Urban Interstate Rights-of-Way as Sites of Intervention

This paper proposes model of development that uses a critical piece of the sprawl infrastructure, urban interstate rights-of-way, as a catalyst for fundamentally changing the nature of the American City.

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INTRODUCTION

With increasing concern over the environmental and economic impacts associated with the sprawl that has characterized US urban development for over half a century, cities are searching for ways to redirect growth toward more benign patterns. The problems prompting this change are myriad: low-density development at the periphery of cities is consuming rural land while putting ever greater strain on municipal services; rising fuel costs are moving the ownership and operation of private vehicles beyond the reach of an increasing number of residents; the ethics and viability of current methods of feeding, powering, and managing the waste streams of our cities are being seriously questioned; car-based transportation systems are groaning with overuse while simultaneously generating landscapes that are antithetical to a sense of community and civic culture. This is just to name a few.

Not surprisingly, arresting and redirecting decades of urban inertia is exceedingly difficult. The task is made even more challenging by the fractured nature of ownership and the many competing interests seeking to shape the contemporary American city.

THE TROUBLE WITH URBAN INTERSTATES

While the US interstate highway system functions quite well in rural areas, difficulties quickly mount as it nears and enters cities. Routing interstates into cities required the acquisition in whole or in part of hundreds of pieces of property at a much higher per acre cost than in the countryside and presented significant construction difficulties in nearly every case. The resulting intrusions caused rifts in urban neighborhoods, often cut cities off from their waterfronts, and introduced a significant source of noise and air pollution. While connecting cities directly to a nationwide supply network, they also perhaps made it too easy for downtown businesspeople to zip to their suburban homes at the end of the work day,

encouraging those with means to abandon the urban core and inner ring neighborhoods. Though, this ease of commuting would prove an ever elusive mirage as increases in urban highway capacity incentivized even greater increases in traffic.

Such problems were foreseen at the time of the design and construction of the interstate highway system and its precursors, most notably by Lewis Mumford, Clarence Stein, Benton MacKaye and other members of the Regional Planning Association of America (RPAA).[1] However, the concerns they expressed were largely disregarded, particularly when the Federal Aid Highway Act of 1956 settled on a 90% federal / 10% state and local funding ratio. Municipalities across the country saw this as an opportunity to address transportation needs within cities despite the insistence of both the Eisenhower administration and most urban planners that these needs would be best met with mass transit systems.[2] Ironically, Eisenhower apparently misunderstood the effect that the 1956 act would have on cities and told participants in an Oval Office meeting that if he had known the interstates would enter city centers he never would have signed the act that created the highway system that now bears his name.[3]

From its earliest implementation, the urban segments of the interstate system were flashpoints for conflict. The associated unrest often pitted the residents of a city's neighborhoods against the political and economic power structure.[4] In fact, Jane Jacobs, one of the 20th century's most influential urban reformers, first came to prominence in just such a struggle. However, it wasn't until rather late in the urban highway building boom set off by the 1956 act that highway revolts had gained enough legal savvy to successfully stop construction in some cities.[5] Where urban highway construction did occur, in urban design terms, it was highly detrimental to the urban fabric; creating physical and psychological rifts that are extremely difficult to bridge and introducing a substantial source of noise and air pollution. Cities across the country continue to struggle with this legacy. Indeed, the removal of urban interstates is a growing trend in the US.[6] This paper posits that this trend, if carried to its logical extreme, can yield sites of intervention that hold the promise of remaking the American city.

SCOPE

According to the census bureau, in 2012 there were 228 US cities with between 100,000 and 300,000 population.[7] Upon inspection, many of these are revealed to be integral parts of larger metropolitan conglomerations. Take for example; Chandler, Glendale, Peoria, Scottsdale, Surprise, and Tempe, Arizona; all of which are included in the greater Phoenix area. Setting aside these large urban groupings and their particular entanglements with each other and the interstate system, one is left with 129 discrete mid-sized American cities (Figure 1). The interstate highway intersects or passes nearby nearly all of these. This, "chafe where the local and regional meet," is the locus of this proposal.[8]

Closer examination of the 129 cities identified as distinct places reveals that these cities interact with the interstate system in a variety of ways. These range from no interaction where the city is completely detached from the interstate system to highly complex interactions where the urbanized core is traced with a web of interstates. Athens, Georgia is an example of the former while Buffalo, New York is an example of the latter. The variation in the interface between urban fabric and interstate can be described by 28 typologies. Fifteen of these typologies are configured such that selected urban segments of the interstate system can be removed and, with no new highway construction, the system can still continue

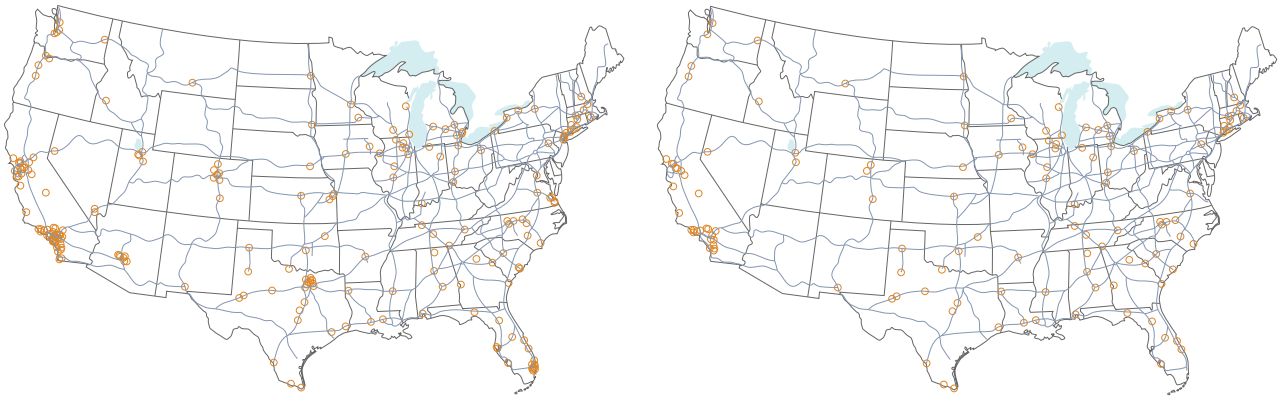

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Figure 1: (Left) Location of all mid-sized US cities in relation to the interstate highway system and (right) location of the 129 mid-sized cities identified as discrete locations in relation to the interstate highway system.

to function on a macro scale (Figure 2). We propose that this is exactly what should be done. Even operating in this focused way would yield 33 mid-sized cities where urban highway rights-of-way could be reclaimed and reprogrammed. Presumably, were the results favorable, they would suggest that the more entangled cities, which would require the construction of bypasses in order to reclaim the urban rights-of-way, would be worth the increased effort and expense.

CHARACTERISTICS OF URBAN HIGHWAY RIGHTS-OF-WAY

When considering urban highway rights-of-way as sites of intervention certain common characteristics are apparent:

1) They are large. Associated proposals will be the antithesis of acupuncture. These sites offer the possibility of thinking on a large scale and making sweeping proposals. This is not to say that these interventions can be insensitive. As noted below, they will need to be intricately linked to many finer-grained infrastructures.

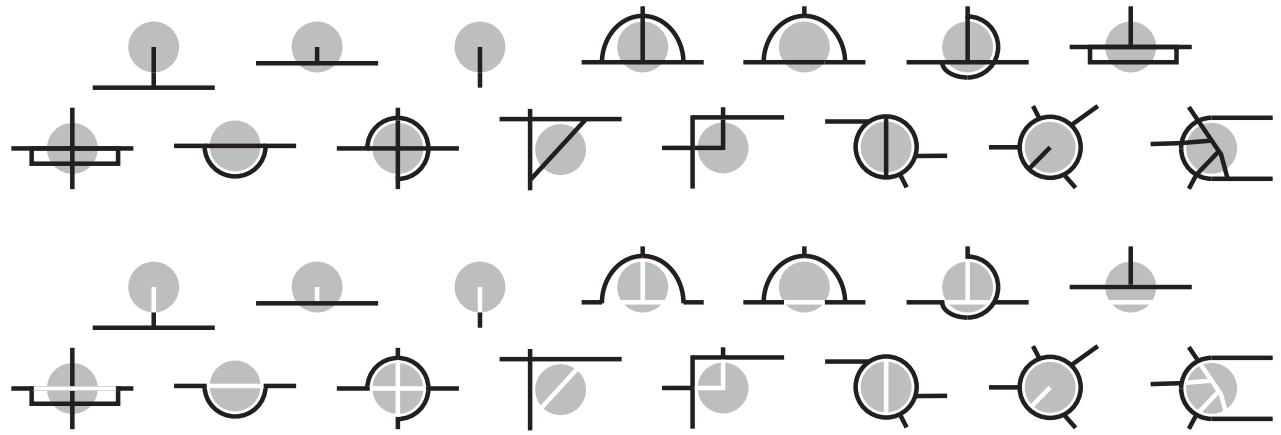

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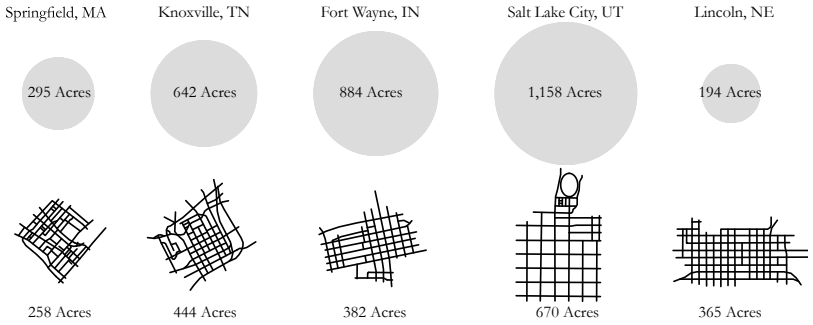
Figure 2: The fifteen types of urban/highway interface that allow for removal of certain segments and, with no new highway construction, still permit the interstate system to function. Shown (above) as they currently exist and (below) as they would look with selected urban highway segments removed.

It is also worth considering that these are currently large areas of urban land that are not generating any tax revenue. The value of this land is presumably substantial and therefore so too is the tax revenue cities could generate by putting them to a different use.

Examining a small sample of five cities (Fort Wayne, IN; Knoxville, TN; Lincoln, NE; Salt Lake City, UT; and Springfield, MA) selected for their diversity of size, age, typology, and geographic location finds that the areas represented by the reclaimed rights-of-way in most cases are larger than each city's central business district (Figure 3).

2) They are contiguous. Unlike most large urban landholdings, urban highway rights-of-way are by their very nature connected spaces. The basic logic of the construction of the interstate system held that the continuous functionality of the highway was of paramount importance. Allowing automobiles to transcend the stop and go traffic of the city streets was the very impetus for the construction of urban highways.[9] This single- minded insistence on privileging automobility over all other concerns has yielded sites of connectivity in urban landscapes otherwise characterized by the mosaic of heterogeneity. When considering these spaces for redesign, this characteristic opens the possibilities of inserting the networked systems of various urban infrastructures.



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3) They intersect many finer-grained infrastructures. As highways made their way through cities they necessarily encountered the many systems that comprise the urban fabric – streets, sidewalks, building stock, and (less detrimentally) storm water, power, and sewer systems. While local streets were sometimes maintained using grade separation, the highway passing either overhead or underneath creates a physical, auditory, and perceptual barrier separating one side from the other. The "missing teeth" of removed buildings in these areas contributes the sense of discontinuity. Often city streets were completely severed by the introduction of urban highways. The result is severe discontinuity in the urban realm with some neighborhoods either completely destroyed or left a shadow of their former selves (Figure 4).

4) They coincide with natural systems (particularly water systems). Of course, the urban realm is immersed in natural systems. The relatively unkempt areas alongside urban highways often contain unmanaged grass and tree populations that serve as habitat for small birds and wildlife. It is rather common for urban highways to closely follow water courses as these often represent both the path of least resistance through the surrounding topography and a preexisting cleared pathway through the urban fabric.

5) They coincide with urban ills. Preliminary investigation of urban highway rights-of-way in the identified mid-sized cities shows some correlation with several issues of social concern. These include food deserts, underperforming schools, poverty, and crime. While our investigation into these geographic correlations is ongoing, it is clear that they exist. (It is important to note that the existence of these relationships does not necessarily imply causation.) It is unsurprising to find such connections since urban highways were often routed through distressed neighborhoods and their introduction only further stressed these areas.

6) They are under unified control. Unlike most other sizable urban interventions, reclaiming urban highway rights-of-way would not require negotiating with multiple property owners each holding various interests or initiating imminent domain

Figure 3: The area of reclaimed rights-of-way compared to the area of the central business district in five selected cities. In all cases, the sizes are roughly comparable.

4

Figure 4: Compiled from right-of-way acquisition drawings from projects funded by the Federal Aid Highway Act of 1956, this diagram shows the extent of properties and city streets claimed for the construction of the interstate in one Knoxville neighborhood.

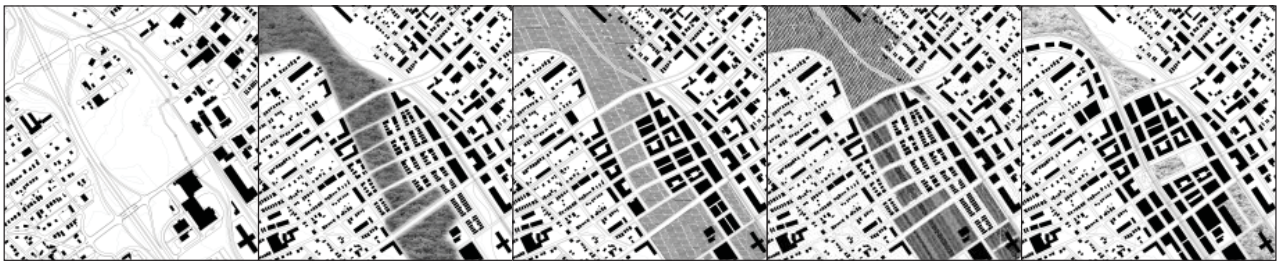
proceedings. Ironically, this delicate and complex work was done when the highways came through cities. This transition of ownership from private to public and from multiple hands to few has created a legal framework in which the removal becomes feasible.

While the rights-of-ways often have overlapping federal, state, and municipal control and responsibility, aligning these entities, particularly when the instigating impulse comes from the local level, is much easier that assembling large, networked areas of urban land from multiple owners.

MONOCULTURES: FOUR THOUGHT EXPERIMENTS

Arguing for the reclamation and redesign of urban highway rights-of-way necessarily leads to the consideration of the appropriate form for the proposed intervention. As a way of beginning to answer this question we have proposed four thought experiments each of which has performative, spatial, and connective implications for the city. The proposals are monocultures for the purpose of isolating specific issues and drawing them into high relief. Each is applied to the right-of-way in the primary study city, Knoxville. The four monocultures are urban forest, energy, food, and transit/density.

1) In this context an **urban forest** is a managed wooded area that provides several outcomes, the most obvious being that residents would enjoy increased recreational opportunities. In fact, in the particular instance of Knoxville, with very little additional work the right-of-way forest could be linked to an existing urban wilderness system. Additionally, forested land would provide the natural benefits of shade, improved air quality, more natural storm water absorption, and habitat. Finally, through proper management, the forest would produce between 160,000 and 192,000 board feet of lumber each year.[10] As early as 2001, the US Forest Service recognized the growing importance of urban areas in forest productivity noting that urban areas accounted for 3.5% of the nation's land and stating that, "[a]s landscapes become fragmented and more urbanized, more forests will be managed by urban residents and institutions."[11]



Existing Condition | Urban Forest | Energy | Food | Transit | Density

5

This monocultural intervention would lend itself to reconnection of the severed city grid, though not the reestablishment of the continuity of the urban fabric along the reconnected streets. It would likely attract residential and recreational development to adjacent areas as these uses would view the urban forest as a significant asset. As the forest matured it would limit opportunities for useful solar gain for areas located along its northern edge.

2) As an **energy** landscape monoculture the right-of-way begins to address the supply side of Architecture 2030's challenge that our built environment become carbon neutral. We can imagine the entire reclaimed right-of-way in [name withheld for anonymity] converted to a photovoltaic array. Assuming a panel tilt equal to the city's latitude (36%) and spacing the panels so as to avoid overshadowing during the winter solstice yields 1,814 m2 of panels per acre or 1,178,240 m2 of panels over the entire right-of-way. Annual insolation on one m2 of flat plate collector with tilt equal to latitude in [name withheld for anonymity] is 1,713.5 kWh.[12] If we take a reasonable PV panel efficiency of 15% this yields electrical production a bit over 473 MWh/acre/year or 302 GWh/year if the entire right-of-way were put to use. As way of comparison, according to the Knoxville Office of Sustainability the average city household uses 1,302 kWh of electricity annually.[13] Thus, the full installation would power nearly 232,000 homes.

As has been noted by Chris Ford, electricity infrastructures in urban areas enjoy a significant efficiency advantage compared to those in remote locations as they have much lower transmission loses.[14] His work also points to the possibility of increasing the output of urban energy landscapes by augmenting photovoltaic output with vertical axis wind turbines and geothermal wells – possibilities that are disregarded here for simplicity.

As a photovoltaic energy production landscape would be very sensitive to overshadowing, it would necessarily limit tall development along its southern edge. To maximize load matching and minimize the need for electrical storage, ideal adjacent development would consist of business and civic uses with a daytime activity schedule. Like the urban forest, his monoculture would allow for reconnection of the street grid but not for the reestablishing of the continuity of the urban fabric through the former right-of-way.

3) As a landscape for **food** production, the contiguous nature of a highway right-of-way lends itself to the efficiency found in larger farms but often lost in smaller urban farming situations. Despite this benefit, it is not suggested that a right-of-way farm could feed its associated city. Rather, such a farm is seen as significantly augmenting the city's diet with food that can be provided fresh and with very little associated transportation energy. Greenhouses could be used to extend the productive season. While the addition of animals to the farm products could increase

Figure 5: Diagrammatic representations of the four monocultures – urban forest, energy, food, and transit/density – on the same stretch of urban highway right-of-way in Knoxville.

the diversity of its yield, that possibility is discounted here for simplicity and in light of the noise and odor concerns that animal husbandry raises in urban areas.

Agricultural extension information provided for a growing region similar to that of Knoxville suggests that the following growing seasons and yields are expected: tomatoes June – November at 10-15 tons/acre; spinach February - April at 3.5-7.5 tons/acre; sweet corn May – September at 248 crates (with 4-6 dozen ears each)/acre.[15] If one were to focus on maximizing useable nutrition per acre, roots and tubers could compromise a greater percentage of the crops, with sweet potatoes promising to produce some 28,000 calories per acre per day.[16] At this output, use of the entire right-of-way for farming could provide 30% of the recommended daily caloric intake for a bit more than 22,000 adults.

Much like the first two examined monocultures, urban farming would allow for selected reconnection of the street grid but would discourage the reestablishment of the urban fabric along these new streets. Further, if mechanized farm implements were used a conflict would be created as they crossed these new connecting streets to access each field. Housing, restaurants, and food markets are recommended adjacent uses when attempting to match supply and demand of foodstuffs. Tall development would be detrimental along the southern edge of fields planted with crops requiring full sun for development. Finally, agriculture's need for reliable irrigation makes large scale water collection and storage strategies a logical companion use.

4) The final monocultural intervention examined here is at once historically referential and a forward-looking response to some of the contemporary difficulties of the American city. By repopulating the right-of-way with **density and transit** one has the possibility of rediscovering the urban structure that was lost when the interstate was constructed. Neighborhoods can be restitched, streets reconnected, buried streams daylighted, and cultural institutions reintroduced to areas where they have been wiped away. By taking advantage of the connected nature of the reclaimed right-of-way a new transit backbone, such as light rail or bus rapid transit, can be introduced that is more urban, efficient, and egalitarian than the interstate. Focusing new development into walkable multiuse nodes along this new spine creates the possibility for residents to enjoy rich, active, low-energy lifestyles – the antithesis of the opportunities presented by the interstate.

In Knoxville's reclaimed right-of-way—if we were to set aside 20% of the space for new transit infrastructure, civic uses, and open spaces, developing the remaining space to a relatively modest 1.5 FAR—would yield 10,500 new dwelling units at a healthy 1,200sf average size, commercial space to support 19,300 new jobs, and office space to support an additional 44,000 jobs – all values that rival or surpass those currently found in the central business district. This does not take into account any growth that would be sparked in the areas adjacent to this new urbanized corridor.

Of all of the monoculture thought experiments, this one has the greatest opportunity for reestablishing the complete continuity of the urban fabric and the greatest flexibility with respect to the location of uses. Though providing nothing tangible in the form of outputs, its contribution to city property tax rolls would be significant.

CONCLUSION

Ultimately, the promise inherent in the repurposing urban highway rights-of-way

must be greater than presented by any one of the monocultural scenarios outlined here. Undoubtedly the "appropriate" design would be a hybrid of all of these systems and more. Yet, these thought experiments point out some of the possibilities. By viewing the rights-of-way of the urban interstates through these lenses we imagine them as fields lying fallow awaiting their next iteration. They help us crack the veneer of permanence presented by the urban interstates and allow us to question their inevitability. Thus, urban highway rights-of-way ironically become placeholders for new, complex directions of American urbanism – an opportunity to replace an inherently anti-urban form with a rich urban ecosystem able to catalyze all it touches.

This is an audacious vision but no more audacious than the vision of the interstate system before it was constructed. In fact, it is quite similar in terms of its national scope and its local entanglements. The proposal aligns itself with Stan Allen's notion of infrastructural urbanism in that it is concerned with performative aspects of the city and, "understands architecture as a material practice – as an activity that works in and among the world of things."[17] It further posits that this material manipulation is intricate and has a broad responsibility to diverse constituencies. Such responsibility, if taken seriously, must necessarily lead American urban design away from the sprawl model typified by the urban interstates and fueled by financial and legal systems that commodify suburban land. Such a shift in thinking will reveal that urban interstate rights-of-way are not being put to their highest and best use and will allow us to begin to ask what highest and best might look like for the 21st century American city.

ACKNOWLEDGEMENTS

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ENDNOTES

1. See for example, Lewis Mumford, *The Highway and the City* (New York: Harcourt Brace Jovanovich, 1953) or Benton MacKaye, "The Townless Highway" *The New Republic* 62 (1930): 93-95.
2. Raymond A. Mohl, "Ike and the Interstates," *Journal of Planning History* 2 (2003) 247.
3. Gary T. Schwartz, "Urban Freeways and the Interstate System," *Transportation Law Journal* 8 (1977) 202-204.
4. For an exhaustive recounting of freeway revolts in the US see Raymond A. Mohl. "Stop the road: freeway revolts in American cities." *Journal of Urban History* 30, no. 5 (2004): 674-706.
5. Ibid.
6. See for instance Jeffrey Spivak, "Top 10 Metro Highway Removal Projects." *Urban Land*, accessed 11 July 2013. http://urbanland.uli.org/Articles/2011/September/SpivakTopTenHighway. Or Tyler Falk, "Top 12 Urban Highway Removal Projects." In *Smart Planet*, accessed 11 July 2013. http://www.smartplanet.com/blog/cities/top-12-urban-highway-removal-projects/1953.
7. Census Bureau, "Incorporated Places and Minor Civil Divisions Datasets: Subcounty Resident Population Estimates: April 1, 2010 to July 1, 2012" Accessed 9 July 2013. http://www.census.gov/popest/data/cities/totals/2012/SUB-EST2012.html
8. Jonathan D. Solomon, "On a Post-Fordist Infrastructure." In *Pamphlet Architecture 26: 13 Projects for the Sheridan Expressway, a.k.a. Jump, Slump, Hump, Bump – Guide Specifications for a Post-Fordist Infrastructure*, Johnathan D. Solomon (New York: Princeton Architectural Press, 2004), 20.
9. Ted Shelton, "The Highway comes to the American City: Automobility, Urbanity, and the Functioning of City Streets" in *Nuts and Bolts of Construction History: Culture,Technology, and Society,* Vol. 3, ed. Robert Carvais, André Guillerme, Valérie Nègre, and Joël Sakarovitch, (Paris: Éditions Picard, 2012), 627-635.
10. Email correspondence with Wayne Clatterbuck on 13 September 2013.
11. US Forest Service, *U.S. Forest Facts and Historical Trends*, United States Department of Agriculture publication number FS-696-M, September 2001.
12. National Renewable Energy Laboratory. "30-Year Average of Monthly Solar Radiation, 1961-1990" at http://rredc.nrel.gov/solar/old_data/nsrdb/1961-1990/redbook/sum2/state.html, accessed 16 Sep 2013.
13. City of Knoxville "Citizen's Guide to Sustainability" at http://www.cityofknoxville.org/sustainability/energyconservation.pdf, accessed 16 Sep 2013.
14. Chris Ford, "REIs: Renewable Energy Infrastructures v1.0" in *Eco-Architecture III: Harmonisation between Architecture and Nature*, ed. S Hernandez, et al, (Southampton: WIT Press, 2010), 590-591.
15. Douglas C. Sanders, *Fresh Market Tomato Production: Piedmont and Coastal Plain of North Carolina*.; Douglas C. Sanders. *Spinach*.; and Jeanine M. Davis, *Organic Sweetcorn Production.* All published as part of the Horticulture Information Leaflet Series, North Carolina State University.
16. Will Oremus, "I Think, Therefore I Yam: When farmland is scarce, will we eat roots and tubers?", slate.com, posted 12 June 2012.
17. Stan Allen, "Infrastructural Urbanism." Points+ Lines: Diagrams and Projects for the City (1999): 52.