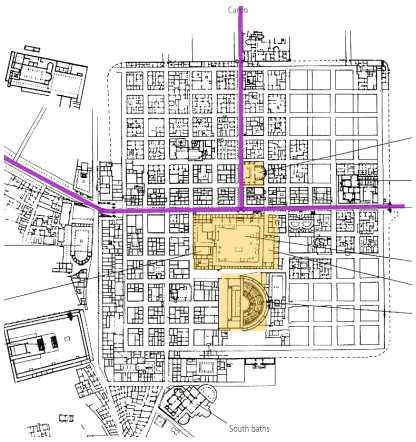

figure 2: typical Roman city
In a typical Roman city, the public spaces were centrally located, organized around the two main avenues called the cardo and the decumanus.

A brief overview of traditional urban development is necessary to understand the wounds that Industrialization caused. Before the introduction of mass-transit, the automobile and industrial manufacturing, societies were agrarian. Cities were centers of trade, safety in times of conflict, centers of civic life, and allowed for a consolidation of resources. From their earliest development, they were dense collections of people and enterprises, clearly defined by edges and centers. The density of the city led to multiple scales of buildings, streets and spaces, creating a tightly woven urban fabric. Romans organized their cities around a central collection of public buildings (figure 2). Medieval cities relied on a network of plazas and public spaces connected to churches, civic buildings or palazzos. A mixture of uses occurred within the same block and even the same building, creating an urban vitality throughout the day. Public spaces became places of congregation, places for the exchange of goods, or public ritual. These cities were not utopian, however. Sanitation problems abounded. Poverty and class distinction often led to civic unrest and crime. The natural world remained firmly outside the city walls and an idea of sustainability existed only as far as it made economic sense to reuse buildings, materials, and resources.

"Cities… are nothing less than over grown prisons that shut out the world and all its beauties."

-John Clare (1793-1864),
quoted in *Cradle to Cradle* p.20

The Enlightenment of the seventeenth century brought radical changes in science that affected many facets of life and philosophy. Rapidly expanding knowledge

of the physical universe meant the wilderness outside the city was no longer something to be feared, but something that could be studied, understood, and enjoyed (Marx 96). Nature became the "universal norm" and man the Noble Savage (88). It provided an escape from the noise, filth, and crime of industrial urban life to a place of sublime beauty and picturesque views (96). The exploration and settlement of the New World occurring concurrently with these philosophical shifts dramatically affected the perception of the new colonies and the mind-set of their settlers, leading ultimately to "a fully articulated pastoral idea of America... [by] the end of the eighteenth century" (73). United States cities had not developed long before a combination of rising industrialism, expanding frontiers, and the pastoral image promoted by Andrew Jackson Downing, Frederick Law Olmstead, and other influential designers began to affect the way Americans built their cities.

On the other hand, industrial production, exploding in America during the mid-1800's, wounded most American urban landscapes. Neighborhoods were divided or, as industries developed around the city core, the city had no choice but to leapfrog the industries and expand outward. Mass transit via railroads and streetcars, and the later introduction of the automobile, allowed residents to spread even further from the city center. Early twentieth century zoning laws separated uses and decreased density as social reformers faced the failure of the city to address the problems rising out of rapid industrialization. Such functional zoning laws create "monocultures" that are as unhealthy for our cities as for our crops (Berry, *Home* 151). As cities were abandoned during the post- World War II urban flight, industries were allowed to spread within the urban centers like a diseased wound; because zoning laws "contained" these wounds, people ignored them. The politically powerful prevented the factory or rail yard or interstate from developing in their backyard, while these wounds directly affected those socially, economically and politically marginalized, further dividing our cities by use and demographics. Cities abandoned these sites as Industrialism waned in the latter twentieth century, and the wounds became even more apparent. Derelict buildings decayed throughout the city center and its edges, along waterfronts and rail

lines and interstates. The soil and buildings were often contaminated by industrial processes and difficult to clean. Currently, as city centers revitalize, these zones are barriers between crucial first ring neighborhoods and the urban core. Empty and derelict, they are ideal sites for increasing our urban density.

Knoxville contains many such sites situated around the city center. In the early years of Knoxville's industrial development, the northern edge of the city became an industrial corridor (figure 3). Major rail lines utilized this area and significant topography slowed residential expansion while businesses developed around the industrial buildings. As the city grew, residents crossed over these industrial sites to find more space in which to build (figure 4). Yet because local transportation occurred on foot or on horse, development remained relatively dense. The addition of the streetcar system in the first decade of the twentieth century made longer commutes possible, and neighborhoods developed further from the city center though still focused along main streets for access to this transportation (figure 5). Automobiles soon became the primary form of transportation; buses replaced streetcars in 1947. The city sprawled further outward, but retained some of its original organization and structure, despite the industrial infrastructure at its core (figure 6). The Federal-Aid Highway Act of 1956 prepared the way for the insertion of I-40 through downtown, cutting a large swath through many of the poorer neighborhoods (figure 7). This, combined with the ongoing urban flight, left the urban center all but abandoned of residential occupants. Many sites saw minimal use for the next half of a century.

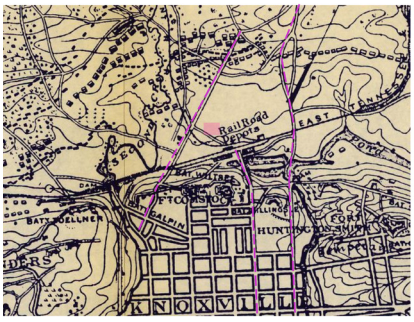

figure 3: Knoxville 1863
map with overlays denoting primary streets (purple) and the project's site (pink).

figure 4: Knoxville 1884
Sanborn Map with overlays denoting primary streets (purple) and the site (pink).

figure 5: Knoxville 1917
Sanborn Map with overlays denoting primary streets, the wound of the rail lines, and site

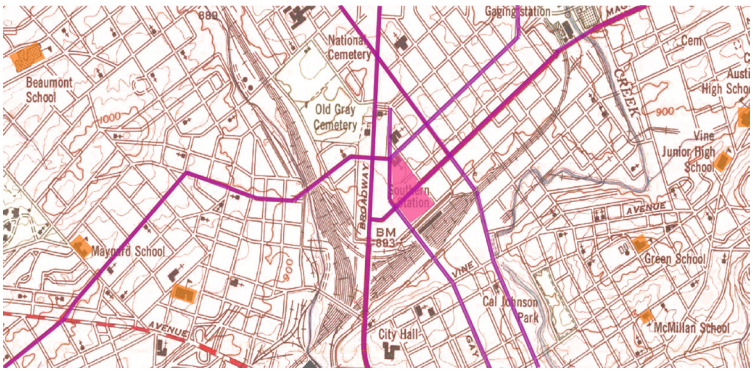

figure 6: Knoxville 1953
map with overlays denoting primary streets, schools, and the site

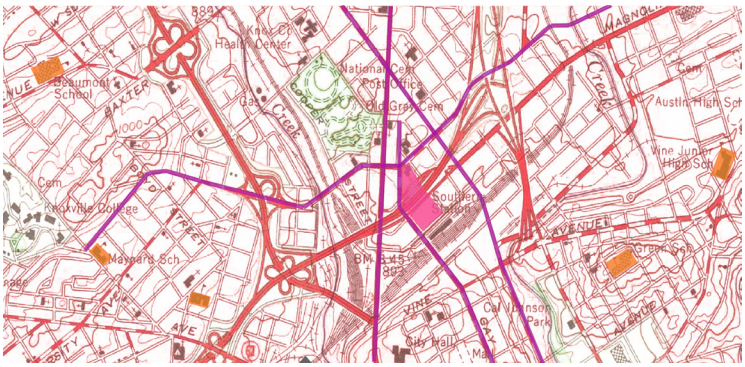

figure 7: Knoxville 1966
map overlays denoting primary streets, schools, and the wound of the interstate

social

"You can create desolate wastelands of the spirit as well as of the environment. You can scar people as well as land."
A. L. Huxtable (Wines 29)

The built environment is an experiential art form. Places are made memorable, both positively and negatively, by the way they are experienced. This is true of individual buildings, the landscape around them, and the composition of building and landscape into urban design. As people inhabit a landscape they begin to mark and shape it in unique ways, creating a "cultural landscape" that varies based on the collection of people within it (Berleant 11). When damage occurs to that urban fabric, the way people interact with each other and the landscape around them changes. There is an intimate connection between the urban landscape and our actions so that as we shape it, "the landscape we inhabit influences our patterns of activity and, in subtle ways not well understood, colors our temperament and attitudes" (Berleant 11).

Man finds physical comfort in his perception of perimeter security, close refuge or socializing rhythms.
- Joseph Rykwert (191).

By the early 20th century attitudes toward the urban experience began to shift. No longer was the city a collection of rituals, processions, festivals and other physical experiences, both daily and sacred, but it had become, as Freud states, a place of "going about one's business in the hurry modern working world without being hindered by aesthetic experiences or an unplanned discovery." The city had become "an efficient instrument of production and consumption" (Rykwert 189). The widespread use of personal vehicles throughout the twentieth century further decreased any sense of ritual, procession or community. An understanding of a pedestrian scale and use - indeed, even the need for pedestrians - was lost and replaced with the automobile. Streets died as communities retreated within the confines of their homes and jobs. People moved further from their places of work and recreation, spending more time in cars and buildings and less time walking, shopping, and experiencing the city on foot. Ideas of modern city development promoted by influential designers like Le Corbusier shaped the creation of these networks of landscape

and buildings. The scales of buildings and blocks increased, city governments zoned and confined use into homogeneous districts, and buildings became solitary monuments rather than integrated parts of the urban landscape.

Often the insertion of the highways created a physical wound, a barrier closing off roads and making portions of the city all but inaccessible. Knoxville certainly contains numerous evidences of such wounds, yet this site presents a different challenge. Broadway, Gay Street, Williams Avenue, King Street and Central Avenue all cross under the interstate (figure 8). Yet the interstate has become a physical and psychological barrier despite these connections. It divides the city for census and school districts (figure 9), by socioeconomic groupings, and demographics. The land between each street is virtually empty, some of it surrounded by eight foot fencing to keep the homeless out. The recent revitalization of the Fourth and Gill and Old North Knoxville neighborhoods has had little impact on the blocks adjacent to I-40 and the rail lines that separate these and other neighborhoods from downtown. Community meetings held over the summer of 2006 express the confusion of how to approach these sites: within the same discussion there were calls for turning the neighborhood's collective back on the interstate and inserting buildings that can act as walls to I-40 and calls for exploring potential uses for the residual space under the interstate. Residents of downtown view this northern portion of the city as separate from downtown, despite its urban forms and fabric and its historic association with downtown pre-Interstate 40. They see the interstate as a barrier, and institutions like the homeless shelters create a negative stereotype of the area (Neely 13). Yet this residual space is inhabitable and crucial to reconnecting the urban fabric of the city. Rather than viewing the interstate as a physical and virtual barrier, the adjacent architecture and planning should find opportunities to connect to and underneath the elevated road (figure 10). Such an approach would reconstruct the urban fabric and would regenerate the island created by I-40 and the rail lines. It would reconnect north Knoxville to the city center and would increase the density of the urban district.

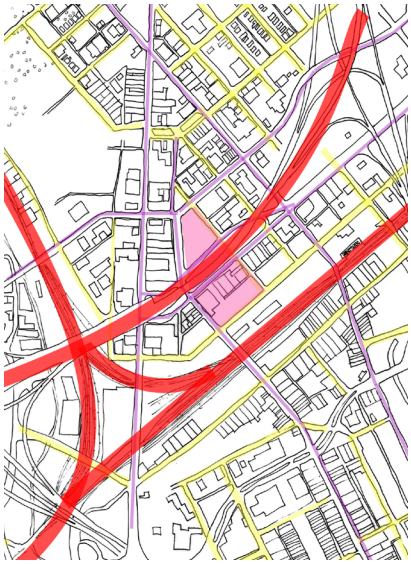

figure 8: Knoxville 2006
map denoting the primary and secondary roads, the wounds created by the interstate and the rail lines, and the project's site

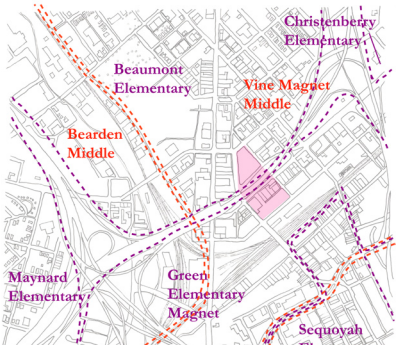

figure 9: Knoxville elementary and middle school districts, current

The type of program occupying this space is important because of what it must accomplish and what it symbolizes. Interestingly, public education shares many of the same problems as these industrial sites. Schools themselves are evidence of our post-industrial decentralization. During the decades of urban flight and urban sprawl, schools were often the first sign of development within the suburban frontier, consuming vast amounts of land and locating themselves in often isolated areas that were central to everyone but convenient to no one (figure 11). The automobile and a busing system allowed students to be shipped from further distances. School districts increased in size to cut costs (though studies have since proven that large schools are not necessarily cheaper, particularly in their cost to the student's education). The schools themselves became "factories of knowledge," patterned after an industrial model that seeks to "mass produce a minimally educated public" (Haar 7). Schools are no longer the centers of community, uniting local residents around a common space and cause and providing places for community groups to meet.

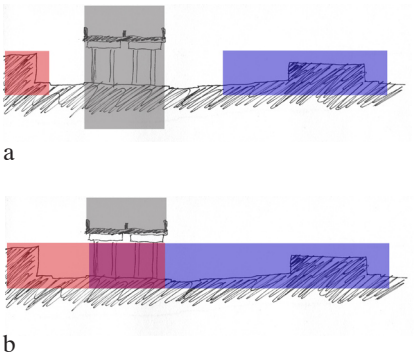

figure 10: site section sketch
section through the site showing the interstate as a barrier (a) and the architecture as a connector beneath the interstate (b).

"The public school system... is the most influential planning entity, either public or private, promoting the... sprawl pattern of American cities."
- W. Cecil Steward (Haar 31)

figure 11: Sprawl School
A sprawl school located on a remote site in the coastal region of South Carolina.

ecological

"A culture that does not measure itself by nature, by an understanding of its debts to nature, becomes destructive of nature and thus of itself."

-Wendell Berry, *Home Economics*

The documentation of the harm humanity has perpetrated against the natural world is extensive. The impact of the architectural and construction industries alone contains staggering statistics: United States buildings account for: 36% of total energy use and 65% of electricity consumption; 30% of greenhouse gas emissions; 30% of raw materials use; 30% of waste output/136 million tons annually; and 12% of potable water consumption (*Environmental Building News*). Industrial sites, interstates and other urban wounds are symbolic of the consumptive mind-set of the society that created them. Land, resources, people, and urban spaces were consumed as our industrial society grew, fattening itself on a "seemingly endless supply of natural capital" (McDonough, *Cradle* 24). Early industrialist strove to create products that were "desirable, affordable and operable by anyone, just about anywhere; that lasted a certain amount of time... and that could be produced cheaply and quickly" (24). Before Industrialism, and even during its infancy, buildings were made to last decades, even centuries. In following the Industrial pattern contemporary buildings now have a "built-in obsolescence," lasting for about twenty years before being demolished and replaced (figure 12).

The combined forces of the Enlightenment and the Industrial Revolution brought about a change in the way we viewed nature. Nature became something "outside the human sphere," something to be controlled, used, or tamed, not something to be engaged (Berleant 30). Particularly for Americans who, even in the nineteenth century, had a vast, uninhabited frontier, nature was an immense expanse that would always be there to consume and control. Despite the laments of Romantic and Transcendentalist writers, artists, and philosophers, nature seemed to be in no danger

figure 12: Ingles in Asheville, NC
On the left is an Ingles constructed in the 1980's. In the 1990's a new store was constructed next door, and the old store was converted into a strip mall. A new store, constructed in 2006, is located behind the first two stores. Once it is completed, the old stores will be demolished to make room for an even larger parking lot. This photograph was taken from the parking lot of a competing grocer.

"The dream of suburbia was the possibility of the good life without the restraints of the country or the anonymity of the city."

- John Rennie Short (50)

of destruction. Design ideas such as the Garden City movement established little more than a desire for a suburban pastoral experience. The more we consumed products of nature on a large scale, the further we removed ourselves from a connection with nature. Not only could we take as much as we wanted from nature, but we believed nature would in turn "consume" as much waste as we could produce (Benyus 242). As societies became increasingly urbanized, the fallacy of such a mind-set became apparent. Nature is not a place we leave at the edge of our cities. It is a part of the system in which we live and work and play, and each of our actions affects the natural world around us.

"The trouble is not with protecting and preserving wilderness. It's that the design of the world we inhabit – our communities, our workplaces, our economy – is so impermeable to nature it is all too easy to leave our reverence in the parking lot of national parks."

William McDonough
"A New Geography of Hope"

In addition to the typical ills associated with industrial sites – soil and water contamination, air pollution, and destruction of habitats – this project's specific site in Knoxville must address ecological wounds created by interstates. The Federal Highway Act of 1956 drastically altered our landscape and the way we circulate to and through our cities. As in most cities, the interstate in Knoxville pierces the urban fabric, destroying and dividing existing neighborhoods. As automobile use escalated during the twentieth century so did traffic congestion, and traffic engineers widened highways further to accommodate the growth. Interstate 40 is currently undergoing massive construction to expand this section of highway downtown.

In Knoxville the population increased 21% from 1990 to 2000 while the average miles per day increased by 57% (US Census Bureau). The automobile is often utilized as a symbol of our consumption-oriented, resource-dependent society, and rightly so. A sign of independence and economic opportunity, the automobile is central to our current way of life. Interstates and highways use up vast amounts of land while doing little more for our urban environments than planting a few trees or wildflowers. Certainly these gestures are important, but they seem insignificant when a highway such as the James White "Parkway" completely submerges First Creek under concrete and culverts, denying any kind of access for people or wildlife. The delicate ecosystem of freshwater creeks and riparian corridors, already severely challenged by excessive pollution in Tennessee waterways, stands

little chance of health and vitality enclosed in a culvert and inundated with all manner of storm water runoff from adjacent neighborhoods.

Schools follow this consumptive mind-set. Current guidelines recommend a ratio of 1 acre per 100 students plus a base of 10 acres for elementary schools alone, meaning that the typical Knoxville elementary school of 800-100 students needs 20 acres. This is impossible on urban sites, and should be undesirable anywhere else. The site for this project is 7.2 acres and covers two city blocks - a sizeable piece of urban land - yet would not be enough to meet typical sizing ratios. In addition, massive playing fields use water, require fertilizers to maintain, and minimize the use of trees while expansive parking lots largely sit empty, collecting heat and runoff. School buildings themselves are typically sprawling, one story complexes inefficiently using land, energy and resources. Clearly the current approach to suburban school design rarely considers the resources and space consumed by these necessary facilities. As designers we must actively explore ways to reduce the ecological impact of our schools while enhancing the educational opportunities available to our children. There are many ways to accomplish both of these goals, and this project explores a few examples.


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"The cities have forgot the earth,
and they will rot at heart
till they remember it again."
- "A Letter" by Wendell Berry
(*Farming*, 102)

Healing these industrial wounds begins at the urban design scale. Clearly one building will not address or rectify the existing problems. Architects must concern themselves not only with designing excellent buildings, but also with understanding how collections of buildings begin to form public and private spaces, outdoor "rooms" that should be designed with as much thought and care as the spaces within the building. Architecture must "move beyond the physical boundaries of a structure to embrace its connections to the site" (Berleant 33). To accomplish this within wounded areas, architects and urban planners must address urban issues such as traditional zoning. They must identify and target districts as initiators for renewal. Cities must examine the conflict between currently operating industries and renewal opportunities. It is in understanding the larger, unique urban context that one begins to uncover the methods needed to heal each city's wounds. Cities, and even districts within the same city, will not heal the same way because of differences in the type of wound, topography, demographics, economics, history, current zoning laws, the distance from the center city, and many other factors. Districts must be addressed as distinct entities, habitats with their own characteristics, wounds, and potential.

Of all the macro-scale issues, those related to zoning and planning are the most challenging and yet posses the largest potential for impact. Many urban designers are battling these entrenched systems of organization with varying degrees of success. Falling under the headings of smart growth, new urbanism, traditional city planning, transit-oriented development, and sustainable development[1], these efforts strive to "build

1 The Environmental Protection Agency has Ten guidelines for smart growth. They are to: (1) mix land uses; (2) take advantage of compact building design; (3) create a variety of housing choices for different types of income and household types; (4) create walkable neighborhoods; (5) foster distinctive,

more compactly, to place homes and stores and work places close to each other, and to take advantage of existing infrastructure, especially trains and buses, rather that laying down so many miles of new asphalt" (Flint 4). Knoxville is only beginning to address its current zoning apparatus district by district. The south Knoxville waterfront and the Cumberland Avenue corridor have recently shifted to form-based codes, and it appears that the Broadway - Central Avenue corridor will soon receive similar attention. Such moves allow the city to become a pattern of diverse and mixed uses rather than monocultural functional blocks.

In reevaluating the current urban conditions, we can view the post-industrial zones within the urban landscape as areas of overlap for adjacent neighborhoods instead of barriers between districts. Avoiding a monoculture approach to the urban landscape allows the development of "a highly diversified, multipurpose landscape, democratically divided, with many margins" (Berry *Home* 151). In ecology ecotones (figure 13) are the edges of habitats and microhabitats where an increased density of life and activity takes place (Gilman 1). Imagine the edge of a pond or lake. It is in this riparian zone of overlap where the aquatic habitat and its residents meet the forest habitat and its residents that great density of life occurs. The same can be true of the social fabric of our cities. The edges and areas of overlap within our cities (figure 14) can be places where interaction and connection can occur between various demographics, activities, and residences of different neighborhoods.

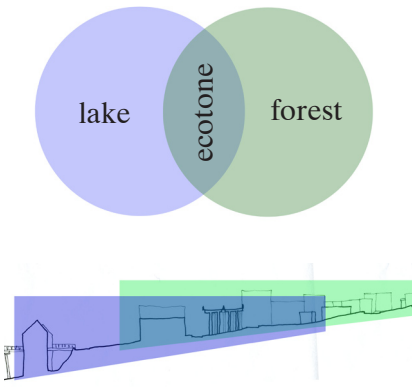


figure 13: Ecotones
As in ecology, the areas of overlap between various urban districts and neighborhoods hold a potential for great diversity and density of life.

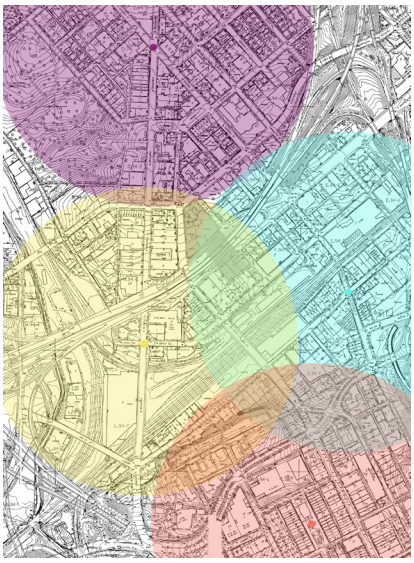


figure 14: Neighborhood Rings
Planners often organize urban regions into neighborhoods with a quarter-mile radius, or a 10-15 minute walk. The thesis site is located at the overlap of three neighborhoods: the Old City (blue), the Central/ Broadway intersection, and a proposed neighborhood centered near the intersection of Broadway and Depot. The Market Square neighborhood (pink) is adjacent and covers most of the city center.

attractive communities with a strong sense of place; (6) preserve open space, farmland, natural beauty and critical environmental areas; (7) reinvest in and strengthen existing communities; (8) provide a variety of transportation choices; (9) make development decisions predictable, fair and cost-effective; and (10) encourage citizen and stakeholder participation in development decisions. (EPA web site)

social

"One way to make the process of learning "action rich" is to move our isolated children out of the school buildings into the community. This cannot be accomplished with an occasional field trip to a museum or to the zoo. To be effective, this process means actually locating elements or aspects of the school in the community."

Mildred Freidman (Haar 21)

To heal the social fabric of our urban areas requires rethinking the way we make decisions and plans for our cities. The typical twentieth century model has proved unhealthy and unsustainable and new schemes must be applied. Jane Jacobs, in her book *Death and Life of Great American Cities* provides interesting guidelines with which to approach the social healing of our neighborhoods. She emphasizes the need for multiple functions within a district, short blocks, a variety of building types and ages, and a high density of people living and working in the neighborhood. Her ideas make urban places more pedestrian friendly and keep "eyes on the street" to increase public safety and participation in the community. Filling in the abandoned sites within the urban landscape increases the density of the community and provides additional opportunities to engage the public. She resists the gentrification that often occurs in mixed-use urban revitalization projects. In the first ring neighborhoods of Knoxville this last point is especially relevant. To heal the industrial wounds on this site is not to remove all existing businesses and residents but to incorporate new uses amongst the old. Auto repair shops can and should coexist with offices, restaurants, residences and public institutions.

Jacobs' challenge to existing functional zoning as unhealthy and a hindrance to good urban development is particularly important when looking at the post-industrial urban landscape. Functional zoning (figure 15) places limits on the potential for healing these

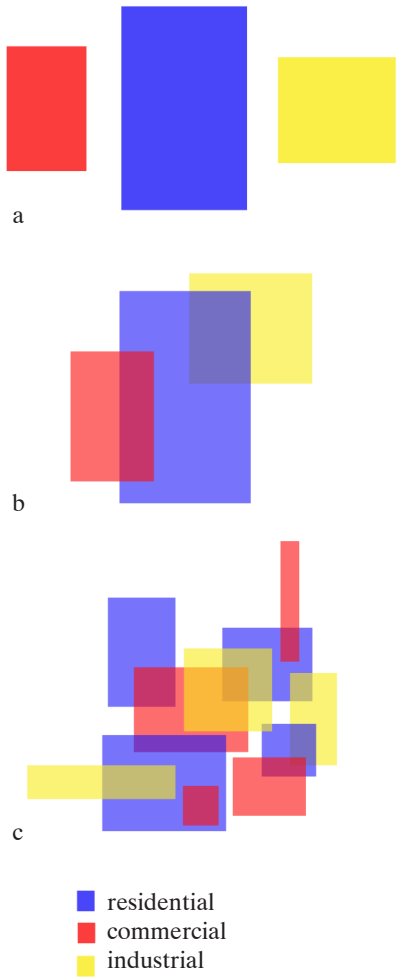


figure 15: Zoning modifications
This diagram illustrates two concepts simultaneously. First, it shows how cities can move from a functional, monocultural approach to planning to a more diverse mix of building types, sizes and funtions. Second, it abstractly demonstrates the ability of community schools to diminish the segregation between the students, community members and culture of the city.

urban wounds because they mandate one specific use on each site without considering how a mixture of uses could be healthier. This kind of zoning even forbids some positive programs or uses to the detriment of the community – for example, the current zoning of C-3 on this particular site prohibits the construction of schools (figure 16). Current discussions about the revitalization of this district address the need to modify current zoning restrictions. The community expressed in recent meeting their desire for an overlay of mixed-use districts for the Broadway and Central Corridors and the adjacent land (figure 17). These districts would create better streetscapes, stronger neighborhoods, and would preserve the existing historic fabric. Focusing on form-based codes rather than functional codes allows a greater flexibility of use and provides for the shaping of the public realm in addition to the private realm.

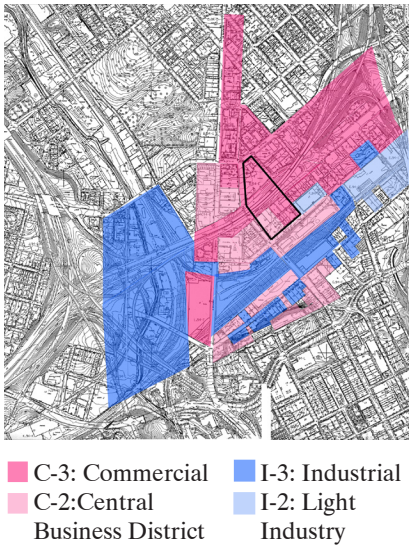


figure 16: Current zoning.

A school is an ideal program for reconnecting a community divided by zoning laws, demographics or other social barriers, particularly if viewed as a community school. The community uses this kind of school during non-school hours, often through partnerships with businesses, other educational institutions and non-profit organizations. The school also views the community as part of the classroom, utilizing institutions and organizations for essential pieces of the program. In Minneapolis at the WMEP Inderdistrict Downtown School students use the local YMCA for PE and take classes in conjunction with the University of St. Thomas (figure 18). The school in Knoxville has similar opportunities with local art museums, government agencies, businesses, and public parks.

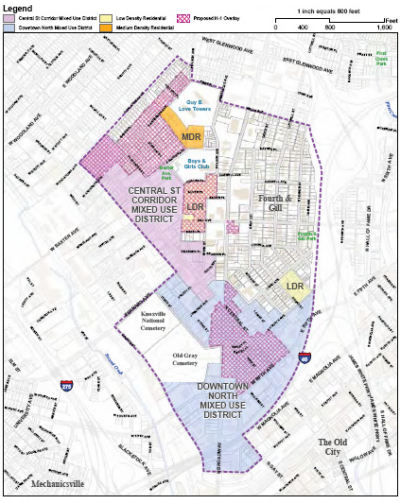


figure 17: Potential Zoning Overlays
An overlay district proposal along the Broadway and Central Cooridors would provide for a mixture of uses.

The school is intentionally small[1] to encourage interaction between students, teachers, parents, and the community. It should not be viewed as a traditional "inner city school" where the neediest students receive the fewest resources. By creating a strong educational environment with the strongest teachers the school can positively affect those students who traditionally lack educational advantages. As the downtown school

1 Small schools are typically defined as those with 200-400 students in the elementary grades and 300-600 in the middle school. They are typically more autonomous and often have a specific focus or area of distinction rather than being comprehensive.

improves the perception of urban education, more young families will be wiling to live and work downtown, adding to the economic success of the urban businesses. It also should not be a magnet school that draws most of its population from distant communities rather than focusing on the students in its neighborhood[2]. Just as the site is a local context within which we work, education is a local enterprise. This proposal calls for the redistricting of the surrounding communities to create an urban school district, drawing students from downtown and adjacent neighborhoods while relieving the higher attendance rates at nearby schools like Christenberry and Green Elementary Schools. In keeping with the Small Schools guidelines, this school should strive to keep attendance between 200-400 each in the elementary school and 300-500 in the middle school. This is done without compromising the educational opportunities for the students. Indeed, by remaining within small school guidelines and utilizing the learning opportunities available in the community around the school, the students can have additional learning experiences that large suburban schools may miss. This project also suggests transforming the old Knoxville High School, one block from the project site, into a small urban high school with close ties to community businesses, organizations, and the university.

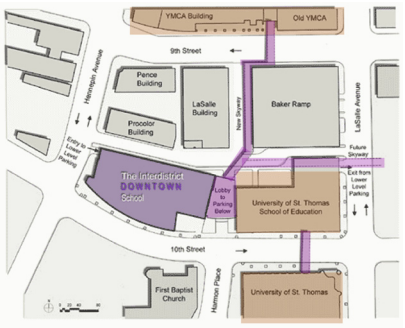


figure 18: WMEP Interdistrict Downtown School
The WMEP Interdistrict Downtown School utilizes the resources of local businesses and institutions as part of the curriculum and daily experience at the school.

2 The Magnet Program is already strongly represented in downtown Knoxville. Two elementary, one middle and one high school already exist within this immediate area. Currently these schools face large challenges and many question their classification as magnet schools, yet the infrastructure exists to meet this need of the larger metropolitan area. This thesis, however, seeks to create a community school that services a unique urban district.

ecological

"... to ignore the signals of human presence is to miss an opportunity to engage the extremities of the landscapes we have created and, by design, to lay the foundation for their renewal."

- William McDonough, "A New Geography of Hope"

As the public and design professionals become increasingly aware of the ecological problems that our current level of consumption creates, attention has shifted to the many practices that fall under the umbrella of sustainable planning or design. The intention is good but unfortunately building industries are now concerned with doing less harm while using the same industrial-minded processes and approaches that caused the damage. Yet there is the potential that "the human presence in the landscape can be regenerative. Not simply benign or less bad, but positive, vital and good" (McDonough, "Hope" 11). This requires a shift in thinking from "nature as something to be controlled" to nature as something to be engaged (McDonough, *Cradle* 84). More important that a checklist of sustainable "to-dos" is the holistic mind-set that asks: What is here? What will nature permit? What will nature assist (Berry, *Home* 146)? These questions, posed by the essayist, poet, and farmer Wendell Berry, reveal the necessity of understanding the specifics of the place in which you design. The answers to those questions will vary based on geography, topography, the size of the city, the extent of the ecological wound, and its location within the city. Often there is more occurring from an ecological perspective than is immediately apparent, and many of mankind's biggest decisions - and disasters - "... have been made... in ignorance of whereabouts" (147). It is by carefully observing what activities occur on or near the district in question that you can begin to understand the ecological potential of the site. It is important to remember, too, that it is not just man that helps nature. Often it is nature that can help man.

"Sustainable design is an approach that looks to the design process to heal as well as it has damaged."
-Jason McLennan (5)

Ecologically, approaching the healing of our urban environments requires a shift in perspective. No

longer can we view nature as something outside the city, contained in state and national parks or rural farmland. The natural world is present even in an urban environment. Our understanding of ecological relationships should not be limited to large tracts of uninhabited land, but should include those places that are "part of the ordinary landscape of daily life… [H]ow we engage with the prosaic landscapes of home, work, local travel, and recreation is an important measure of the quality of our lives" (Berleant 16).

It is important to define and understand the idea of urban ecology. The healing of ecological wounds is not an attempt to return to some kind of utopian - albeit false - natural state. As Emilio Ambasz states there are few sites left on earth that are unaltered by human hands. Even trees exist "because someone planted it or because someone decided to leave it there" (Wines 72). Instead we should begin to understand how our cities can coexist and interact with the natural world by understanding the urban ecology that surrounds us. The new field of urban ecology views the city as an ecosystem, a radical departure from the tradition of defining ecology as those places untouched by humans (Lord et. al., 2). Rather than comparing the ecology of our cities to those of pristine wilderness – an approach that always perceives cities as "degraded beyond repair" and humans as initiators of destruction – urban ecology seeks to define what a healthy, biologically diverse urban environment would look like and views humans as a keystone species within that environment (5). Cities contain collections of street trees, lawns/ parks, urban forests, cultivated land, wetlands, lakes/ seas, and streams that form an ecological network of green and blue spaces, different from those in rural or wilderness areas (Bolund and Hunhammar 294). Until this new area of science is more deeply understood, local groups can inventory their cities to document the existing and potential flora and fauna of our cities just as we document the human residents (Urban Ecology Institute).[1] University of Tennessee ecology students could study and document our urban environment through resource mapping and assessments that study the distribution of characteristics like tree cover,

1 The Urban Ecology Institute in Boston, MA, assists communities with documenting their ecological resources through ecological resource mapping and rapid ecological assessments.

developed land, open spaces, water networks, and existing infrastructure and catalogs existing biological diversity, invasive species, water issues, and soil issues. By combining the information gained from these exercises we can understand the gaps in the existing urban ecology and devise ways to address those gaps without eliminating the human element. Just as a diversity of human use and population is vital to a neighborhood's success, so it is in the natural world. Wildlife corridors and a network of interconnected parks and greenways connect the natural spaces just as streets and sidewalks connect built spaces within the city.

As we formulate new ways to organize our cities we must remember that the political and social boundaries that currently divide the city are meaningless ecologically. A robin in search of food does not consider if the worm he eats comes from a harmful industrial site or a healthy urban park. The urban and ecological spaces of a city form a complex network of natural resources. This network provides a framework within which to design, one that promotes biodiversity and renewable and regenerative practices. An understanding of urban ecology provides long-term guidelines that can reorganize the development of the city by creating an underlay of ecologically sensitive areas that guide and direct the urban fabric in a way that is healthy for the environment and the city. Such an understanding would base zoning on the carrying capacity, health, structure and function of the city's natural resources (Lord et. al. 335). Denser developments would occur in areas with less sensitive ecological resources. New development would include networks of natural resources that promoted biodiversity while utilizing those sites already damaged by human intervention (10).

Schools can and should benefit and assist in the ecological healing of our cities. They provide a place for increased green spaces and a way for students to learn about urban ecology. Students can learn how to care for and encourage the development of the urban ecology of their cities through the planting of trees, cleaning up creeks and wetlands, tending to community gardens, and understanding the sustainable building systems used. Students can help document

the existence and health of various urban species, adding to the city's understanding of its environment. The building itself can help heal the land through its materials, siting, and energy consumption. The landscape around the school can provide habitats for urban wildlife. Minimizing gray spaces (paved, impervious surfaces) diminishes the urban heat island effect and reduces the rain runoff that overwhelms and pollutes drainage systems. The school then is an active member of its ecological community, both taking and distributing resources in a healthy, symbiotic manner.


program
connections
holistic
social
ecotone
industrial
site
analysis
habitat
design
friendliness
introduction
scar
ecological
architecture
space
education
urban
systems
landscape
public
community
sustainable
constructed
found
living organisms
place
site
wound
fabric
recreation
conclusion
healing
precedents
regenerative
remnants
association
mixed use

"... to obliterate this area forever, which is currently the fate of the [Berlin] wall zone, would be to deny for future generations that this part of the history of the city ever existed."

Sir Norman Foster

The various types of urban wounds lead to different scar formations. Wounds may require a hard (built) or soft (ecological) operation – or a mixture of both. The combination of wound type and hard/soft operation creates a variety of solutions that result in a range of final compositions. In a puncture on the urban fabric, as seen in abandoned lots, small urban factories, or parking lots, the scar fills in the hole, placing something new in the midst of the existing context. New York City's Highline Project (figure 19) is a unique kind of puncture, formed by the residual space of the abandoned elevated rail line that winds through several neighborhoods. The current plan proposed by Field Operations calls for transforming the rail bed into a linear public park, an act that vertically fills in the wound of the elevated track. Other wounds might resemble an abrasion or burn, perhaps caused by a large factory or brownfield, and require the designer to infuse another layer of information onto the raw surface of the site. Once healed, the outline and texture of the scar remains. Such wound may contain large amounts of contamination that require extensive grafting of soil and plant matter to make the space habitable. For example, the Duisburg-Nord Landscape Park (figure 20) in Germany transforms a former blast furnace plant in to a series of public spaces by weaving parks, plazas, gardens and museums into the industrial infrastructure. In cuts on the urban fabric, such as railroads, interstates, or industrial riverfronts, the architecture works perpendicular to the linear wound to stitch the edges together. The Interim Bridges project by Kennedy/Violich (figure 21) accomplishes this by creating temporary bridges between neighborhoods of Boston disrupted by construction related to the Big Dig. Each bridge responds to specific site context, and their temporality recognizes that as the construction progresses and the interstate is eventually buried, the

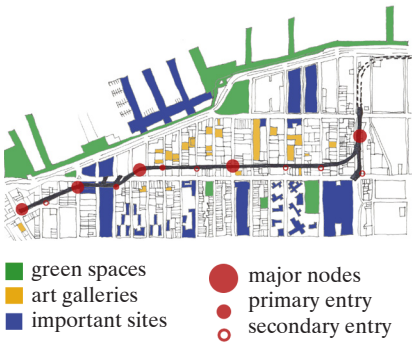
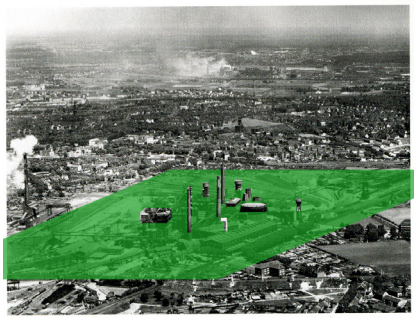


figure 19: The NYC Highline plan
The Highline Project in New York City utilizes the residual space of an abandoned rail line to create a linear public park that connects significant points in the district.



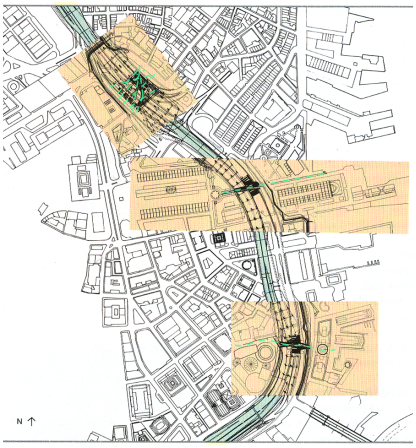
a

b

figure 20: Duisburg-Nord Landscape Park aerial photographs
The Duisburg-Nord Landscape Park by Peter Latz retains the industrial infrastructure and incorporates the remnants into the park to create a powerful juxtaposition of machine infrastructure and natural materials.

context and thus the scar will change.

In sites of urban damage, we see the negative impact of humanity at its worst. Often the initial reaction is to clear the site of all industrial remnants and create a tabula rasa, a level site free of any constraints - but also free of any context. Yet as Carol Burns discusses in her insightful essay "On Site," a cleared site is a mythic construct (Burns 152). All sites contain markers of its past and present, and to ignore these scraps is to "isolate architecture from time" and to presume "a power to initiate and finalize the site in both spatial and temporal terms" (Burns 150). We should not try to write over the history of the place. Instead, we should take those sites and regenerate them into something living and active, both ecologically and socially. There are lessons to learn from our historical treatment of the land which can stand starkly, and powerfully, in contrast with current regenerative approaches. Scars are a narrative, telling a story of our past – the importance of industry in our history, the damage done to the environment by those industries, issues of public health and security, the cultural history surrounding these sites, and our changing priorities for our rivers, landscapes and businesses. As a narrative scars imply remembrance. They allow you to connect with what used to be without preserving the past as a museum piece or artifact. The layers of the past and present within the architecture become part of the usable public experience.



a

b

figure 21: The Interim Bridge Project
The Interim Bridge project reconnects portions of Boston isolated by the Big Dig as seen in the site map (a) and the conceptual diagram (b).

Scars also possess an element of time. With some extensive types of damage, it may take years or even decades to form a scar that completes the healing process. Others rely on slow political or social processes that necessitate shifts in thought by the public. It is this temporal dimension that can make scars difficult to define or outline in the urban landscape but also empowers them in our collective perception and memory.

On this site in Knoxville, the gash of I-40 divided the city. The urban school inserted into the site must work with the interstate as an existing element while not allowing the interstate to continue to divide the site and the city. To that end the design utilizes a series of regulating lines derived from the structure of

figure 22: regulating lines
The repetitive structure of the interstate viaduct creates regulating lines that run north-south through the site.

the interstate (figure 22). Rotating these regulating lines creates a dynamic grid (figure 23), a series of stitches that govern the placement of various program and structural pieces. Thick wall placed along these lines (figure 24) re-stitch the site across the wound, simultaneously acknowledging and refuting its presence. These walls also ensure the memory of the interstate will remain as a layer of site information even if the interstate is eventually removed. The poche space within the CMU walls is then used for closets, bathrooms, mechanical chases, and other service needs, echoing the appropriation of the residual space below the interstate by the school itself.

figure 23: rotated regulating lines
Rotating (blue) the regulating lines created by the interstate structure (red) re-stiches the site across the wound made by I-40.

figure 24: thick walls
Thick walls placed along the regulating lines shape the various program pieces of the school. The design inhabits the poche spaces of these walls to meet the service needs of the program.

social

For severed communities, scars reconnect them to the urban fabric in an empowering way. They allow urban life to organize and flourish, closing the wound and rooting the architecture to that particular city and region. A public space like a school provides a place for students, families, teachers, and community members to invest and interact. Creating a series of community and learner spaces within the school allows the school to become a microcosm of the larger community. Paths of circulation, patterns of use, spatial hierarchy, and mixed uses combine to tightly integrate the school into the city. Koning Eizenberg's winning entry into the Chicago Public Schools Design Competition demonstrates these ideas (figure 25). An internal "street" organizes the campus and connects the two sides of the site, forming a kind of cardo and decumanus with central public plazas grouped around the main points of entry. The design places the learning spaces together in a series of "neighborhoods" that branch off the main circulation route. Courtyards provide safe places for learning and play, and other outdoor spaces weave between the various buildings.

My proposal will approach the organization of the campus in a similar way. The community and learner spaces are located off an internal street that runs north-south through the site (figure 26). The design groups "neighborhoods" of learning along this street (figure 27). In the elementary school, each neighborhood is comprised of one classroom each of first through fifth grades, a large group space, an outdoor learning space, and support facilities. The kindergarten classes form their own neighborhood north of the interstate, and the middle school's loosely organized neighborhood is south of the elementary school. This breaks the

figure 26: Internal Street plan, thesis
The internal street of the site will help connect the northern and southern portions of the site divided by the interstate and will organize the program elements.

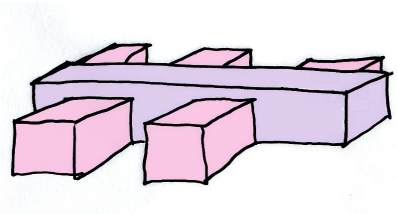


figure 27: Internal Street axon, thesis
Neighborhoods of learning (pink) are located off the internal street (purple).

figure 25: Chicago School Competition, plan
The design by Koning Eizenberg organizes the neighborhoods of learning along an internal pedestrian street. Public spaces are located at the crossing of the pedestrian street and the plaza.

school down into smaller learning communities that allow the children to create a sense of place within the larger school context. The internal street acts as a unifying device between each neighborhood and the community spaces they share, re-stitching the site beneath the interstate.

With linear wounds such as I-40, the architecture must act as a connector in order to heal the site and form a scar on the landscape. The Placa de les Glories Catalanes in Barcelona addresses the wound created by the intersection of several main arteries by acting as both connector (figure 28) and collector (figure 29), activating a residual space with a public plaza, parking structure, and pedestrian and vehicular paths (figure 30). An elementary or middle school does not immediately seem appropriate for this kind of site but schools have a great potential to unify a community. A school's sense of permanence makes it a stabilizing force in the community and emphasizes its role as an inerasable scar on the post-industrial landscape. A school can reconnect downtown residents and workers with North Knoxville residents. The same relationship extends east and west. It becomes the center of activity for the community (figure 31) and the students engage the community by extending their learning into surrounding neighborhoods (figure 32). The school becomes a connector between groups within the community and a collector of people in a site which once could do neither.

The program, structure and spaces of the school should tell a story about reconnecting these divided neighborhoods. It should reveal the wound and the healing process that occurs, weaving pieces of the past into the building. Growth and change will not completely erase the wound on the site. Keeping the interstate for this proposal highlights the role of the school as a scar that is slowing re-stitching the wounded city. Utilizing the residual spaces surrounding the interstate creates public space out of what was once private, inaccessible and unusable. As the community surrounding I-40 in Knoxville grows and increases in density, the contrast between the school and its post-industrial landscape becomes less severe. In the future, citizens demanding better transportation options can remove the interstate while the school remains as a

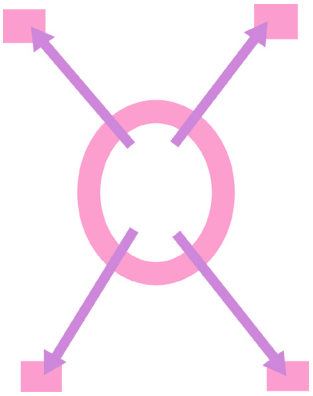


figure 28: Placa de les Glories Cantalanes as connector
The plaza as a connector to important site around Barcelona

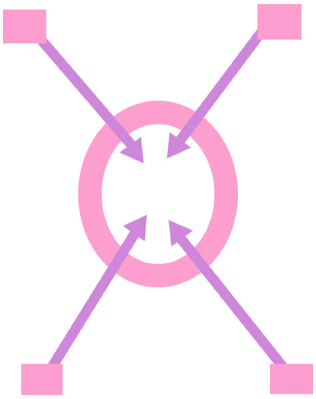


figure 29: Placa de les Glories Cantalanes as collector
The plaza as a collector of people and automobiles

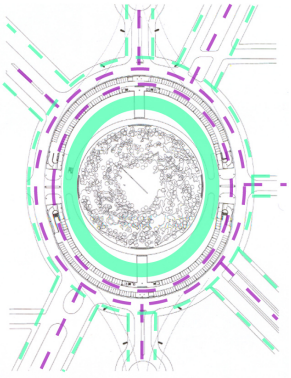


figure 30: Placa de les Glories Cantalanes paths
The vehicular (purple) and pedestrian (turquoise) paths through the plaza.

narrative of the site's history. The school's program also connects students to the larger urban context by utilizing resources around the city as the extended classroom. The public library, art galleries and local parks are just a few ways that the school can engage the community. In this way the school becomes an integral part of the downtown community and provides opportunities for local groups to invest in the lives of the students. In turn, Knoxville's urban school also becomes the center of many community activities and events from children's sports to adult education to community gardens, furthering the connection.

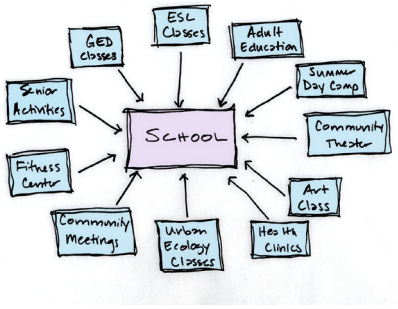


figure 31: The community uses the school

Public education itself is a kind of scar. Educational approaches and theories change as research and experiences combine to positively affect our children. A school building is the physical manifestation of those theories, and educators and designers alike recognize "that the physical environment has a direct impact on the learning process" (Perkins 1). Schools permanently imprint student's minds and perceptions, acting as a kind of positive scar. The physical arrangement of the school can allow for flexibility of educational approaches and technological changes while maintaining a core of "permanent" pieces. The organization of the learning neighborhoods creates a specific kind of learning environment that will shape the students while providing flexibility between the usage of the classrooms, group spaces and outdoor spaces.

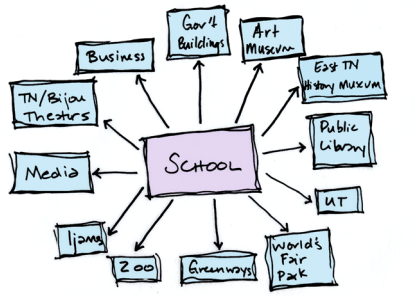


figure 32: The school uses the community

It is important to remember that this is an urban school; thus its organization, spatial considerations and public facades will differ substantially from the sprawling educational complexes typically built. A separation between community and learner spaces and the organization of those spaces on the site strengthens the urban fabric of the district and reestablishes Gay Street's urban presence to its termination at Emory Place. To that end, the elementary cafeteria, administration buildings and auditorium are placed along Gay Street. The Fifth Avenue facade is also an important public edge and contains the gymnasium, another important public space (figure 33). Continuing these public spaces both north and south of the interstate increases the opportunities for interaction between various members of the community and the school rather

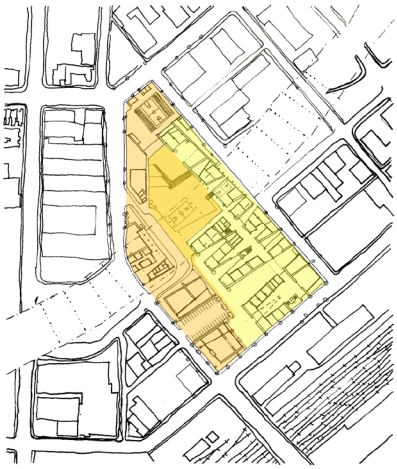


figure 33: Public/ Private, thesis
Community spaces (orange) are located along the public edges created by Gay Street and Fifth Avenue while the learner spaces (yellow) are located within the interior of the block.

than grouping the public spaces on one end of the site. Students utilize program spaces north and south of I-40 each day, further strengthening the connection. These urban edges respect the scale, density, and sidewalk presence of the surrounding urban buildings. The materials used and the community character of these spaces will enhance their reading as a scar, a structure that stands in relief against the surrounding context without being alien.

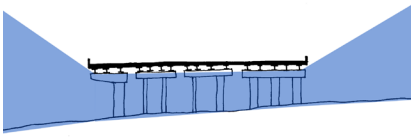


figure 34: compression/ expansion

Spatially, the interstate creates a sense of compression and expansion as you move under it and continue either direction into the neighborhood (figure 34). This experience is recreated in the school as pieces wedge themselves under the interstate. The administration space as well as the portion of the classrooms under I-40 have lower ceilings while the spaces to the north and south expand vertically. This allows the user to sense moving under and away from the viaduct even within the school. In addition, the structure of the interstate punctures the roofs of the buildings, further emphasizing the presence of the interstate.

ecological

As discussed earlier, urban ecology provides us with a new way to investigate the ecological health of our cities. Implicit in the idea is an understanding that the marks of man on the urban landscape are unavoidable. Rather than attempting to idealize our pastoral landscapes and decry our cities as evil, urban ecology strives to uncover the systems that exist within our cities and to enliven our urban landscape. It recognizes that a return to a pre-Industrial city is impossible yet denies that this means the city is without ecological value. Simple features like street trees have the power to dramatically alter the microclimate of the site. Creating networks of green and blue spaces in Knoxville and protecting those that already exist are powerful ways to increase the ecological density and diversity of the urban landscape. These "natural" elements provide a provocative counterpoint to the backdrop of built spaces. As urban ecology grows both as a science and as a way of approach the design of our cities, this distinction will diminish. Yet the clear contrast of built and natural structure ensures that the ecological scar will – and should – always remain, however sustainable our buildings become.

The ecological environment of the city tells a story about our industrial past and our changing attitudes towards the public experience of our cities and the natural world. It will take time for us to heal these post-industrial sites and to create an "infrastructure" of urban ecology in our cities. An ecologically sensitive approach to the design of this school is an important part of the new chapter of the story of our cities. The students of the school will be part of this process, experiencing the narrative first-hand as they tend to community gardens, clean waterways, and learn about sustainable architecture. Each successive generation of students will subtly (or not so subtly) alter the urban ecology in positive ways, reflecting changing attitudes toward the natural world. Sidwell Friends School in Washington, D.C. takes such a holistic approach. Central to the plan is a constructed wetland (figure 35) that treats waste water and provides students with first-hand experience of the biotic processes of an active urban ecosystem. Such overt gestures make the building a teaching tool both to the students and to the community as a whole.

figure 35: Sidwell Friends School plan
Sidwell Friends School uses many sustainable strategies including the constructed wetland/ biofilter/ rain catchment system located in the courtyard.

This school will also pave the way for a new, sustainable approach for all school design in Knox County. In this school system alone, campuses have 1400 acres of mowed grass, 875,620 square yards of paved surfaces and 8.3 million square feet of building to educate 50,000 students – clearly sustainable schools could have a far-reaching impact on the resources used by the city. Typical school design calls for over 435 square feet per child plus ten acres per school, resulting in sprawling one-story complexes. This thesis proposes nearly halving that to 280 sf per student plus over 2 acres of outdoor learning and play spaces, reducing the green spaces consumed, the impervious surfaces created, and the square feet of spaces that need heating and cooling. Many states have created guidelines to certify "green schools" using a system of points awarded for various categories of sustainability. The US Green Building Council will publish a LEED Certification for schools in 2007. These checklists are useful tools that aid architects in designing schools that are more compact, energy efficient, and healthy centers of learning. Woodlea School in Bordon, England, uses sustainable design ideas such as passive ventilation and daylighting systems that utilize the school's siting (figure 36). The organization of the school also provides access to a variety of exterior learning spaces off the classrooms, from quiet covered decks to noisy places of group investigation. The design for this urban school in Knoxville also takes advantage of wind and sun to provide natural ventilation (figure 37) and daylighting (figure 38) to diminish the reliance on active systems to meet energy needs. Rainwater is collected from the roofs and stored in cisterns (figure 39); the water is then used to meet graywater needs within the school and to water the community gardens and landscape. The thermal mass of the school is utilized to offset the heating needs. Each of these systems aides in making the school more environmentally sustainable and they are highlighted as teachable moments for the students and teachers.

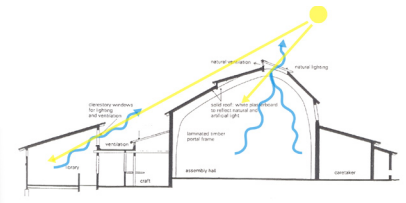


figure 36: Woodlea Primary School Assembly Hall, section
Woodlea Primary School incorporates sustainable features like daylighting and passive ventilation.

figure 39: Rainwater catchment
Runoff from the roofs of the school is collected and stored in cisterns. The water is later used to meet graywater and landscaping needs.

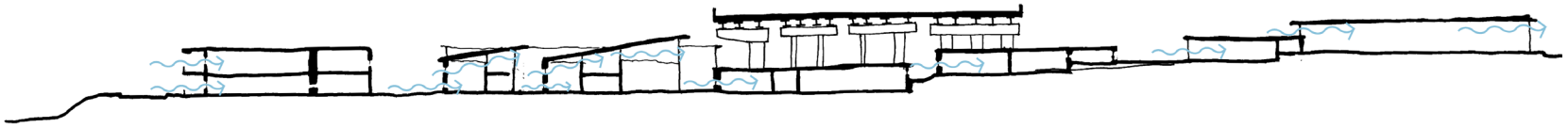


figure 37: natural ventilation
The placement of the fenestration takes advantage of the prevailing winds in Knoxville through natural ventilation.

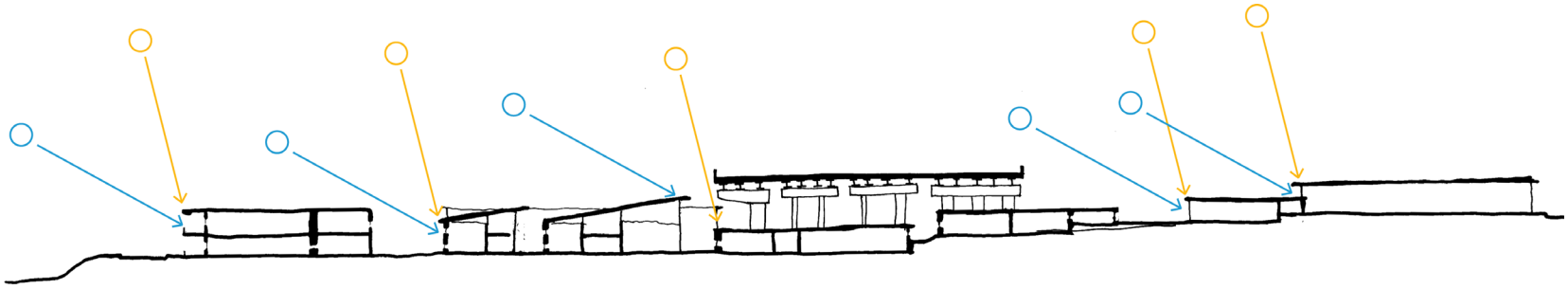


figure 38: solar access
An abundance of windows allows for daylighting throughout the year. The orientation and placement of those windows, however, keeps them shaded in the warmer months and exposed in the cooler months to take advantage of thermal gains.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Sustainable architecture and other “green” topics are daily gaining momentum and popularity. As the public becomes increasingly aware of these issues, we as architects possess the ability to positively influence the shape of our urban environment. Our communities are ready to make positive changes as we address these urban wounds. These sites possess the power not only to use “green” building techniques, systems or materials, but to be truly sustainable from an ecological *and* social perspective.

Ironically, urban sites with degenerative industrial damage hold great potential for regenerating our cities. Utilizing these sites in a positive way enables us to re-stitch the urban fabric while healing the damage that has occurred. The community school in this project heals the urban wound caused by I-40 and becomes a scar, both acknowledging and refuting the presence of the interstate. Its physical manifestation re-stitches the site and becomes another layer of memory within its urban context. The movement in and around the school connects the school to the larger community while providing opportunities to reconnect neighborhoods divided by the interstate. It enhances and diversifies the urban ecology of Knoxville with its treatment of site resources, energy, and building materials.

figure 40: plan, thesis

The social and ecological wounds of Knoxville and the resulting scars create a framework that we can apply to other wounds in this city and to the design of the city as a whole. Innovative approaches to site and program - such as placing a school beneath an interstate - reinvigorate and reconnect the surrounding neighborhoods in a powerful way. Focusing on a diversity of scales, uses, and building types creates networks of people and resources that prevents the creation of monocultural swaths across the city. Treating the architecture as a scar on these wounded sites ties the old with the new in meaningful ways that enrich the urban landscape. Buildings and the landscapes that surround them can increase their use of passive and low-impact active systems, recognizing that they are one part of a complex urban ecological network. These sites provide us - both designers and citizens - with an incredible opportunity to reclaim the landscape of our cities to use in creative, sustainable ways.

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figure 12: photograph courtesy of Judy Stone.
figure 13-16: by author
figure 17: Knoxville- Knox County Metropolitan Planning Commission Broadway- Central-Emory Place Small Area Plan March 2007
figure 18: *Architectural Record*, online Building Types Study, www.archrecord.construction.com
figure 19: by author
figure 20: Reed, Peter. *Groundswell: Constructing the Contemporary Landscape.* New York: The Museum of Modern Art, 2005, pg 124.
figure 21: *Progressive Architecture*. 1 (1992): 93
figure 22-24: by author
figure 25: Cindy Moelis et al (see bibliography); overlays by author
figures 26-34: by author
figure 35: KieranTimberlake Associates, www.kierantimberlake.com
figure 36: Dudek, Mark (see bibliography), overlays by author
figure 37-40: by author
figures 41-43: Reed, Peter. pgs 124-131.
figures 44-46: Field Operations, www.fieldoperations.net
figures 47-49: *Infrastructure*
figures 50-51: Moelis et al, pgs 2.4-2.7 with overlays by author
figure 52: Courtesy of Drew Balzer and Matt Delaney, University of Tennessee
figures 53-55: KieranTimberlake Associates
figures 56-59: *Perkins & Will: Selected and Current Works.* Victoria, Australia: The Images Publishing Group, 2000, pgs 46-49. overlays by author
figures 60-63: Dudek, Mark with overlays by author
figures 64-105: by author

appendices


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Duisburg-Nord Landscape Park Duisburg, Germany Latz & Partners

Formerly a blast furnace plant, Latz has transformed this wasteland along the Ruhr into a 230 hectacre complex of public spaces. The plan regenerates not only the contaminated soil and buildings but also the urban life of the area by connecting the various pieces of the program with the surrounding community. Containing parks, trails, museums, plazas, performance areas, art installations, and even a climbing wall and scuba tank – most housed within the remnant industrial pieces – the site provides social possibilities for the locals and attracts many tourist. Rather than dismantling and clearing the site, the industrial infrastructure is retained and incorporated into the park, allowing the remnants to tell a story about the site's - and community's - past. New building and landscape materials are layered over the existing materials, creating a provocative juxtaposition of machine infrastructure and natural materials.

figure 41: Duisburg-Nord Landscape Park pedestrian path

figure 42: Duisburg-Nord Landscape Park reused industrial materials

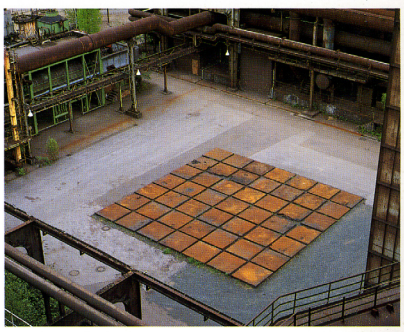

figure 43: Duisburg-Nord Landscape Park Piazza Metallica

NYC Highline
New York City
Field Operations

The Highline in New York City is an abandoned elevated rail line that weaves 1.2 miles through several neighborhoods. A recent design competition was held to transform the site into a public space. The design attempts to preserve and expand the "natural" character of the site as it exists today by creating a variety of ecological zones in this linear park. Importance was also placed on how the highline connected with the surrounding neighborhoods and public spaces, allowing the park to interact with the site context despite being elevated.

figure 44: NYC Highline aerial photo
aerial photo of the highline's path

figure 45: NYC Highline concept drawings
concept drawing of the various materials and textures along the highline

figure 46: NYC Highline past and present
The Highline: past (left) and present (right)

Placa de les Glories Cantalanes Barcelona, Spain Andreu Arriola

In the heart of Barcelona a plaza has been constructed that weaves together vehicular traffic and public space. The plaza is located at the intersection of three important roads: Avenue Diagonal, Grand Via and Meridiana. Prior to its construction the site was an unusable island of residual land; now the plaza and surrounding space is occupiable by both pedestrian and vehicular traffic and surrounding urban spaces have been activated. The elevated highway encircles the site while boulevards intersect at ground level. The residual space under the highway becomes a car park with public transit connections to the city center. The site acts both as a collector of people and cars and a connector to other significant urban spaces.

In a similar fashion, this thesis project will activate the residual space beneath I-40 in Knoxville by designing a school that will act as both connector and collector for the surrounding communities.

figure 47: Placa de les Glories Cantalanes, before
aerial photo of intersection before the plaza's construction

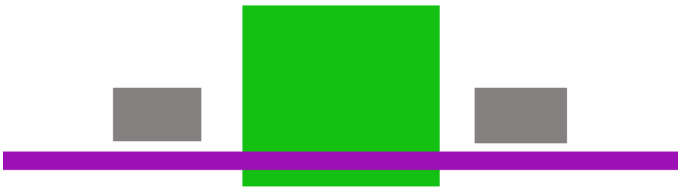

figure 49: Placa de les Glories Cantalanes, diagram
a diagram of the plaza showing the relationship between the plaza (green), the elevated roads (gray), and the grade-level circulation (purple)

figure 48: Placa de les Glories Cantalanes, after
photograph of the plaza and the rerouted roads

Chicago Public School Competition North Side Winner Chicago, IL Koning Eizenberg

In 2000 the city of Chicago, in conjunction with the National Endowment for the Arts, held a design competition for two new public schools. The competition had three goals: to demonstrate cost-effective ways to incorporate sustainability, accessibility, and a small-school approach ; to involve the community in the design process; and to generate a city-wide dialogue about the importance of innovative school design (Moelis et al 1.8). The north side site was divided by an existing road with the larger portion of the site to the south of the road and a smaller narrow lot to the north. Koning Eizenberg's winning entry addresses this split by placing the Pre-K and Kindergarten "Neighborhood" on the northern portion and grouping the Neighborhoods for grades 1-8 on the southern portion of the site. An internal street organizes the Neighborhoods and provides ample circulation space. The existing street that cuts through the site is closed to create a public plaza and parking spaces. Together the plaza and internal street create a kind of cardo and decumanus around which the public spaces of the school are grouped. Playgrounds and outdoor learning spaces are formed in the courtyards and residual spaces between each neighborhood. The materials of the facade, the scale, and the pitched roofs allow the school to fit seamlessly into the community. Daylighting is maximized to both increase work performance and decrease energy usage while shading on the east and west elevations reduces the heat gain (Moelis et al 2.3). In this thesis project similar organizational strategies will be used to create smaller learning communities within the larger school and to unite the two portions of the site divided by I-40.

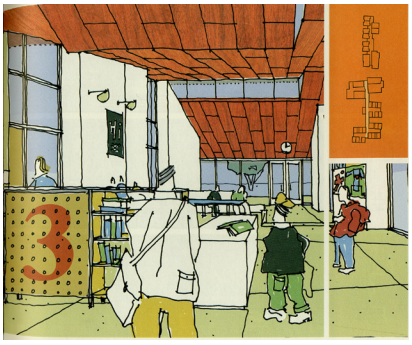

figure 50: Chicago School Competition, internal street perspective
the internal street, its ceiling lined with plywood panels.

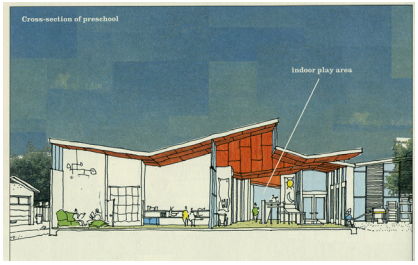

figure 51: Chicago Competition, preschool
This sectional perspective shows the volumetric characteristics of the classrooms as well as unique spaces like the indoor playspace (right) that provides ADA accessible playspace for all their students

An addition and renovation of an existing building, this project incorporates innovative sustainable features into the school's design that act as teaching tools for the students. Rainwater catchment, a constructed wetland, stack ventilation, and shading devices are integrated into the site and building design. The new addition simultaneously holds the corner and creates the fourth edge of the courtyard. This thesis will use similar systems to integrate the school into the urban ecology of Knoxville.

Sidwell Friends School
Washington, D.C.
Kieran Timberlake

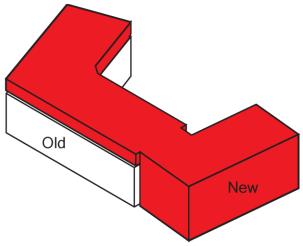

figure 52: Sidwell Friends School, axon
existing (white) vs. new (red) construction

figure 53: Sidwell Friends School, entry perspective
perspective of courtyard and entry

figure 54: Sidwell Friends School, street facade perspective
aerial perspective of southwest corner holding the street edge

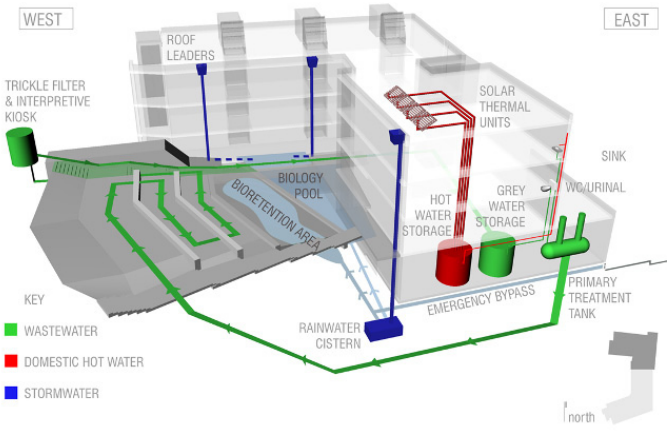

figure 55: Sidwell Friends School, systems
A diagram of the sustainable systems used in the school

Charter School
Chicago, IL
Perkins & Will

This unbuilt school design utilizes a site that stretches under an elevated highway. The school is located on the larger portion of the site and the remaining section is set aside for future commercial development. Larger public spaces are placed along the noisy highway while the quieter classroom spaces form the edge of the urban block, forming a courtyard in the remaining space.
The project turns its back on the highway rather than attempting to connect the two portions of the site.

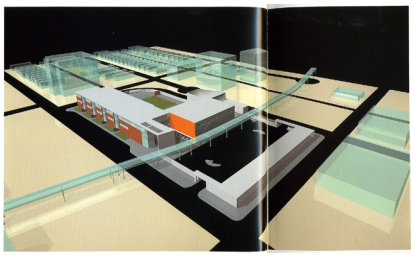

figure 56: Charter School, aerial perspective
aerial perspective of site with the school to the north of the interstate

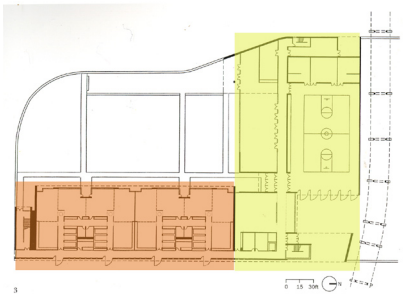

figure 57: Charter School, plan
site plan denoting classroom (orange) and community (yellow) spaces

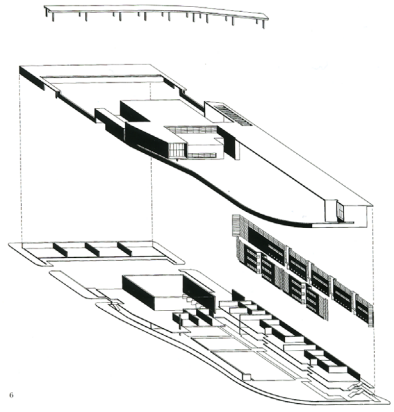

figure 58: Charter School, exploded axon
exploded axon showing the layering of the facade on the urban street edge

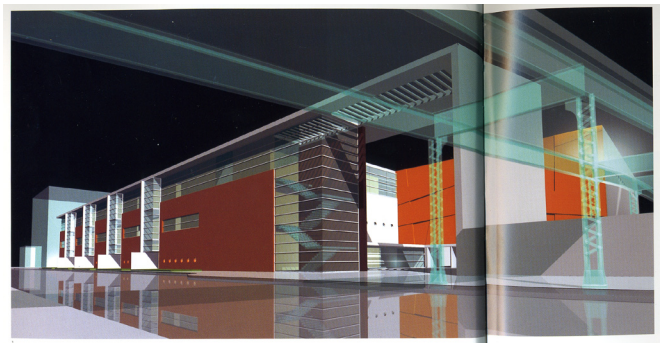

figure 59: Charter School, ground-level perspective
ground-level perspective looking beneath the interstate at the public threshold into the school

Woodlea Primary School
Bordon, England
Hampshire County Architects

This rural school in England utilizes the sloping topography to create a variety on interior and exterior spaces. Outside, the courtyard is reserved for quiet, dry activities on a grassy surface. The perimeter of the classroom buildings is used for loud, wet activities on hard surfaces. Public interior spaces are grouped near the main entrance and the more private classroom spaces form the wings. Within the classroom wings there are layers of spaces for a variety of groups: individual classes, small group areas, large group areas, and shared decks. Such an arrangement allows for great flexibility in teaching and learning environments. The school also thoughtfully incorporates sustainable design ideas into the siting and spatial organization. This thesis will utilize similar organizational strategies to break the larger school into a collection of smaller learning communities. These communities will have both classroom and community space as well as indoor and outdoor learning spaces. The school will then begin to mirror the organization of the neighborhoods and community around them, teaching the students how to be active and responsible participants in their urban district.

figure 60: Woodlea Primary School, public and private
public (purple) and private (yellow) spaces within the school

figure 61: Woodlea Primary School, learning communities
learning communities within the school are broken down into classrooms (brown), small group areas (red), and large group areas (orange) .

figure 62: Woodlea Primary School, outdoor spaces
outdoor spaces are grouped by use: loud (orange) and quiet (blue)

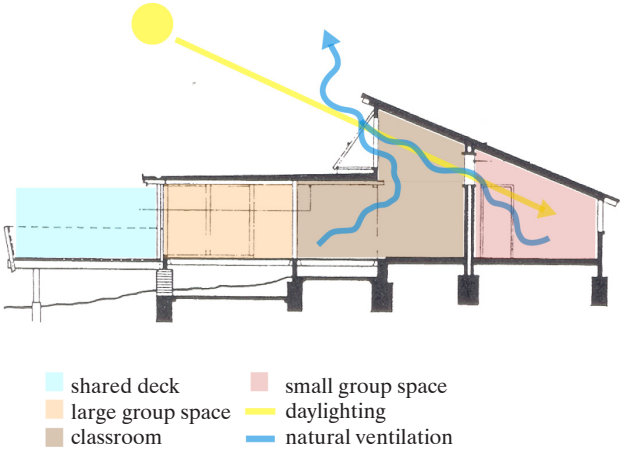

figure 63: Woodlea Primary School, section through classrooms
the organization of the learning spaces in section showing the incorporation of daylighting and natural ventilation


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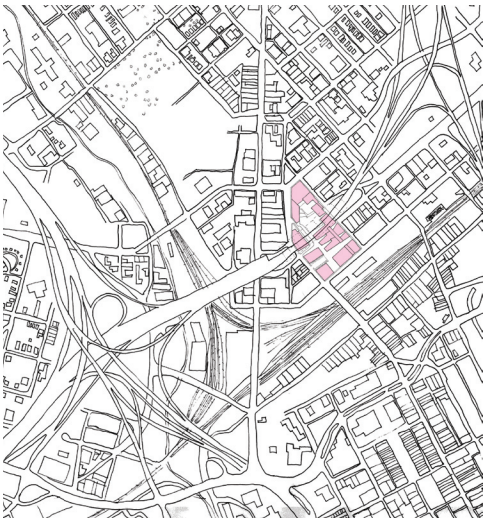

figure 64:
site map

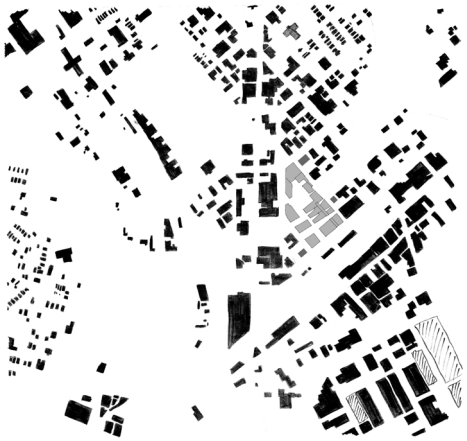

figure 65:
figure ground

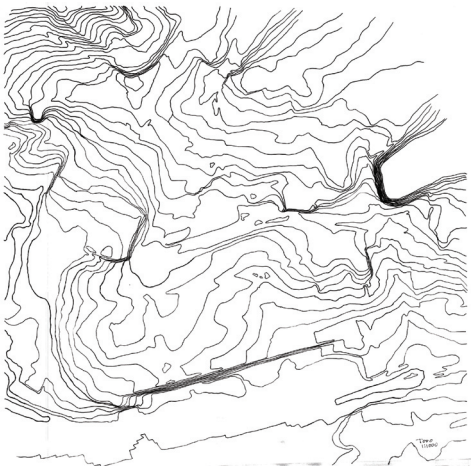

figure 66:
topography
(2’ intervals)

figure 67:
site drainage

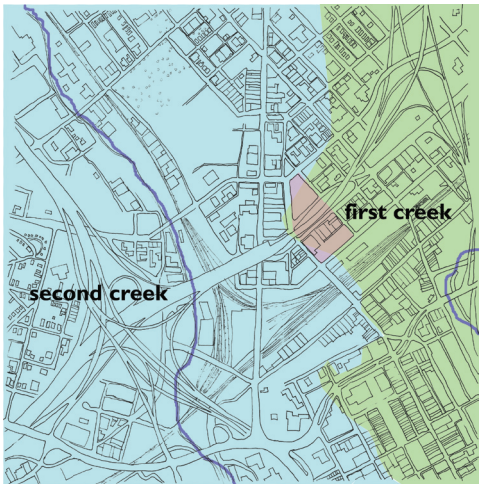

figure 68:
watersheds

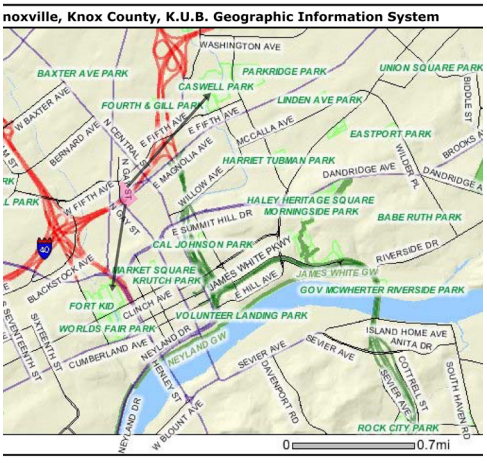

figure 69:
existing parks and greenways

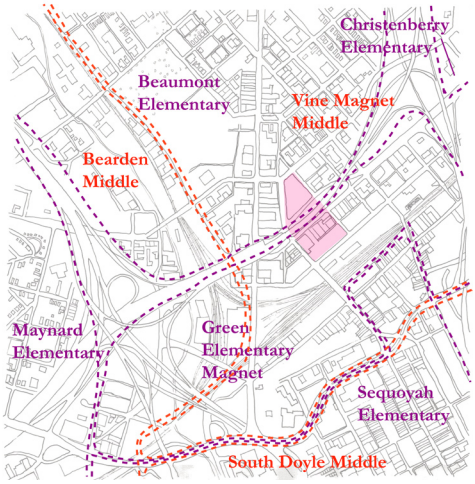

figure 70:
existing elementary (purple) and middle (orange) schools

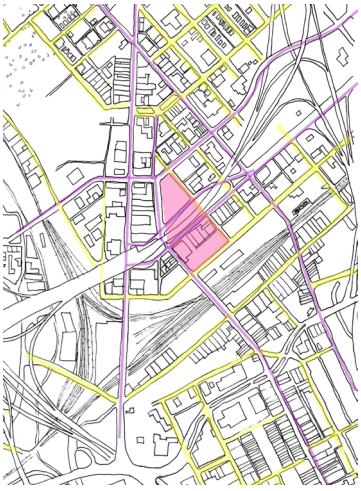

figure 71:
existing primary (purple) and secondary (yellow) streets

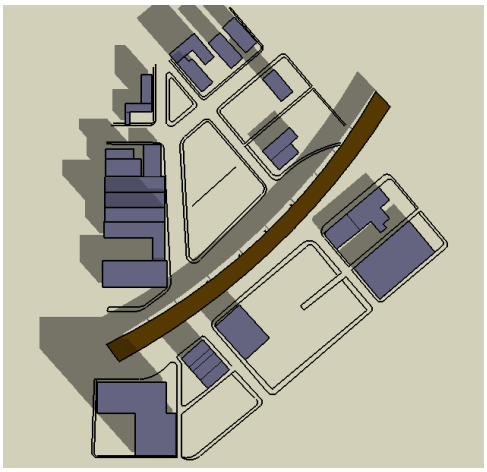

figure 72:
shading Dec. 21
at 9 a.m.

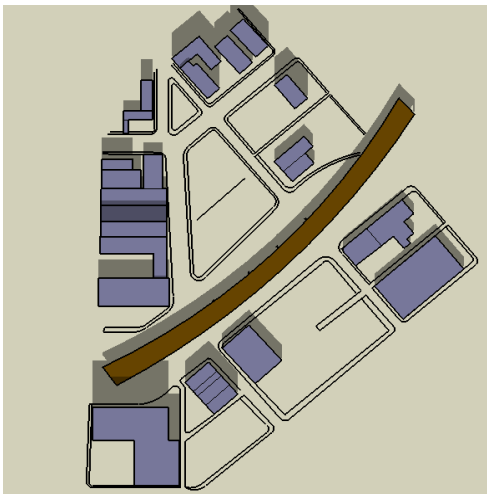

figure 73:
shading Dec. 21
at noon

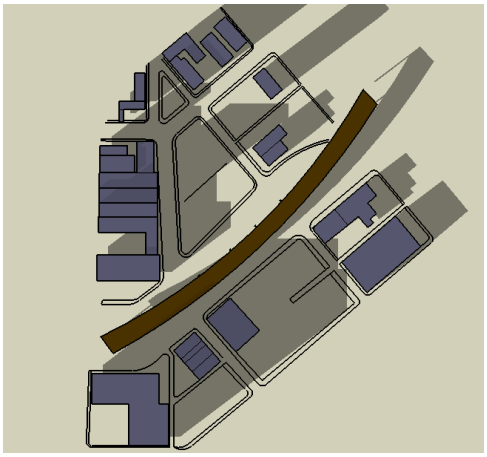

figure 74:
shading Dec. 21
at 4 p.m.

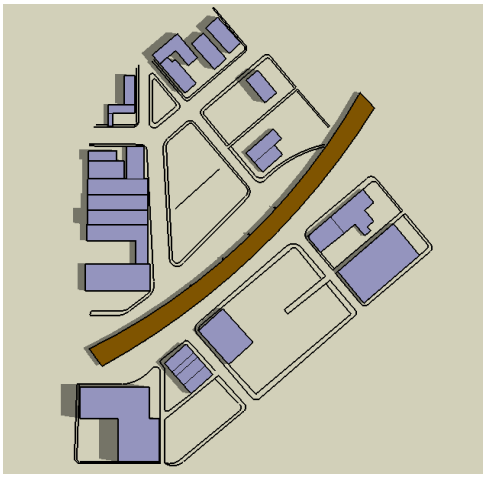

figure 75:
shading June 21
at 9 a.m.

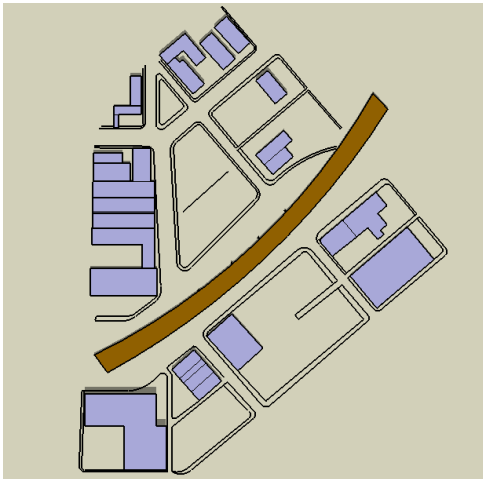

figure 76:
shading June 21
at noon

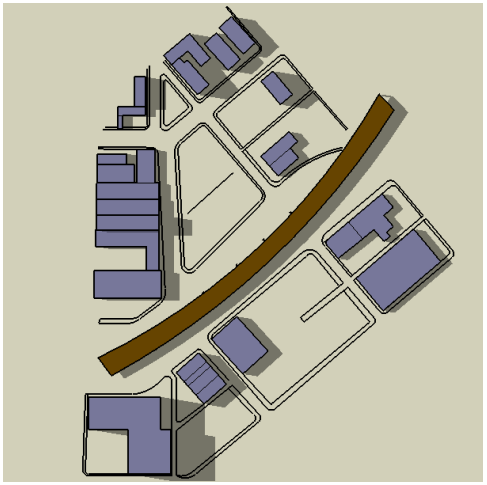

figure 78:
shading June 21
at 5 p.m.

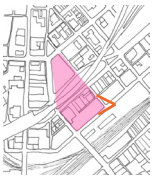

figure 78:
site from southeast

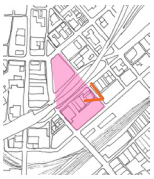

figure 79:
Southern Williams Ave.

figure 80:
Gay Street under I-40

figure 81:
Northern Williams Ave

figure 82:
Magnolia Ave under I-40

figure 83:
North Gay Street


program
connections
holistic
social
ecotone
industrial
site
analysis
habitat
design
friendliness
introduction
scar
ecological
architecture
space
education
urban
systems
landscape
public
community
sustainable
constructed
found
living organisms
place
site
fabric
wound
recreation
conclusion
healing
precedents
regenerative
remnants
association
mixed use

Qualitative Program

figure 84: Program grouping, thesis
By dispersing key program pieces on both the north and the south side of the site, the design ensures circulation through the site by both the students and the community.

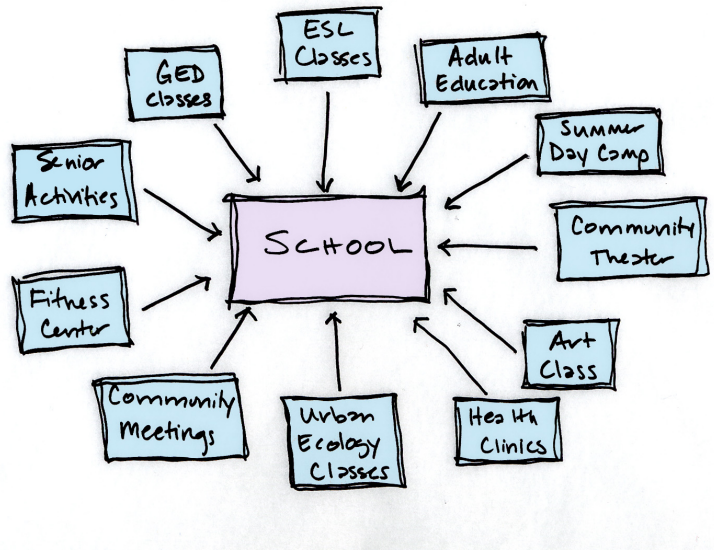

figure 85: Community using the school

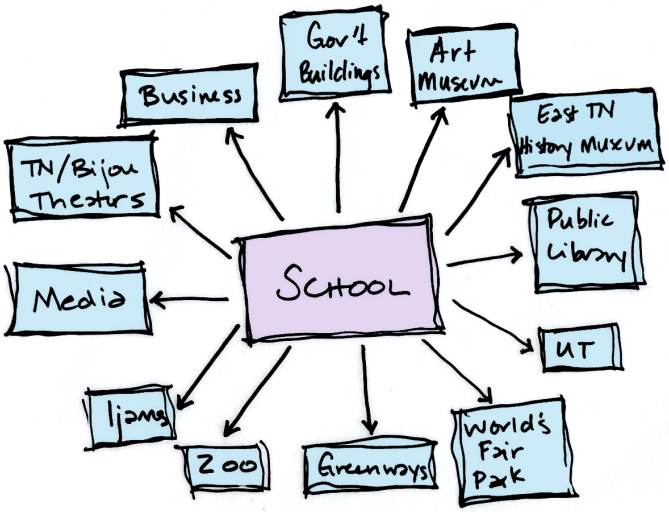

figure 86: School using the community

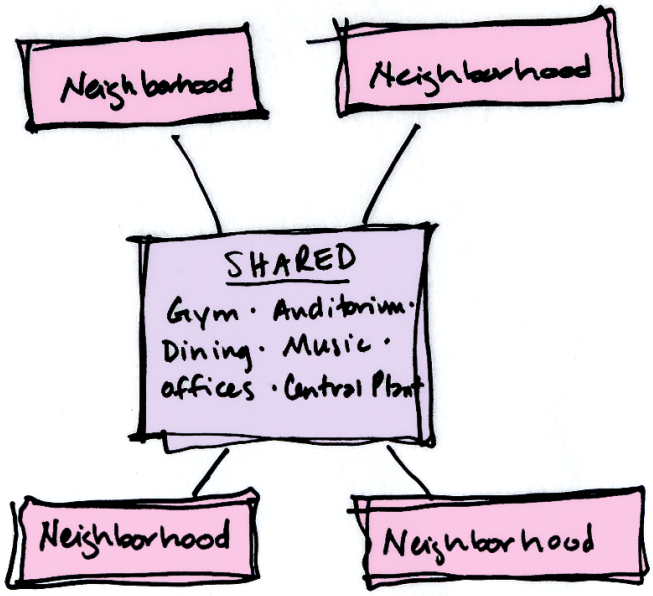

figure 87: Shared and Neighborhood spaces, thesis
The design groups the classrooms into "neighborhoods" of learning. Community spaces shared by all of the students are located in the public zone.

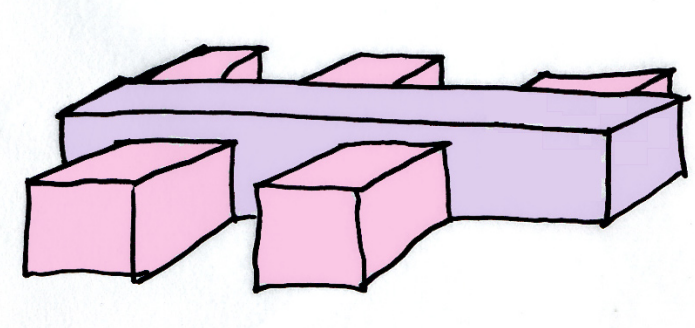

figure 88: Internal Street
The neighborhoods (pink) are located off the internal street (purple) that stitches the site together north to south.

figure 89: urban connections
The community school utilizes the resources of the urban landscape to meet the daily education needs of the students. These resources include parks, government buildings, theaters, and art museums.

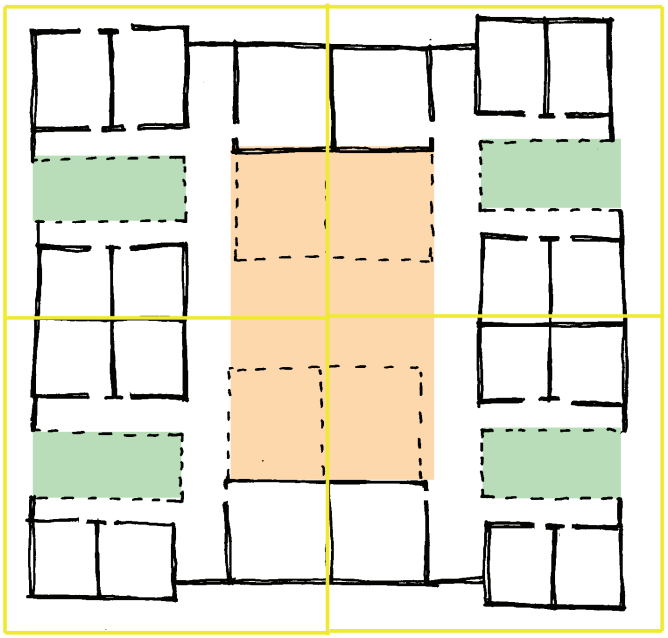

figure 90: Learning Neighborhoods parti
Each neighborhood is comprised of several classrooms, a shared large group space (orange), and an outdoor learning space (green).

figure 91: Outdoor and Group Learning Spaces
The outdoor learning spaces and the group spaces are flexible and can be used by multiple classes within a neighborhood or by classes from different neighborhoods.

school year

figure 92: School Year Program
The school and the community will use the facility for a variety of purposes throughout the year. These interacting and overlapping uses activate the neighborhood, making a lively, safe place to be.

summer

figure 93: Summer Program
Using the facility in the summer as a day camp and for community activities not only brings revenue to the school but also further integrates the school into the lives of the urban residents.

Quantitative Program

Table 1: Quantitative Program

space	class size	quantity	avg size (sf)*	min ceiling height*	min windows*	net sf
Learner Spaces						
kindergarten classroom	18	5	1386	10	8% or greater	6,930
grade 1	18	4	1162	10	8% or greater	4,648
in class toilets (K thru 1)		9				
grade 2	18	4	1099	10	8% or greater	4,396
grade 3	22	4	1040	10	8% or greater	4,160
grade 4	22	4	926	10	8% or greater	3,704
grade 5	22	4	1155	10	8% or greater	4,620
group space - elementary school		4	1050	10	8% or greater	4,200
storage - elementary school		3	364			1,092
grade 6	26	3	790	10	6% or greater	2,370
grade 7	26	3	808	10	6% or greater	2,424
grade 8	26	3	841	10	6% or greater	2,523
science/math		3	1143	10	6% or greater	3,429
other middle school classrooms		4	813	10	6% or greater	3,252
group space - middle school		3	1323	10	6% or greater	3,969
storage - middle school		1	2423			2,423
					net learner sf	**54,140**
total students	732					
Community Spaces						
art		**knoxville art museum**				
music		1	1000	12		1,000
music storage		2	400	12		800
auditorium, lobby and restrooms		1	10000	min 10		10,000
gym (including lockers, concession and offices)		1	26500	20		26,500
elementary play room		1	3449	12		3,449
library		**public library**				
elementary dining room- 2 shifts		1	3880	14		3,880
elementary serving and kitchen		1	5800	14		5,800
middle school dining		1	3390	14		3,390
middle school serving and kitchen		1	2814	14		2,814
					net community sf	**57,633**

Table 1, continued

space	class size	quantity	avg size (sf)	min ceiling height	min windows	net sf
Outdoor Spaces						
bus drop off		9	528			4,752
visitor parking		1	11746			11,746
outdoor learning areas		7	2093			14,651
outdoor play areas - min 50 sf per child @ 50 kids per play period		1	27721			27,721
kindergarten outdoor play areas		1	3221			3,221
					net outdoor space sf	**62,091**
Support Spaces						
admin reception		1	1655			1,655
admin offices		7	409			2,863
admin work area		1	1341			1,341
admin storage		2	573			1,146
conference room		1	678			678
guidance suite		1	1319			1,319
nurse's suite		1	2263			2,263
faculty room		1	969			969
teacher's resource space		3	665			1,995
special resource suite	12	1	2460	10	8% or greater	2,460
					net sf	**16,689**
					total net bldg sf	**128,462**
					multiplier for circulation, toilets and mechanical	0.37
					gross bldg sf	**203,908**
					gross site sf	**312,050**

* compiled from the "North Carolina Public Schools Facility Guidelines", September 2003, North Carolina State Board of Education

Occupancy Groups

A-3: Assembly

This group includes recreational, amusement, and worship uses not specifically falling under other Assembly groups, including, for example, galleries, auditoriums, churches, community halls, courtrooms, dance halls, gymnasiums, lecture halls, libraries, museums, passenger station waiting areas, and the like.

E: Educational

Educational uses include schools for grades K through 12 and day care for children older than 2 1/2 years of age, with 6 or more occupants. Day care for no more than 100 children 2 1/2 years of age or less may also be classified as an Educational use when each day care room is located on the level of exit discharge and has an exit door opening directly to the exterior.

Construction Types

A-3	no limitation based on needed square footage
E	Type I-A and I-B unlimited area; Type II-A, II-B. III-A and III-B sprinkled; Type IV-HT sprinkled or unsprinkled

Egress

A-3	minimum of 2 exits required when occupancy load is greater than 50 per room; 2 exits required per floor if occupancy is 500 or less
E	one exit for classroom; minimum of 2 exits required when occupancy load is greater than 50 per room; 2 exits required per floor if occupancy is 500 or less
Both	250’ max travel distance to point of egress (sprinkled) 20’ max dead-end corridor .2” per person egress width on level egress path; 44” minimum for less than 100 occupants; 72” minimum for occupancy greater than 100 .37” per person egress width on stairs or ramp egress path; 44” minimum


program
connections
holistic
social
ecotone
industrial
site
analysis
habitat
design
friendliness
introduction
scar
ecological
architecture
space
education
urban
systems
landscape
public
community
sustainable
constructed
found
living organisms
place
site
fabric
wound
recreation
conclusion
healing
precedents
regenerative
remnants
association
mixed use

figure 94: Regulating Lines

figure 95: Thick walls

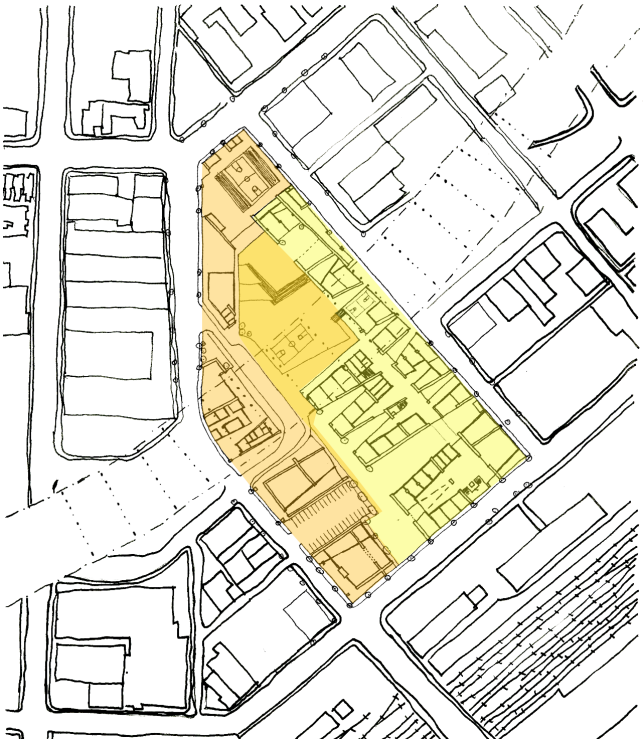

figure 96: community/ learner zones

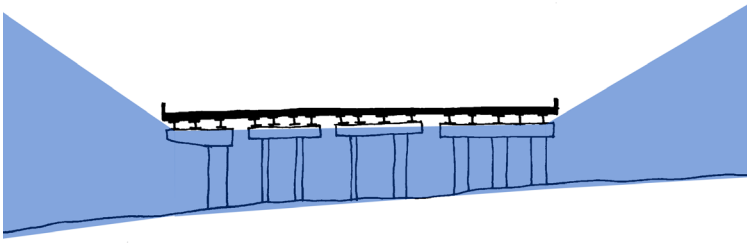

figure 97: compression/ expansion

figure 98: rain catchment

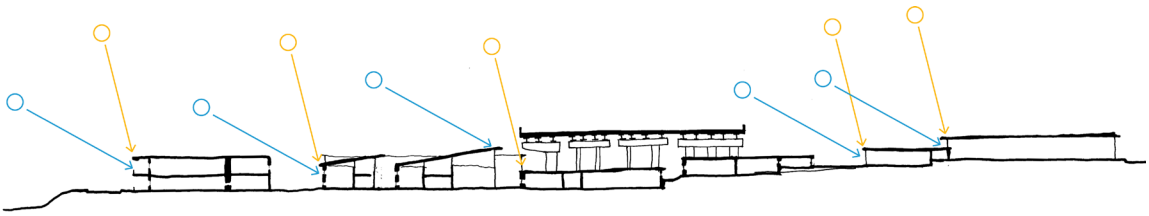

figure 99: solar access

figure 100: ventilation

figure 101: plan

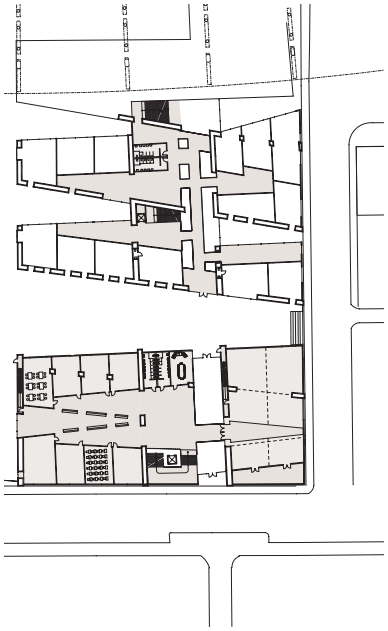

figure 102: upper level plan

figure 103: east elevation

figure 104: section a-a

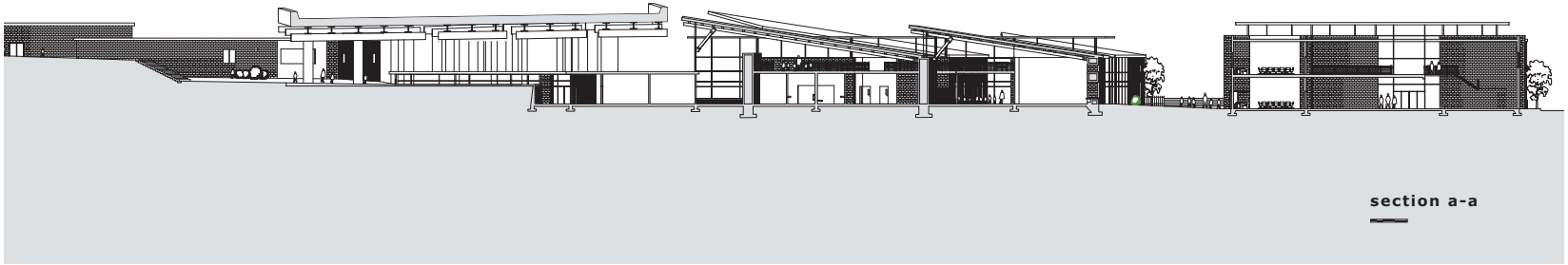

figure 105: section a-a, enlarged

vita

Heather Stone was born and raised in Asheville, NC. She attended Asheville Christian Academy for elementary, middle and high school. Upon graduating high school in 1995, she attended Carson-Newman College in Jefferson City, TN and earned her Bachelor of Arts with a double major in English and History. Teaching Teaching Outdoor Education gave her great joy for several years, but soon she discovered her new passion for architecture. She earned her Masters of Architecture in 2007 from the University of Tennessee, and began working as an intern architect with Craig Gaulden Davis.