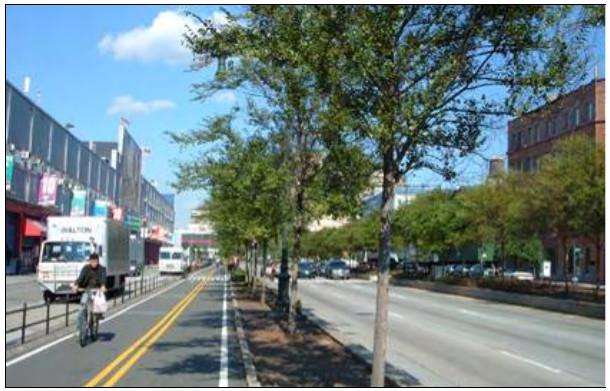
Case Studies of Urban Freeways for *The I-81 Challenge*



Syracuse Metropolitan Transportation Council

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Cover photos (clockwise from top left): Octavia Boulevard, San Francisco, CA; Whitehurst Freeway, Washington, DC; Westside Highway, New York, NY; Route 183, Austin, TX; Cleveland Memorial Shoreway, Cleveland, OH; Marquette Interchange, Milwaukee, WI.

Behan Planning and Design, Smart Mobility, Inc., and Plan-it Consulting conducted the research for this report and produced the initial version of the document.

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CASE STUDIES FOR *THE I-81 CHALLENGE*

OVERVIEW

About *The I-81 Challenge*

As many people in Onondaga County are learning, portions of I-81 are nearing the end of their lifespan. This is particularly true of the elevated sections of the highway in downtown Syracuse. Over the next decade, these portions of the road will need to be replaced, reconstructed, removed, or otherwise changed. Given this reality, the Syracuse region, including the road's owner, the New York State Department of Transportation (NYSDOT), is faced with a challenge: what should be done with I-81.

This discussion has already started. In fact, government officials, local organizations, and members of the public have already offered numerous ideas about the future of I-81: remove the elevated portion (the viaduct) and replace it with a boulevard, route traffic onto I-481 and decommission I-81 between the I-481 interchanges, bury the elevated portion underground and cover it with a park, or rebuild the viaduct at a higher elevation with a more attractive design. Ultimately, the region is still several years from a final decision on the future of I-81 – a choice this large must involve the whole community in a thoughtful, deliberative dialogue. But these ideas provide a starting point for the official I-81 decision-making process, which is beginning right now.

In the Fall of 2009, the New York State Department of Transportation (NYSDOT) and the Syracuse Metropolitan Transportation Council (SMTC) launched *The I-81 Challenge*, the official process to determine the future of I-81 in the greater Syracuse region. Together, these two entities are trying to engage the community in developing and evaluating options for the future of the highway. *The I-81 Challenge* will consider the needs of and impacts to the entire I-81 corridor within the SMTC's planning area, from the southern boundary of Onondaga County to just over 6 miles into southern Oswego County[i]. This report – as just one element of *The I-81 Challenge* – focuses on potential outcomes for the viaduct section in downtown Syracuse. This report is intended to provide information about the range of outcomes, processes, and alternatives considered by other regions facing similar challenges.

Challenges Faced by Other Regions

Freeways have been constructed through the downtowns of many cities across the United States. Many of these highways were constructed in the 1960s or 1970s, and were intended to ensure economic viability in an era when suburban growth, along with car ownership and use, was accelerating. It was feared that without the direct connections that highways provided, the cities would die. At the time, there were differing opinions about these decisions to locate highways through the centers of cities; in hindsight, there are decidedly mixed conclusions as to whether the highways have done more harm or good. Some argue that urban highways resulted in collateral damage in the form of environmental, social, aesthetic, and economic impacts on the city, contributing to the decline of these urban areas in recent decades. Others emphasize the positive role that these highways play in providing access to downtowns and moving people and goods regionally.

Many of these highways are now over fifty years old and are in need of major investment. In some cities, this has been viewed as an opportunity to address any negative impacts associated with the first generation of urban highway construction, and, depending on the highway's role in the regional transportation

[i] The SMTC's official Metropolitan Planning Area includes all of Onondaga County plus small portions of Oswego and Madison Counties.

network, to broadly reconsider the future infrastructure and mobility needs of the city and the region. However, addressing the challenge of an aging urban highway can be a very difficult and sometimes contentious issue. There are many potential options and impacts to consider.

Today's regulatory environment adds to the complexity of such a decision. Unlike the era when much of our interstate highway system was built, consultation with a far broader range of interests and individuals and consideration of a broader range of alternatives are now mandated by law. While this may make it more difficult to develop and implement changes to our urban highways, the required processes also ensure that large decisions such as these are made in a more inclusive and comprehensive manner than they were in the past.

The Syracuse region is not alone in facing this situation. This report tells the stories of some of the other cities and regions that have faced challenges comparable to that of Syracuse and the I-81 corridor. All of the cases included in this report involve the major reconstruction or reconfiguration of an urban limited access highway. Some are completed projects, and others are in various stages of planning and public discussion. Although there may only be a few cases that are directly comparable to the I-81 corridor, all of these projects can offer insight into some aspect of *The I-81 Challenge.*

Outcomes of Urban Freeway Projects

The case studies presented here offer a wide array of options for consideration as we begin to explore possibilities for the future of I-81 in Syracuse. Common outcomes that have been considered include:

- **Reconstruct an elevated highway**: The East-West Expressway, an elevated toll highway through downtown Orlando, was recently reconstructed using design techniques that reduced the potential negative impacts of the highway. These included raising the elevation of the highway to reduce noise and shadowing, treating the piers and abutments with public art installations, and designing the space under the highway for active, creative uses. For embanked sections (i.e. constructed on fill rather than on a structure or viaduct), terracing and landscaping were used to soften and enhance the highway's appearance.

- **Bury the highway**: Boston's Big Dig provides a recent example of tunneling a major interstate highway under the center of a historic city. While the Big Dig has resulted in the creation of open space and improved traffic flow, the costs and complexity of the project have also been enormous. For Seattle's Alaskan Way Viaduct and Brooklyn's Gowanus Expressway, favored alternatives include deep bored tunnels to serve through traffic, combined with improved surface streets and transit service. Deep bored tunnels have less impact during construction than the "cut and cover" type employed in Boston, but typically only serve through traffic and do not provide intermediate access points.

- **Depress the highway:** Fort Washington Way/I-71 in Cincinnati was reconfigured as a narrow, depressed highway, which allowed numerous wide at-grade street crossings that improved the connectivity of the city's street system and opened the Ohio Riverfront to development. Several cities have "capped" their depressed highways with parks (as in Seattle's "Freeway Park"), or with development (as in the Union Station district in Columbus, OH).

- **Relocate the highway**: Rhode Island's I-Way project involved relocating the elevated I-195 highway from downtown Providence to a nearby industrial corridor. This opened up valuable redevelopment areas and is allowing the city to reconnect parts of the downtown street grid. It is often difficult to find a new alignment for a highway in a dense urban area due to the potential for localized impacts and opposition.

- **Remove the highway and replace with a boulevard**: Three cases where freeways were replaced with a boulevard, including the Embarcadero and Central Freeway in San Francisco and the West Side Highway in New York City, occurred after the highways were closed due to unexpected infrastructure failures. There were no plans in place to reconstruct the freeways, so the cities had to adapt to life without the highways. As time

went on, public support for replacing the freeways declined, and eventually each was replaced by a surface street. The aging Park East Freeway in Milwaukee was converted to a boulevard rather than reconstructed, allowing for redevelopment of the city's riverfront.

Lessons from the Case Studies

These case studies can offer many lessons for *The I-81 Challenge*. No single case study offers the answer for I-81 and the Syracuse region. Many of the examples cited in this document are not Interstate facilities, which may limit their applicability to I-81, since the Interstate designation carries with it certain design standards and functional characteristics that do not need to be considered for non-Interstate facilities. The cases here are meant to present a set of ideas for the community to think about as a starting point in the dialogue about the future of I-81.

Urban Traffic Circulation and Mobility

Each of the cases describes a unique situation in terms of a highway's importance in providing access to a downtown and serving long distance through travel. There are diverse situations among these case studies in terms of traffic volumes, growth rates, and transportation alternatives (i.e. robust mass transit, street network capacity, or bypass routes). While none are identical, most of these offer some parallels to *The I-81 Challenge*.

Some of the cases illustrate the concept of "induced demand," in which traffic responds relatively quickly to available highway capacity. This is most often demonstrated in cases where a highway is constructed or expanded, and cars seem to arrive out of nowhere to use the new road, quickly exceeding traffic volume forecasts. The converse is also true, and the cases of freeway closures have shown that traffic can be highly adaptable, making use of alternate routes when necessary.[1] Under the right circumstances – a dense urban street grid, other parallel highways, or a well-developed transit network - the impacts of a freeway closure can be greatly minimized as people find other ways to get to their destinations.

The most successful projects integrate highway, street, and transit improvements to focus broadly on urban mobility. Boston's Big Dig was accompanied by a parallel effort to significantly upgrade and expand the transit system, both to mitigate the short-term impacts of construction and to provide a long-term supplement to the highway system. Seattle's Alaskan Way Viaduct process included developing an Urban Mobility Plan for the downtown area first, so that all alternatives could work toward the goals established in the plan. In order to successfully plan the future of I-81, consideration should be given to the city and the region's overall urban mobility goals.

Urban Design and Economic Development

The era of interstate highway construction resulted in many new highways in downtown urban areas that were intended to aid the local economy by making them more accessible. Years later, it is clear that these highways had both positive and negative effects. Freeways can play an important role in bringing workers and visitors to and from the downtown. Freeways also provide regional mobility, carry freight traffic, and bring economic benefits to a region. However, freeways are sometimes perceived by the community as responsible for urban blight and decline.[2] Economic and aesthetic considerations have been dominant factors in many projects involving reconstruction or reconfiguration of urban freeways, such as the Big Dig in Boston, the Embarcadero in San Francisco, and the Park East Freeway in Milwaukee (note that the latter two examples are not Interstate facilities). Substantial improvements to the urban environment have resulted, stimulating economic development or creating new public spaces.

Some projects, such as the I-71 improvements in Cincinnati, did not remove or bury the highway, but reduced its scale to make room for economic activity and urban redevelopment and lessen its barrier effect. Others, such as the East West Expressway in Orlando and the Marquette Interchange in Milwaukee, have included aesthetic enhancements, such as decorative concrete imprinting on the overpasses and murals depicting local historic events. These projects have just been completed, and while they have improved highway operations and increased capacity, it is too early to know if their design enhancements will be viewed as an improvement to conditions adjacent to these highways.

The Route 183 Freeway in Austin used piers for the elevated structure that have a much narrower base, and therefore allow more light penetration underneath the highway. Increasing the elevation of freeway viaducts can reduce the effects of noise and shadowing on the ground level. However, these facilities have fewer access points due to their higher elevation.

The "capping" of a depressed freeway offers additional possibilities to create a positive urban environment. While the Big Dig in Boston is the primary example included in this report, there are other smaller scale examples that may be relevant for I-81, including Seattle's "Freeway Park" on a depressed section of I-5, and Columbus, Ohio's Union Station shopping district, which is constructed over a depressed section of I-670 near downtown.

Planning and Decision-Making Process

The case studies represent a wide range of planning, decision-making, and political processes. Some of the freeway projects were the result of catastrophic structural failures, which forced an abbreviated planning and decision-making process on the community. Others have been the subject of protracted discussion, controversy, and changes in attitudes, which have made achieving consensus difficult. In several instances, city-wide votes were held to advise decision-makers of voters' preferences among competing alternatives.

Several projects stand out for their success in terms of public and stakeholder engagement, consensus-building, and, ultimately, efficient implementation. The processes for the I-Way in Providence and the Fort Washington Way/I-71 in Cincinnati were characterized by early consultation with a wide range of stakeholders and a balanced consideration of urban design, economic, and transportation concerns. These projects placed a priority on addressing the perceived negative impacts of the highways and included major urban redevelopment components. This approach served to generate enthusiasm and support from the broader community, providing momentum to carry the projects smoothly through funding and implementation.

Conversely, there are numerous examples of less harmonious and efficient planning processes. The earthquake-damaged Central Freeway in San Francisco was the subject of a great deal of controversy and dispute between the city and the California Department of Transportation (CalTrans). Voters weighed in three different times in community-driven ballot initiatives, with two votes in support of replacing the freeway with a boulevard, and one vote supporting freeway reconstruction.

The Gowanus Expressway example illustrates how a process can be derailed when the community is not engaged up-front in the process. The Gowanus project began in the 1980s as an engineering-driven reconstruction project, which did not adequately engage the community in its early stages. This resulted in a proposed alternative that focused solely on moving traffic and did not address any of the highway's negative community impacts. A coalition of local community organizations filed a lawsuit to stop the reconstruction of the viaduct. The project was subsequently re-started with the active involvement of a community stakeholder group.

Seattle's Alaskan Way Viaduct also experienced setbacks when reconstruction and tunnel alternatives, preferred respectively by the state and city, were both rejected in a city-wide vote. These alternatives both required the highway to be closed for five years, were perceived by many as too narrowly focused on moving cars, and were never compared to an alternative replacing the highway with a boulevard and streetcar line. After the vote, the project was re-started as a collaborative planning process including a broader range of participants and alternatives.

One interesting model of incorporating community concerns into the decision-making process was used in the Bruckner/Sheridan project, in the South Bronx area of New York City. In earlier stages of this project, community members were not happy with the highly technical decision-making criteria that did not, in their view, adequately reflect local goals and concerns. However, it is sometimes impossible to develop numerical measures of important community criteria. A renewed effort was made to address this by convening a panel of local and state experts to rank alternatives based on qualitative criteria. For example, the panel was asked to rank

the alternatives in terms of how well community aesthetics were addressed. These rankings were then averaged into scores, allowing these aspects that are important yet difficult to measure to be on equal footing with more traditional criteria in the decision-making process.

These examples illustrate the importance of including a diverse range of stakeholders in the planning process and the benefit of identifying a broad range of alternatives from the start. An inclusive and comprehensive approach to the planning and decision-making process is likely to result in a more efficient process and a better outcome.

Success Stories

The projects that have proceeded most efficiently and effectively to implementation are those that recognized the importance of balancing the impacts of the highway on the urban environment, the economy, and the transportation network. Broad-reaching public engagement is also an essential component of a successful process. In the cases presented here, this type of approach tended to garner support from a large cross-section of the community and gave these efforts the momentum needed to proceed through a complex process of planning, design, and permitting.

Even in the best cases, these types of major projects take years to study, discuss, debate, and design. Many processes that ultimately resulted in successful projects did not necessarily move in a straight line from concept to implementation. The Syracuse region will need patience, persistence, and willingness to listen to all concerns in order to meet *The I-81 Challenge*.

Case Studies for *The I-81 Challenge*

This report does not present every possible case study, but is intended to cover a wide range of outcomes and design options. Each project involves a major highway in an urban area in the United States. The next page provides summary tables of the case studies for built projects and for projects that are still in the planning and design stage. The tables are followed, on subsequent pages, by descriptions of each case study.

The case study descriptions vary in length and detail, based on both the potential relevance of the project and the availability of reliable information. In each built project case, after a brief description, the following questions are addressed:

- What was the decision-making process?
- What were the outcomes?
- Are there parallels to *The I-81 Challenge*?
- What can we learn from this project, in terms of urban traffic circulation, economic development, and the political/public process?

For projects that are still in the planning and design stage, the project descriptions are followed by short discussions about what *The I-81 Challenge* can learn from the efforts underway in each case.

Following the case studies is a brief sampling of international examples. While it is not possible to compare these cases from abroad directly to our domestic examples, they do offer some compelling planning and design concepts and a different view of the role of freeways in cities.

Table 1: Urban Freeway Case Studies – Completed Projects

Highway	Type of Project	Inter-state?	Through traffic?	Vehicles /day	Length	Context	City	Year of completion	Cost (millions, in construction year $)*	Cost per mi. (million $ per mile)	City Population (at time of project)
Reconstruct the highway/new construction											
US 183 Viaduct	New elevated highway	no	yes	86,000	3.6 mi.	suburban	Austin, TX	1997	$ 281	$78	681,804
Marquette Interchange	Reconstructed an elevated highway interchange	yes	yes	300,000	n/a	downtown	Milwaukee, WI	2008	$ 810	n/a	602,191
East West Expressway	Reconstructed and widened an elevated highway	no	yes	140,000	16.0 mi	downtown	Orlando, FL	2008	$ 640	$40	213,223
Bury the highway											
I-93/Central Artery	Replaced an elevated highway with a tunnel	yes	yes	200,000	1.8 mi.	downtown	Boston, MA	2007	$ 15,000	$8333**	559,034
Depress the highway											
Fort Washington Way/I-71	Reconfigured a depressed highway	yes	yes	113,000	1.3 mi.	waterfront	Cincinnati, OH	2000	$ 146	$112	287,540
Relocate the highway											
I-195/The "I-Way"	Relocated an elevated highway and major interchange	yes	yes	152,800	0.5 mi.	waterfront	Providence, RI	2010	$ 610	$1,220	176,862
Remove the highway											
Park East Freeway	Removed an elevated highway and replaced with a boulevard	no	spur	40,000	1.0 mi.	waterfront	Milwaukee, WI	2003	$ 25	$25	596,974
Westside Highway	Removed an elevated highway and replaced with a boulevard	no	yes	140,000	4.7 mi.	waterfront	New York, NY	2001	$ 380	$81	7,894,862
US 99W/Harbor Drive	Removed an at-grade highway and replaced with a riverfront park.	no	yes	25,000	3.0 mi.	waterfront	Portland, OR	1974	n/a***	n/a	437,319
Embarcadero	Removed an elevated highway and replaced with a boulevard .	no	spur	61,000	1.6 mi.	waterfront	San Francisco, CA	2001	$ 171	$107	723,959
Central Freeway	Removed an elevated highway and replaced with a boulevard	no	spur	93,000	0.6 mi.	downtown	San Francisco, CA	2005	$ 50	$83	739,426

* For comparison, the programmed funds in the SMTC's 2007-2012 Transportation Improvement Program (the multi-year listing of federally-funded infrastructure projects in the Syracuse Metropolitan Area) total $306,117,056.

** This cost per mile calculation includes a tunnel under Boston Harbor in the total project cost, in addition to burying I-93.

*** Not available due to age of project.

Table 2: Urban Freeway Case Studies – Planning and Design Projects (Not Completed)

Highway	Type of Facility (existing)	Interstate?	Through traffic?	Vehicles /day	Length	Context	City	Stage	Estimated cost (millions)	City Population
Existing at-grade highways										
I-895/Sheridan Expressway	at grade highway	yes	yes	41,000	1.2 mi.	high density urban	Bronx, NYC, NY	EIS	$413	1,373,659
Cleveland Memorial Shoreway/Route 6 (West)	at grade highway	no	spur	45,000	8.0 mi.	waterfront	Cleveland, OH	planning	$77	596,974
Existing elevated highways										
Gowanus Expressway	elevated highway	yes	yes	198,000	3.8 mi.	high density urban	Brooklyn, NYC, NY	EIS	$2,400 – 12,800	2,528,050
Highway 99/Alaskan Way	elevated highway	no	yes	103,000	2.8 mi.	waterfront	Seattle, WA	EIS	$1,913	582,454
I-84/Hub of Hartford	elevated highway	yes	yes	172,000	1.0 mi.	downtown	Hartford, CT	planning	unknown	124,512
I-10/Claiborne Expressway	elevated highway	yes	yes	69,000	2.0 mi.	downtown	New Orleans, LA	planning	unknown	288,000
Whitehurst Expressway	elevated highway	no	yes	42,000	0.6 mi.	waterfront	Washington DC	planning	unknown	591,833
I-83/Jones Falls Expressway	elevated highway	yes	spur	55,000	1.0 mi.	downtown	Baltimore, MD	concept	$1,000	631,366
I-81 Viaduct	elevated highway	yes	yes	100,000	1.4 mi.	downtown	Syracuse, NY	planning	unknown	140,658

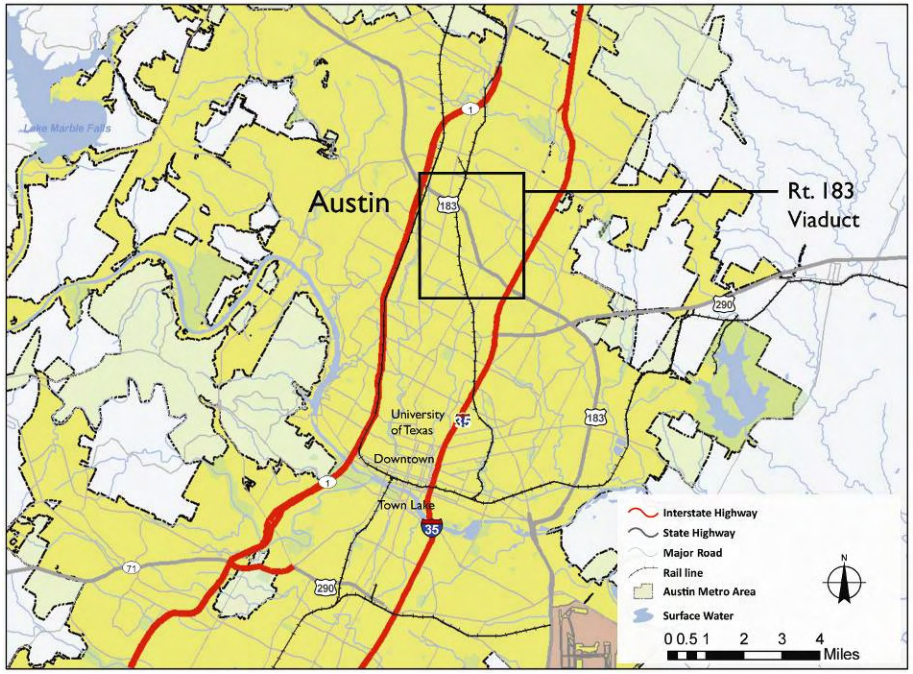
COMPLETED URBAN HIGHWAY PROJECTS

Route 183, Austin, TX

	Route 183	I-81
Project type	new viaduct (elevated highway)	existing elevated highway - TBD
Interstate highway?	no	yes
Through traffic?	yes	yes
Vehicles /day	86,000	100,000
Project length	3.6 miles	1.4 mi.
Context	suburban, primarily commercial	downtown
City	Austin, TX	Syracuse, NY
Population	681,804	140,658
Timeline	planning in the mid-1980s; construction of entire corridor in phases from 1991 to 1997	unknown
Cost/Cost per mile	$281 million/ $78 million per mile	unknown

In 2005, the US 183 corridor, on the north side of Austin, TX, was upgraded from an arterial street to form a partial freeway loop around the city. The heavy commercial development along the northern portion of the corridor and narrow right-of-way led to the decision to elevate the freeway lanes between I-35 and the Mo-Pac Expressway (TX Rte 1). The community was concerned about the aesthetics of an overhead structure, but an at-grade freeway would have had huge property impacts and acquisition costs. As a compromise, the viaduct was designed to mitigate the potential negative aesthetic impacts of an elevated freeway. The design goal was to create a transparent and attractive bridge structure with attention to details. Concrete forms were used to replicate traditional architectural themes in the pier design.

Location



What was the decision-making process?

The project followed the Texas Department of Transportation (TXDOT) project development process, which included an Environmental Impact Statement (EIS). Public outreach was particularly focused in the final stages of design, as decisions were made about the type of structure and its appearance. Because of the extremely rapid population growth in the region, freeway expansions are not uncommon, and all of the "build" alternatives included a freeway in some form. A variety of design options were explored, including grade level and elevated freeways.

The project was originally conceived in the 1990s. The first actual components to be constructed were the freeway interchanges with Route 1 and I-35 at either end of

the segment. Work began on the new freeway in 2001, and construction continued incrementally until its completion in 2005.

What were the outcomes?

Locally, the design of the viaduct is considered successful and attractive, especially when compared to other elevated highways in the area. TXDOT has since used similar aesthetic bridge design treatments on other projects in the Austin area, such as architectural details imprinted in the concrete piers (see photo below). However, the elevated highway still presents a somewhat bland and uninviting environment for pedestrians seeking to cross under the route. But in this case, the context is relatively low-density and auto-oriented; therefore, expectations for the pedestrian environment may not be as high as in a more compact downtown area.

View from under the viaduct. Source: www.texasfreeway.com

Are there parallels to *The I-81 Challenge*?

This project involved new road construction in a rapidly growing city that has limited alternative transportation modes. The immediate context is lower density than Syracuse, and the primary concerns during the planning and design related to impacts to existing businesses. Though there are few direct parallels to *The I-81 Challenge,* this case is useful in demonstrating that modern engineering and design techniques can create more attractive elevated highway structures than is typical of older elevated highways. In the southern U.S., innovative techniques using reinforced concrete have become more common to construct aesthetically pleasing elevated highway structures. However, in northern climates, these are much more difficult to maintain, as they are susceptible to cracks that allow moisture to penetrate the concrete. Once moisture reaches the reinforcing steel, rusting and structural deterioration can occur. This type of structure would likely require frequent maintenance attention, which should be a consideration in the alternatives analysis.

What can we learn from this project?

Traffic Circulation and Urban Mobility: This project resulted from an engineering-driven planning process, and serves an auto-dominant area in the fringe of Austin. There was little consideration of other modes or alternatives. There was controversy primarily centered around the need to acquire numerous commercial properties, which delayed the project's implementation.[3]

Economic Development/Urban Design: This project demonstrates that it is possible to create a modern elevated highway structure that is less massive at the ground level and includes some architectural adornment. While this increased the project cost, it addresses many concerns commonly expressed by the community during the planning and design phase.

Political/Public Process: The planning and decision-making process was narrowly focused on upgrading an existing arterial to a freeway, and did not include consideration of a wide variety of alternatives. The public participation consisted primarily of gathering community input on aesthetic design preferences.

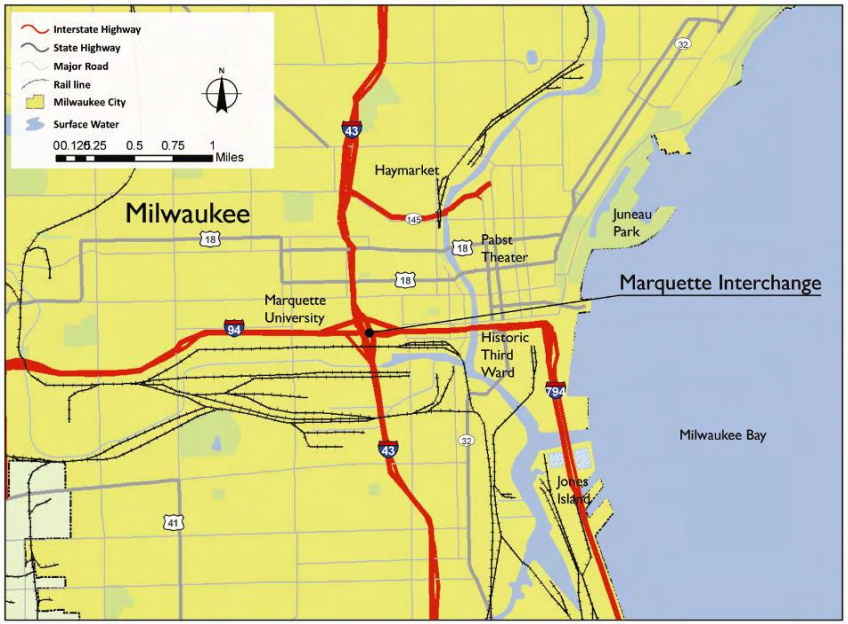
For More Information

http://www.texasfreeway.com/Austin/Construction/183north/austin_construction_183north.html

Marquette Interchange

	Marquette Interchange	I-81
Project Type	reconstruction of an elevated highway interchange	existing elevated highway - TBD
Interstate Highway?	yes (I-794, I-43 and I-94)	yes
Through Traffic?	yes	yes
Vehicles /day	300,000 for full interchange	100,000
Project Length	n/a	1.4 mi.
Context	downtown	downtown
City	Milwaukee, WI	Syracuse, NY
Population	602,000	140,658
Timeline	planning and design 1996-2002; construction 2003-2008	unknown
Cost	$810 million for interchange	unknown

Project Location



This project involved the complete reconstruction of the interchange of I-94, I-794, and I-43 in downtown Milwaukee, the "Marquette Interchange." The interchange was aging, and had an outdated design that did not function well for high traffic volumes merging and weaving at high speeds. In addition, the physical presence of the elevated interchange resulted in negative noise, aesthetic, and pedestrian circulation impacts on the surrounding neighborhood, exacerbated by past urban renewal activities that eliminated the urban fabric in the interchange area.

An EIS was conducted that focused on the involvement of surrounding neighborhoods, with the goal of developing a "community sensitive design." While the interchange is still a massive presence in the area, its design is considered more attractive, and connectivity of the street network was repaired.

What was the decision-making process?

The State DOT-led effort included an EIS, which produced a general design concept for the interchange. A "Community Sensitive Design Task Force" was established in 2002, near the end of the highway design process, to provide input on design features. The project established neighborhood committees to consider design features within each area. Each of these groups had a representative on an advisory committee for the project, which also included representatives from local businesses and government agencies. The work of the community sensitive design committees occurred in a relatively short, six month time frame, after the major decisions about the interchange's structure had been made by Wisconsin DOT (WDOT) and FHWA. Among the primary goals of the neighborhood committees were to make the reconstructed interchange more visually appealing, less of a

barrier, and more pedestrian–friendly at ground level. Visualization tools were helpful for exploring some of the design options with the task force. Final design and construction proceeded without significant delays starting in 2003, and the interchange was complete in 2008.

Highway structures emphasized clean lines and light/bright colors

What were the outcomes?

The project has just been completed, and is functioning well for traffic. However, it is premature to determine if the design enhancements will have the desired outcome of reducing the barrier effect and improving the pedestrian environment. The design process, coupled with visualization tools used by the WDOT, was appreciated by the community, and resulted in a successful collaboration.

Are there parallels to *The I-81 Challenge*?

The Marquette Interchange is comparable to the interchange of I-81 and I-690, which is likely to be a major element of any significant investment on I-81 through downtown Syracuse. The design and construction techniques used in the Marquette Interchange reconstruction could be considered for the 81/690 interchange, especially in light of the similar climate conditions.

What can we learn from this project?

Traffic Circulation and Urban Mobility: In this case, major alterations of the city's freeway network were not considered, as the project focused primarily on the redevelopment of a safe and functional high speed highway interchange.

Economic Development/Urban Design: The design included narrower concrete piers and decorative features applied to the interchange structure to reduce the aesthetic impact of the interchange. Because the project was completed recently, it remains to be seen if the new interchange will create a more appealing place for economic investment.

Political/Public Process: The design of a high speed interstate interchange will by necessity be dominated by engineering concerns, to assure a safe and functional system. The public engagement primarily occurred in later stages of the project design, after key decisions on the interchange alignment were made based on engineering factors. However, the task force seemed to have worked well?

Murals on underpasses illustrate local history

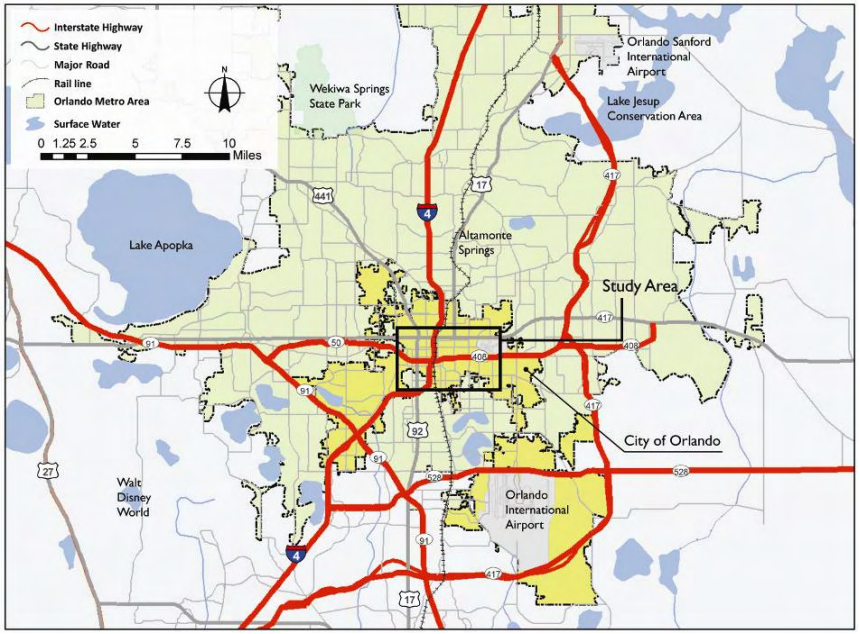
For More Information:

http://www.mchange.org/page.jsp?&key=csd

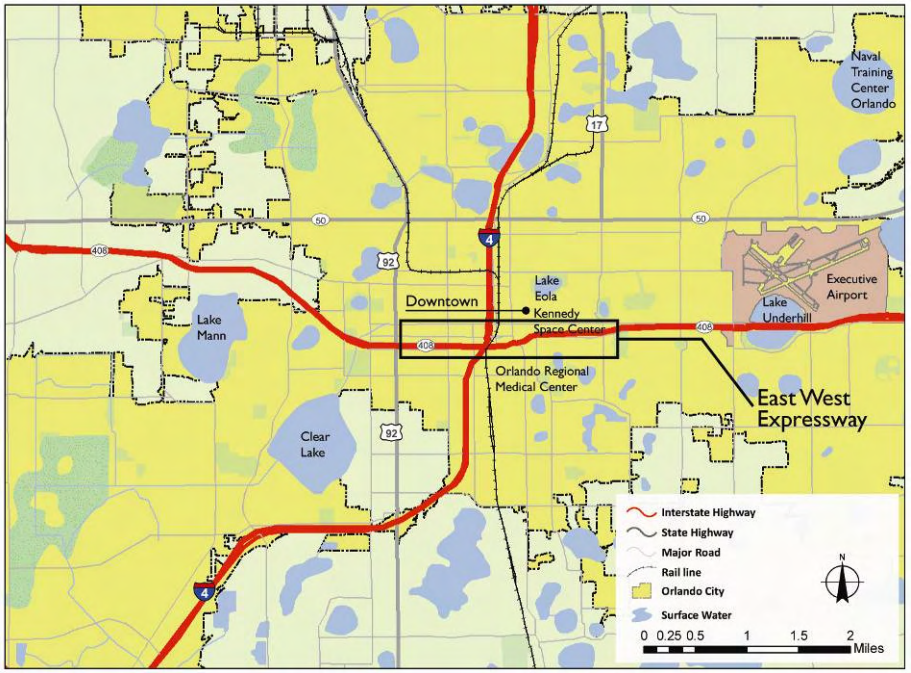
East West Expressway

	East West Expressway	I-81
Project Type	reconstruction of an elevated highway	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	yes	yes
Vehicles /day	140,000	100,000
Project Length	16 miles (to be constructed in 6 phases)	1.4 mi.
Context	downtown	downtown
City	Orlando, FL	Syracuse, NY
Population	213,000	140,658
Timeline	construction 2005 - 2008	unknown
Cost/Cost per mile	$640 million/$40 million per mile	unknown

Regional Context-Orlando



Project Location



This east-west elevated toll road through downtown Orlando serves very high traffic volumes, and the basic purpose and need for the project was to increase the highway's capacity. As a result, other alternatives were not considered in the planning and design process. The aesthetics of the expanded highway were of great concern, as were potential noise impacts. The result is that much of the length of highway through downtown was constructed on a terraced embankment, which is heavily landscaped and incorporates sound walls.

The replacement road was constructed on or immediately adjacent to the existing route. The overpass structures were designed with decorative features to increase their visual appeal.

What was the decision-making process?

Planning and design was conducted jointly by the Florida Department of Transportation and the Orange County Expressway Authority. This project was the focus of an extensive public outreach effort, given its unique context in downtown Orlando. A team of public involvement specialists focused on outreach and consultation with stakeholders, which resulted in unique design details for many of the overpasses, reflecting historical themes of the Orlando area. There was limited public involvement in the alternatives analysis process.

Photo Simulation (left) and final outcome (right) of embankment design (FDOT)

What were the outcomes?

Some segments of the expanded toll road are still under construction, but the elevated portion through downtown Orlando is complete and viewed as an aesthetic improvement over the old elevated highway. It is too early to tell if the improved appearance will spur higher value uses of the land alongside the highway.

Are there parallels to *The I-81 Challenge*?

The high traffic volumes and downtown location are similar to the I-81 corridor through Syracuse. However, this corridor is in a rapidly growing city, which was a factor that led to the decision to expand the highway. Because this highway is also a toll road, with specific planning, access and financing considerations, the range of alternatives was considerably narrowed.

Photosimulation of new underpass with decorative features (Florida DOT and Orange County Expressway Authority)

What can we learn from this project?

Traffic Circulation and Urban Mobility: This project sought to improve the appearance and reduce negative noise and aesthetic affects of an elevated highway through downtown Orlando. While concrete construction techniques used in this project are more challenging in a northern climate, the specific design techniques, particularly for noise abatement, are worthy of consideration.

Economic Development/Urban Design: The project offers some appealing design ideas for screening embanked, elevated highways with terraced landscaping. This type of treatment is more challenging in a northern climate, where landscaping options are more limited.

Political/Public Process: Because this was a toll authority roadway, the range of alternatives was considerably narrow, so there was less public input on the major design concepts that were considered.

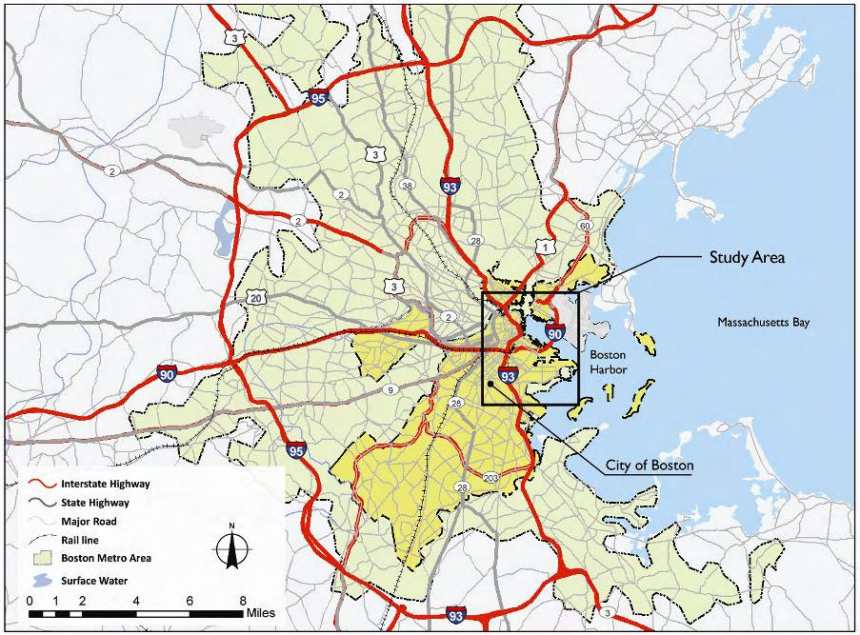
For More Information:

http://www.expresswayauthority.com/Corporate/oursystem/SR408/Default.aspx

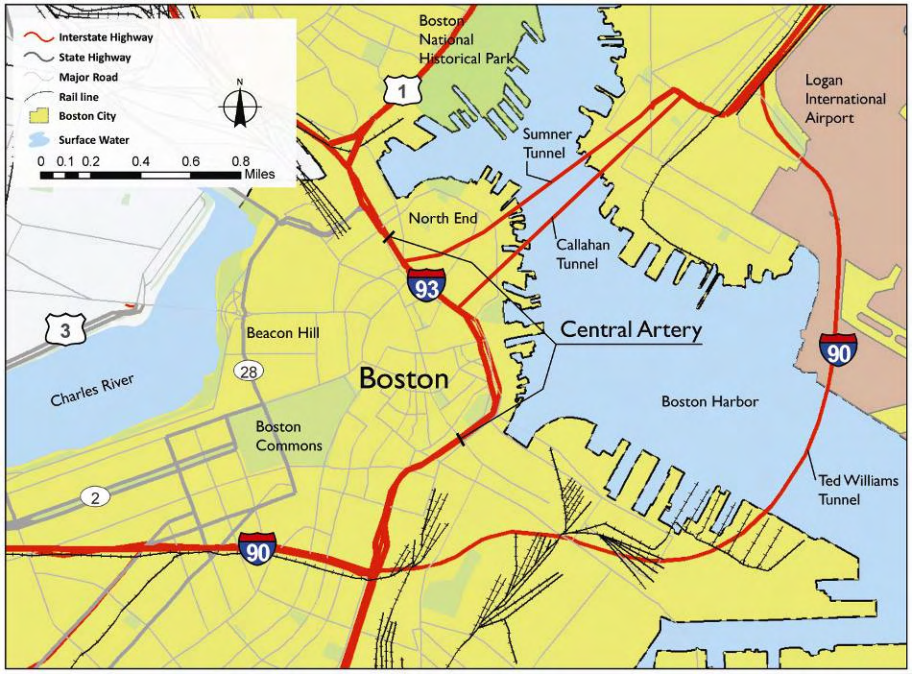
I-93 (Central Artery), a.k.a. the "Big Dig," Boston

	I-93	I-81
Project type	burying an elevated highway	existing elevated highway - TBD
Interstate highway?	yes	yes
Through traffic?	yes	yes
Vehicles /day	200,000	100,000
Project length	1.8 miles for I-93 tunnel, plus 1.7 miles for new tunnel to airport	1.4 mi.
Context	downtown	downtown
City	Boston, MA	Syracuse, NY
Population	559,000	140,658
Timeline	planning 1982-1989; construction 1990-2007	unknown
Cost	$15 billion, $22 billion including interest (2006$)	unknown

Regional Context



Project Location



The "Big Dig" involved an unprecedented effort to bury a major interstate highway through the center of one of the U.S.'s oldest cities. The complications in design and construction were enormous, and final costs were five times the original estimates. There were numerous technical challenges, including leaky tunnel walls and a collapsed tunnel ceiling. The State of Massachusetts will be paying the bonds for the cost overruns for years, placing a financial burden on future taxpayers and limiting funding for projects in other parts of the state.

However, the project has improved the quality of life and urban environment in downtown Boston, and successfully addressed the problems associated with the old elevated Central Artery, which included the noise and aesthetic impacts of the elevated highway and the barrier it created between the North End and downtown. Green space has been developed in the Central Artery footprint, economic

development is occurring in the immediate neighborhoods, and connections between the North End and the rest of downtown have been restored. The Big Dig was accompanied by a parallel effort to significantly upgrade and expand the transit system, both to mitigate the short-term impacts of construction and to provide a long-term supplement to the highway system. The project has significantly improved and simplified traffic circulation and public transit in a city notorious for its congestion.

What was the decision-making process?

In recognition of the deteriorated condition of the elevated I-93 corridor, an EIS process began in 1982, which was completed in 1985 and approved in 1986. In 1987, the U.S. Congress provided earmark funding for project design. Because of the complexity of the project, exploratory drilling and excavation was conducted during the design process. In 1990, Congress allocated $755 million for the project and in 1991, construction began. Because the project was initiated without full understanding of the subsurface conditions, the construction of the underground section was more complicated, time-consuming, and costly than expected. By 1999, overall construction was 50 percent complete, with openings of key components in the subsequent years. I-93 was fully opened in 2005, and the city streets were reconnected by 2007. Greenway construction and development activities are continuing.

What were the outcomes?

Traffic circulation is much improved, and there are outstanding redevelopment opportunities in and adjacent to the footprint, which now hosts a one-mile greenway. There has been a high level of private investment in downtown development in recent years, which is at least partly attributable to the improved public realm and traffic circulation.

However, the complexity of submerging a major highway under a city as old as Boston should not be understated. The total construction cost was $15 billion, over five times early estimates. Because the cost overruns had to be paid through borrowing, bond repayments will require an additional $7 billion in payments, bringing the total investment to $22 billion. This is a major burden passed on to future taxpayers, leading to deferred funding for other projects across the state. The congestion created during the years of construction also had many negative effects on the city and businesses.

Are there parallels to *The I-81 Challenge*?

The traffic volume on I-93 was 190,000 cars per day by the time construction began, significantly higher than I-81. The route had similar roles in that it served both through traffic and provided access to downtown Boston. The regional highway network offers a bypass route, Route 128/I-95. However, this route is also notoriously congested and unable to absorb diverted through traffic. Boston is a large city with very high property values in the downtown area, so the enormous cost of construction could be justified at least in part by the increase in development and property values.

What can we learn from this project?

Traffic Circulation and Urban Mobility: The cost and complexity of burying an urban highway is enormous. Because it is often not possible to fully understand the subsurface conditions until construction is active, there are often "surprises" along the way that result in increased costs or delays. At the same time, Boston's Big Dig provides a compelling example of how a city can prioritize pedestrian, transit, and street level mobility, and improve the urban environment, while maintaining highway access to the city center and preserving through traffic capacity. Recent observations are that traffic flows through the city center have increased due to the improvements, resulting in new freeway bottlenecks outside the city, with no improvement in regional travel time.[4] Transit ridership has generally remained flat since the Big Dig was completed.[5]

Economic Development /Urban Design: The Big Dig has been a tremendous success in terms of its effect on the urban environment. The project has either directly or indirectly stimulated development benefits estimated at $7 billion, including the reuse of formerly underutilized land adjacent to the former freeway footprint.

Political/Public Process: Several elements of the Big Dig were designed on a "fast track process," wherein only a preliminary design was initially prepared. The final construction design was developed as the project began, as adequate information about subsurface conditions was not initially available to prepare a more refined design. In addition to the high cost of maintaining traffic flow during construction (estimated at 20 percent of the project cost), the "surprises" encountered along the way were the primary reasons for the cost overruns, as substantial design changes were needed midstream. There was never a rigorous look at alternatives, with a relatively truncated initial planning and design process. There could potentially have been some savings with a more involved analysis of alternatives, including the exploration of different engineering techniques.

For More Information:

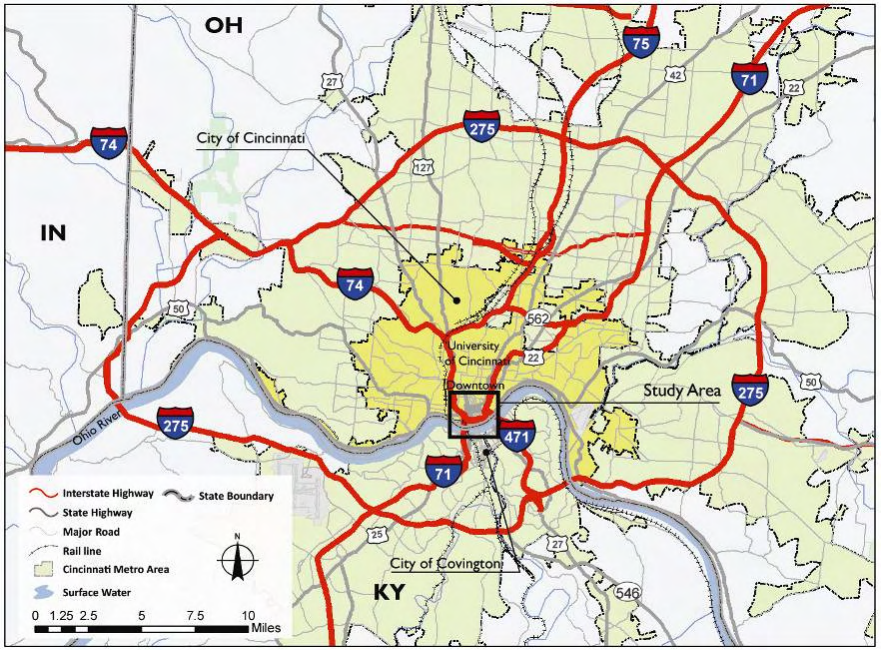
http://www.masspike.com/bigdig/index.html

Photos by J. Behan

Fort Washington Way, I-71

	I-71	I-81
Project Type	reconfiguration of a depressed highway	existing elevated highway - TBD
Interstate Highway?	yes (I-71)	yes
Through Traffic?	yes	yes
Vehicles /day	130,000	100,000
Project Length	1.3 miles	1.4 mi.
Context	downtown: Ohio River waterfront	downtown
City	cincinnati, OH	Syracuse, NY
Population	288,000	140,658
Timeline	planning and design 1995-1997; construction 1997 -2000	unknown
Cost/Cost per mile	$146 million (2004$)/$112 million per mile	unknown

Regional Context



Project Location

The Fort Washington Way is the section of I-71 that passes between downtown Cincinnati and the Ohio River waterfront. In the 1990s, the existing highway provided two through lanes in each direction, with numerous auxiliary lanes and ramps. The through lanes were depressed, and there were several existing overpasses. Traffic volumes exceeded capacity, and the numerous ramps and weaving maneuvers required made it both unsafe and congested for travelers. In addition, the wide right-of-way occupied by the highway and the access ramps created a major barrier between the waterfront and downtown Cincinnati.

The improvements included widening the highway to four through lanes in each direction and the elimination of several exits and entrances to simplify and improve traffic flow. The total right-of-way width was substantially reduced by defining the highway edge using vertical retaining walls rather than sloped embankments. The

additional space was reclaimed as a riverfront park, with new venues for the city's professional sports teams. There are now five streets crossing the highway, which have broad sidewalks and landscaping. These provide a significantly improved pedestrian environment and safe access to the riverfront park. The street connections also help restore connectivity between the riverfront park and the downtown street network, which has improved traffic congestion after sports events.

What was the decision-making process?

The project was initiated in 1995 as a Major Investment Study (MIS) by the Ohio, Kentucky, and Indiana Council of Governments (OKI), the region's Metropolitan Planning Organization (MPO). A highly collaborative process explored 25 different alternatives, which were evaluated for their effects on pedestrian access, land use, riverfront redevelopment opportunities, and local street network access, in addition to conventional highway performance measures. Five alternatives were selected for further study, and eventually the final design was developed through a cooperative effort between the City of Cincinnati, OKI, ODOT and other stakeholders. The project schedule was highly compressed, with the project largely completed by the end of 2000, only five years after initiation.

What were the outcomes?

This project is considered highly successful, in terms of the collaborative process, the relatively streamlined schedule from start to finish, and the benefits that the project has brought to the city. The process was marked by high degrees of cooperation and motivation among the key stakeholders, including the Ohio DOT, Kentucky Transportation Cabinet, the OKI Council of Governments, the Southwest Ohio Regional Transit Authority, City of Cincinnati, and Hamilton County. The state of Kentucky participated in the funding, even though the project was entirely within the borders of Ohio. The project is considered a major catalyst for significant investment in other developments, including several downtown buildings, the sports stadiums, and the riverfront park.

Before (left) and After (right) the Fort Washington Way Improvements

Wider footprint, with fewer through lanes *More through lanes, but narrower footprint*

Source: David Sailors, with permission.

Are there parallels to *The I-81 Challenge*?

This project involved a high volume interstate highway in a major urban area. A primary difference from I-81 is that the existing I-71 lanes were depressed. Ultimately, this project can be viewed as an enhancement to the corridor to reduce its negative impacts rather than a complete redesign of the corridor. The project included some major reconfiguration and reduction of access points, as well as

widening. The need for major realignment of the lanes was avoided, since the project capitalized on the fact that the lanes were already below the street grade level.

What can we learn from this project?

Traffic Circulation and Urban Mobility: This project focused on improving and adapting the existing highway to reduce its impact and be more compatible with riverfront redevelopment. The project also simplified downtown access points to improve the freeway function and included improvements to parallel surface streets.

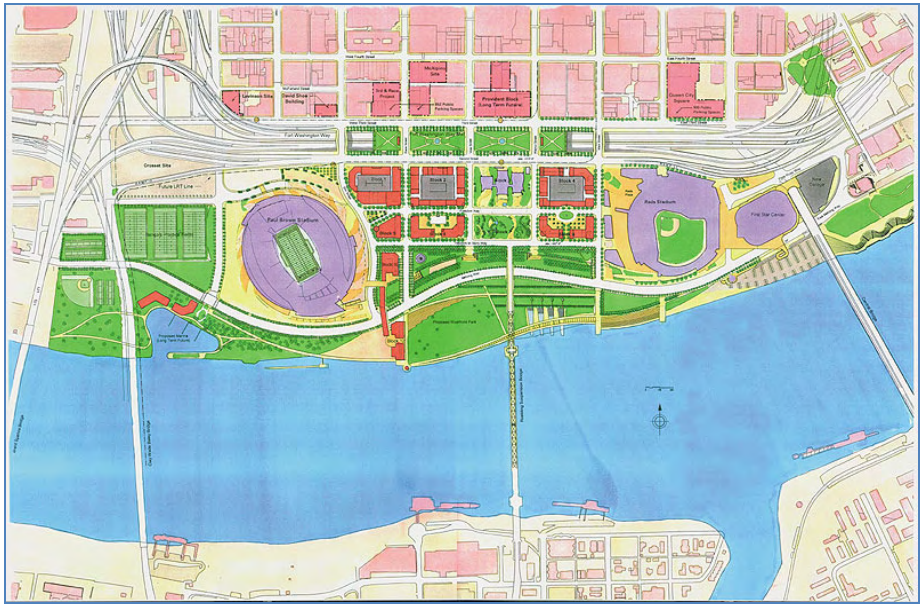
Economic Development/Urban Design: The project was initiated with twin goals of improving the traffic flow and facilitating the redevelopment and recreational use of the riverfront. The results have been very successful, with widely perceived benefits to the city.

Public Process: This project benefited from an effective stakeholder involvement process, which allowed all the relevant agencies to participate and work together to assure rapid implementation of the project. Because the project was integrated with economic development and improved riverfront access, it enjoyed much broader support than would have been likely if it were merely a freeway expansion.

For More Information:

http://americancityandcounty.com/mag/government_road_rehab_reintroduces/

http://www.pbworld.com/news_events/publications/network/issue_59/5

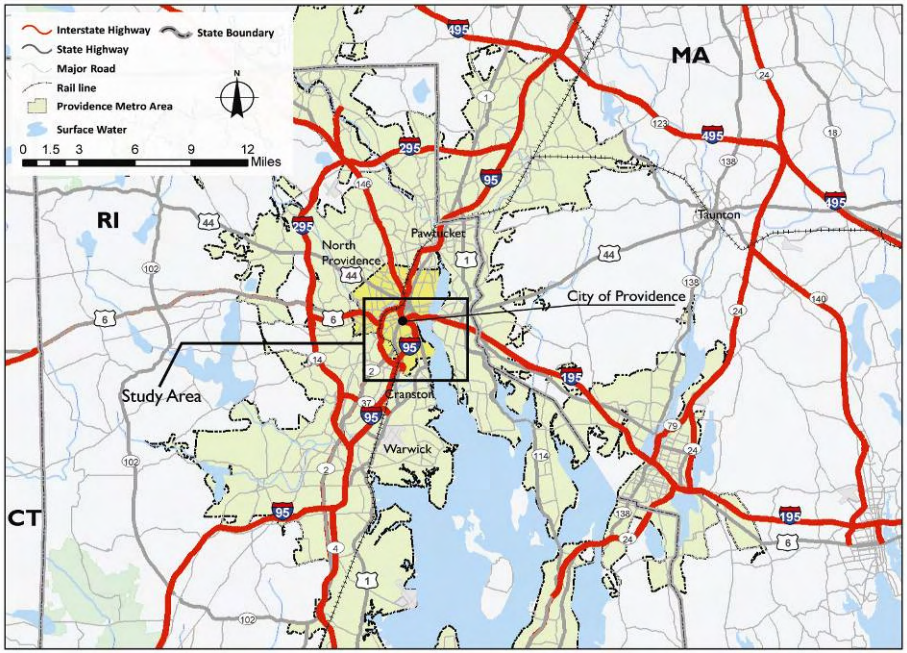


1999 Redevelopment Plan showing a future cap on the I-71 Corridor
*Source: **http://www.cincinnati-transit.net/fww.html***

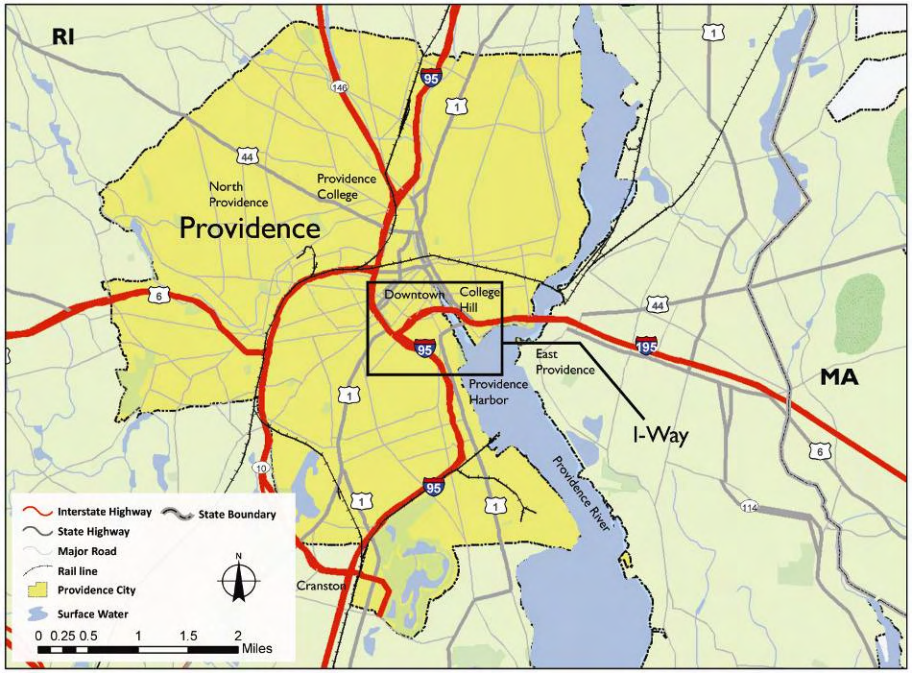
I-195/ The "I-Way"

	I-195	I-81
Project Type	relocation of an elevated highway	existing elevated highway - TBD
Interstate Highway?	yes	yes
Through Traffic?	yes	yes
Vehicles /day	153,000	100,000
Project Length	0.5 mile highway, plus reconstructed interchange	1.4 mi.
Context	downtown waterfront	downtown
City	Providence, RI	Syracuse, NY
Population	177,000	140,658
Timeline	planning, design, and construction 2006-2010	unknown
Cost/Cost per mile	$610 million/$1,220 million per mile (includes major interchange)	unknown

Regional Context: Providence



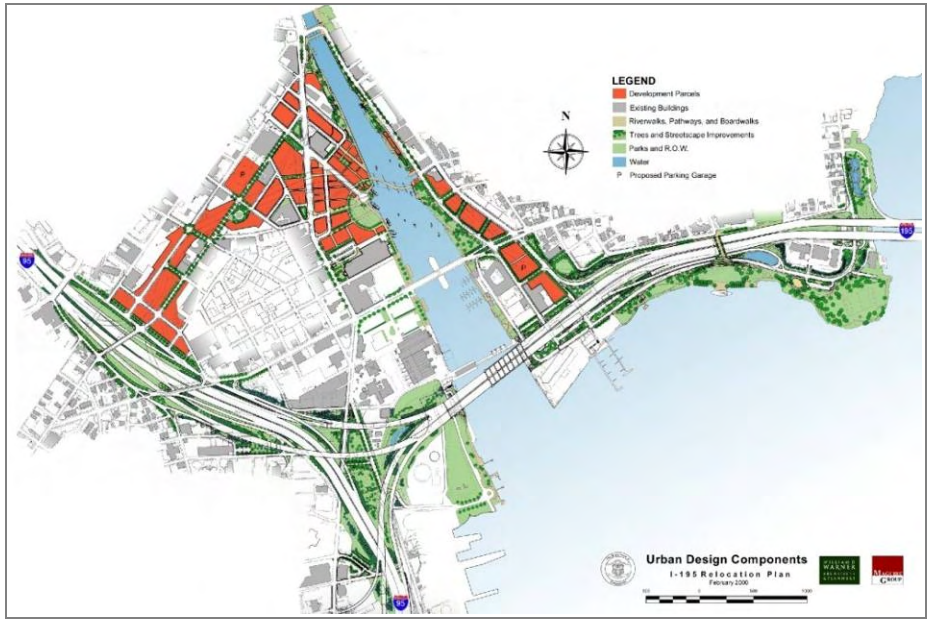
Project Location



When planning for the I-Way began, the I-195 corridor through downtown Providence was outdated, with narrow lanes, constrained merging areas, left exits, and other problematic features. The traffic volumes far exceeded the design capacity, and its deteriorated condition necessitated a change.

An EIS process focused on several alternatives, including relocation of the elevated portion to a new alignment that addressed the highway's geometric issues. The plans also included extensive improvements to the local street network to alleviate existing congestion problems and to address any issues that might arise from the relocated highway. The final design relocated the existing road to a new alignment, which allowed for construction of the new road to occur while the existing one remained in operation. The final plan creates space for urban redevelopment, waterfront access, and improved traffic circulation and street connectivity.

Project plan showing former highway corridor to be redeveloped in orange, with new street connections and greenspace (Rhode Island DOT)



The design incorporates numerous pedestrian amenities, including walkways along the Providence River, and allows much greater access to the waterfront. The design also includes a new signature – or landmark – bridge.

What was the decision-making process?

An EIS was conducted that looked at three alternatives: reconstruction on the existing alignment, a new alignment just north of the existing highway, and the new alignment to the south, along the Fox Point Hurricane Barrier. The third option, which mitigated operational problems and allowed for urban redevelopment of the existing corridor adjacent to downtown Providence and the Providence River, was selected. The new alignment passes through an industrial area, promising fewer socio-economic impacts than other options.

New "Signature" Bridge Crossing and Interchange

Source: Rhode Island DOT

What were the outcomes?

The project is under construction. Therefore, it is too early to measure success or failure. The project development process has been very successful in terms of stakeholder collaboration, garnering public support, and controlling project cost and schedule.

Are there parallels to *The I-81 Challenge*?

I-195 has comparable volumes to I-81, and serves substantial long distance travel between Cape Cod and the eastern seaboard. The size of the metropolitan area, and the complexity of working in an older northeastern urban area are also

comparable. However, there are no regional alternative routes or bypasses to this portion of I-195.

What can we learn from this project?

Traffic Circulation and Urban Mobility: Because the final design relocated the existing road to a new alignment, allowing construction of the new road to occur while the existing one remained in operation, there were few traffic disruptions during the construction phase. Regional mobility has been maintained while local street connectivity in the downtown area has been improved.

Economic Development/Urban Design: Among the reasons that this project enjoyed solid support was the strong focus on urban design. The highway corridor itself was improved from an aesthetic standpoint, and new connections between downtown and the riverfront were established providing opportunities for redevelopment.

Political/Public Process: The public involvement process was characterized by broad involvement of many stakeholders and strong communication. This included outreach through media, websites, project podcasts, and many stakeholder meetings. The project's focus was always on improving both the urban environment and the transportation network.

For More Information:

http://www.dot.ri.gov/engineering/construction/195intro.asp

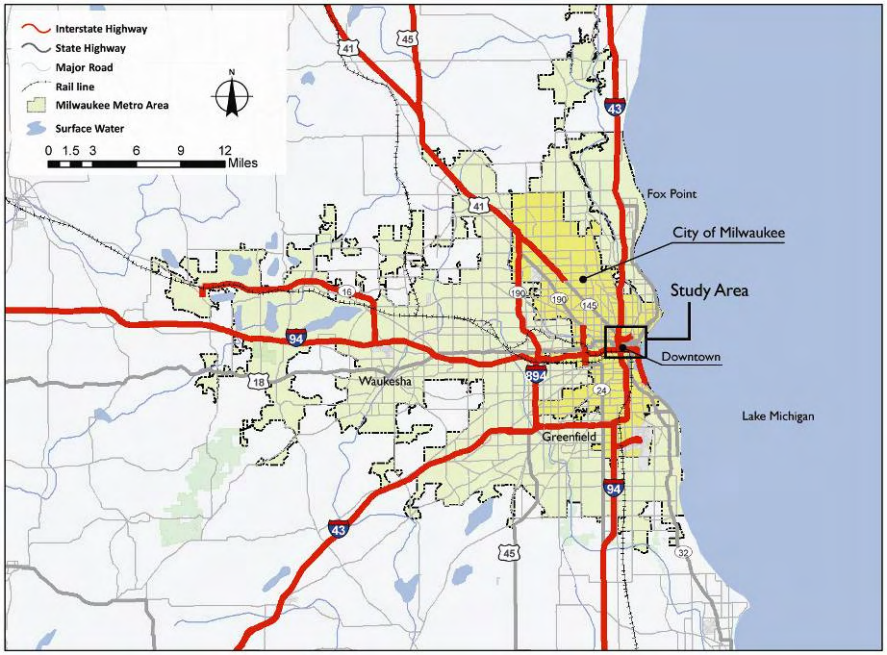
Visual Simulation of Pedestrian Crossing of I-195 to Narragansett Waterfront

Source: RIDOT

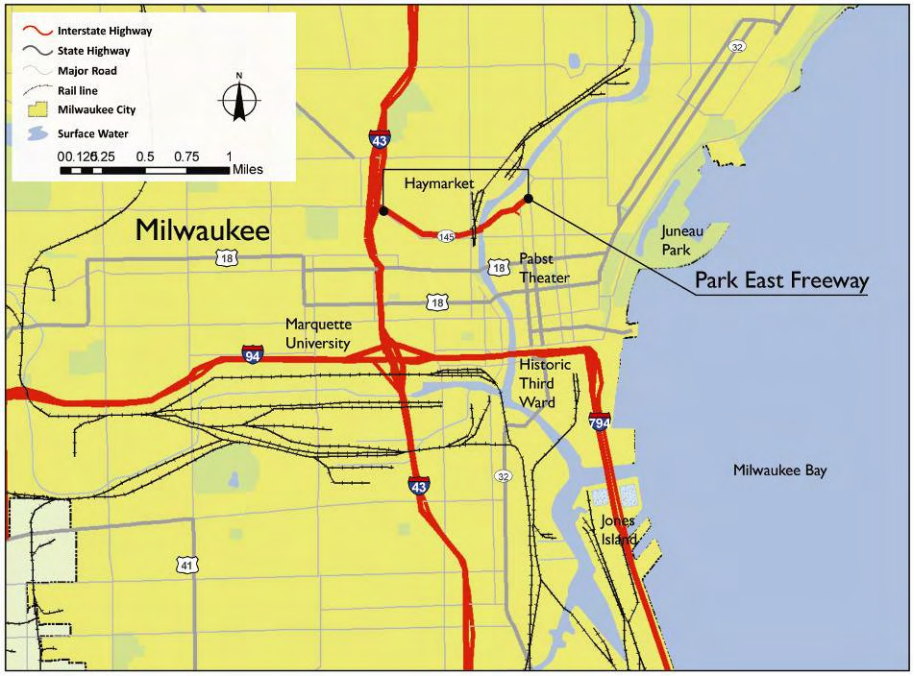
Park East Freeway

	Park East Freeway	I-81
Project Type	removal of an elevated highway	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	no-spur highway to downtown	yes
Vehicles /day	40,000	100,000
Project Length	1 mile	1.4 mi.
Context	downtown: Milwaukee River waterfront	downtown
City	Milwaukee, WI	Syracuse, NY
Population	597,000 (at time of project)	140,658
Timeline	planning and design 1996-2002; construction 2002-2003	unknown
Cost/Cost per mile	$25 million/$25 million per mile	unknown

Regional Context



Project Location



The Park East Freeway was a one-mile spur connection between I-43 and downtown Milwaukee. It was originally intended to continue through downtown, but was never completed. The impacts of this freeway spurred a great deal of controversy such that the extension plans were abandoned, and eventually the old right-of-way intended for this highway's continuation became the East Pointe mixed use development. In 1972, Mayor Henry Maier vetoed funding to continue the freeway, saying: "America is the only nation in the world to let her cities ride to bankruptcy on a freeway . . .

The Flatiron Building, City of Milwaukee

My city has discovered that the freeway is not free." Because of its short length, the Park East Freeway was never heavily used, and its peak hour traffic volumes were always well below its capacity.

The success of the East Pointe redevelopment in the 1990s led to consideration of removing the remaining underutilized and deteriorating Park East Freeway when it was slated for reconstruction. The funding to eventually remove the freeway came from a combination of Intermodal Surface Transportation Efficiency Act (ISTEA) federal highway funds and Tax Increment Financing through the City of Milwaukee. The total construction cost was estimated to be $25 million, which included demolishing the freeway and reconnecting the surface streets to absorb the freeway traffic. The freeway removal made 26 acres of downtown land, much of it on the Milwaukee Riverfront, available for redevelopment. After the freeway removal, land uses changed and values increased substantially. The City of Milwaukee has established the Park East Corridor development area, with a master plan for mixed use urban redevelopment gradually unfolding.

What was the decision-making process?

The process of removing the Park East Freeway was led by then-mayor John Norquist. The idea for removing the freeway was inspired by the combination of successful urban redevelopment in nearby neighborhoods and a Wisconsin DOT-initiated plan, proposed in the mid-1990s, to reconstruct the deteriorating elevated Park East Freeway. With Mayor John Norquist strongly in favor of highway removal, and traffic reports indicating that reconnecting the street network would provide sufficient capacity to replace the freeway, other agencies were encouraged to join in support of the idea of removal. While it was not without controversy, overall community leadership at all levels solidly favored the removal concept. In 1999, the city council agreed on the removal option by a unanimous vote, and the county board of commissioners approved freeway removal by a very large margin. The Federal Highway Administration (FHWA) required additional traffic studies before agreeing to fund the project, partially because they were concerned about the threat of lawsuits by opponents of the removal. The highway was removed in 2003.

The Park East corridor before and after the freeway removal

Park East Corridor in 2006, with street network re-established.
Source: City of Milwaukee

What were the outcomes?

This project has set the stage for highly successful urban redevelopment, which is ongoing today. Traffic congestion from the removal never materialized. Economic development has been encouraged, vacant property has been redeveloped, and property values and tax revenues have increased substantially since the freeway was removed.

Are there parallels to *The I-81 Challenge*?

The physical presence of the elevated freeway, and the adjacent underdeveloped areas through the downtown are similarities to the I-81 corridor. However, the role

of the Park East Freeway was very different from the role of the I-81 corridor in Syracuse. The Park East Freeway had substantially lower volumes (well under its capacity) and served as only a short spur to access downtown from the regional highway network. It was not an interstate highway or through traffic route.

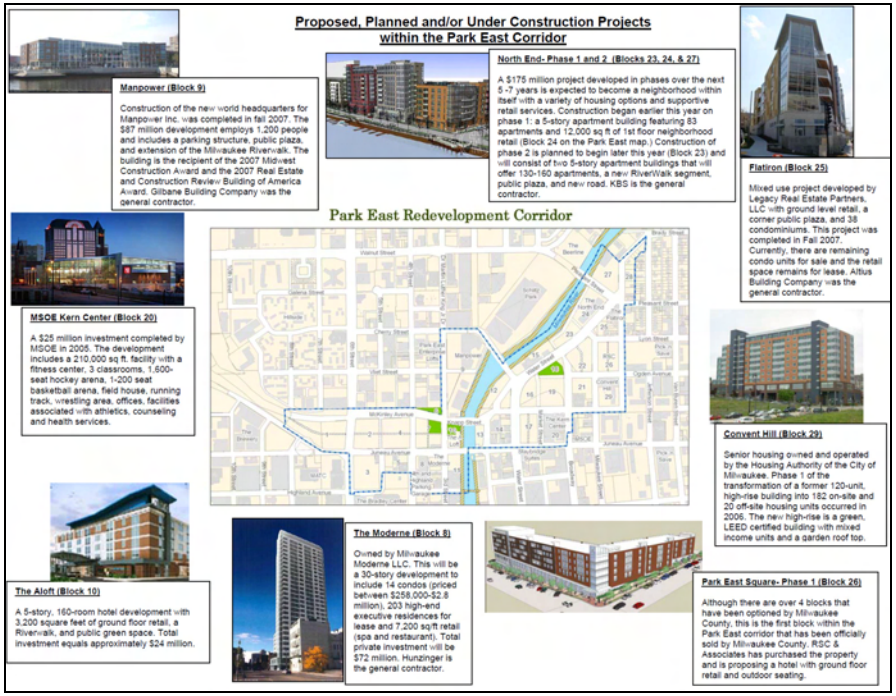
What can we learn from this project?

Traffic Circulation and Urban Mobility: The street network was easily able to absorb the freeway traffic, despite limited availability of transit alternatives in the city. Traffic congestion did not noticeably increase after the freeway was removed, although some commuters may experience an increase in travel time simply due to the change from a high-speed freeway to a lower-speed local street.

Economic Development/Urban Design: In Milwaukee's case, the benefits of opening up underutilized land in the center of the city and along the Milwaukee River for redevelopment seems to have outweighed any negative effects from the loss of convenient highway access. The removal of the Park East Freeway has been accompanied by a significant increase in investment to downtown Milwaukee, and was tied to an economic revitalization plan for the Milwaukee Riverfront that has been successful.

Political/Public Process: The support for the freeway removal built up in a political process, rather than in a formal planning and public involvement process. Strong political leadership at many levels was necessary for this project to be implemented.

Park East Corridor Redevelopment Projects



Source: City of Milwaukee Economic Development

For More Information:

http://www.mkedcd.org/parkeast/

Westside Highway

	Westside Highway	I-81
Project Type	removal of an elevated highway	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	yes	yes
Vehicles /day	140,000	100,000
Project Length	4.7 miles	1.4 mi.
Context	urban core: Hudson River waterfront	downtown
City	Manhattan, New York City, NY	Syracuse, NY
Population	7,895,000	140,658
Timeline	freeway collapsed 1973; planning and design 1985-1993; Construction of Boulevard 1996-2001	unknown
Cost/Cost per mile	$380 million/$81 million per mile	unknown

Project Location

The West Side Highway was the first elevated highway constructed in the U.S. in the 1920s. It ran along the Hudson River shoreline from 72nd Street to the southern tip of Manhattan. It was not designed to modern highway standards, with very narrow lanes and sharp turns at exit ramps. On December 15, 1973, the northbound lanes between 12th and Gansevoort Streets collapsed under the weight of a dump truck, which was ironically carrying asphalt for highway repairs. An interview with Sam Schwartz, former Chief Engineer of NYCDOT, provided some history on how the collapse affected the area's traffic conditions:

> One of my first assignments was racing out to the West Side Highway when it collapsed. This was an elevated platform that fell to the ground. We were hired to measure the impact on traffic. I put traffic counters all across the avenues and traced the diversion; it went to the FDR Drive and to the West Side avenues. But over time, we didn't see any increase in traffic: the other avenues absorbed it and we weren't able to trace it.

What was the decision-making process?

Even though the highway had been closed for years, alternatives for upgrading the corridor to the "Westway" were studied in the late-1980s. These included:

1. a "no build" that would have reconstructed the collapsed highway under the prior configuration,
2. a collection of related alternatives that included an at-grade boulevard with some improvements to access points, and
3. a fully grade-separated expressway.

These alternatives all included parallel bicycle and pedestrian facilities. After seven years of review and discussion, a variation of Alternative Two, which community board members called the "Lessway," was approved in May 1993. Construction began in 1996, and the Joe DiMaggio Boulevard was opened in 2001 to replace the West Side Highway.

The failure of the West Side Highway presented a unique environment for decision-making. As has been the case in several other freeway collapse situations, traffic was able to adapt to the street network. The longer people lived without the highway, the more they became convinced that they didn't need to replace it. This made it easier to reach consensus on alternatives. A variety of alternatives were

considered in the official decision-making process, with ample involvement of community stakeholders. Cost, as well as lack of support for reconstruction of an elevated freeway, was a factor in the final decision. Tunnel options were found to be excessively costly and were eliminated.

Westside Highway: Before and After

Credit: FHWA (above), Charles Spiegel (below)

What were the outcomes?

The Joe DiMaggio Boulevard is a popular corridor for bicyclists, walkers, and joggers. Redevelopment has occurred along the length of the corridor since the freeway was removed. Although some people feel that the design solution does not provide enough capacity, formal studies by the New York City Department of Transportation (NYCDOT) have found that the highway closure has not resulted in undue congestion.

Are there parallels to *The I-81 Challenge*?

Traffic on the highway ranged from 90,000 to 140,000, similar to the volumes on the I-81 viaduct. It is located in the dense urban street network of Manhattan, which was able to successfully absorb the traffic once the freeway closed.

What can we learn from this project?

Traffic Circulation and Urban Mobility: This case shows how traffic is able to adapt to new conditions in ways that may not be entirely predictable by conventional traffic models. New York City has a robust street network that can be congested at times, but was seemingly able to carry the diverted traffic volumes without a noticeable increase in congestion. The new boulevard provides a bicycle and walking path, accommodating additional modes.

Economic Development/Urban Design: There has been some redevelopment alongside the corridor where the highway had been, which may have been unlikely, or of lower value, if the highway existed.

Political/Public Process: The decision-making process took place after the freeway had closed, which greatly altered public perception on the need for a replacement highway. Since so much time (over 20 years) elapsed between the freeway closure and the opening of the boulevard, people became used to not having the freeway and the boulevard essentially offered a new facility to the public.

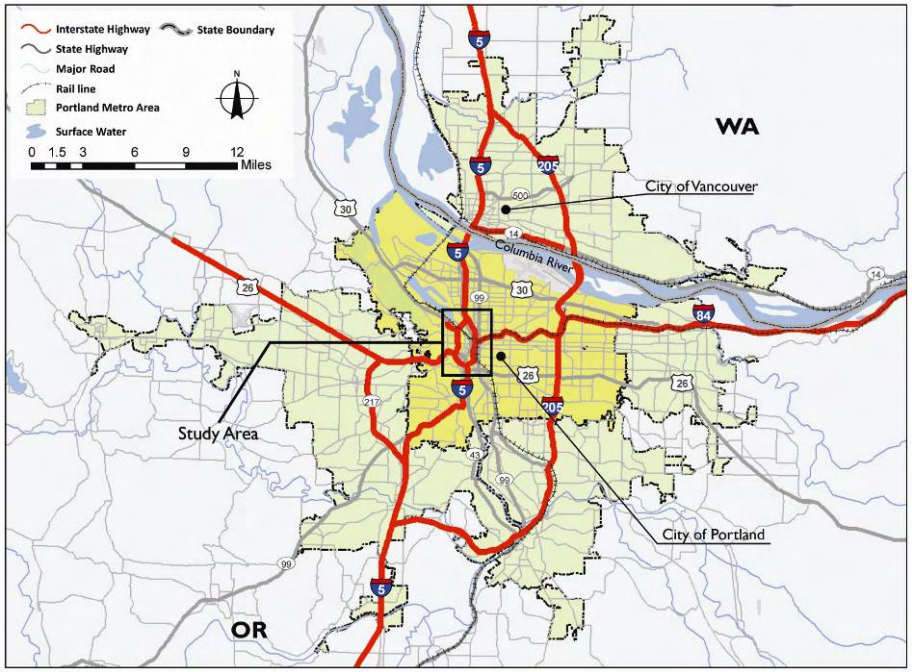
For More Information:

http://www.nycroads.com/roads/west-side/

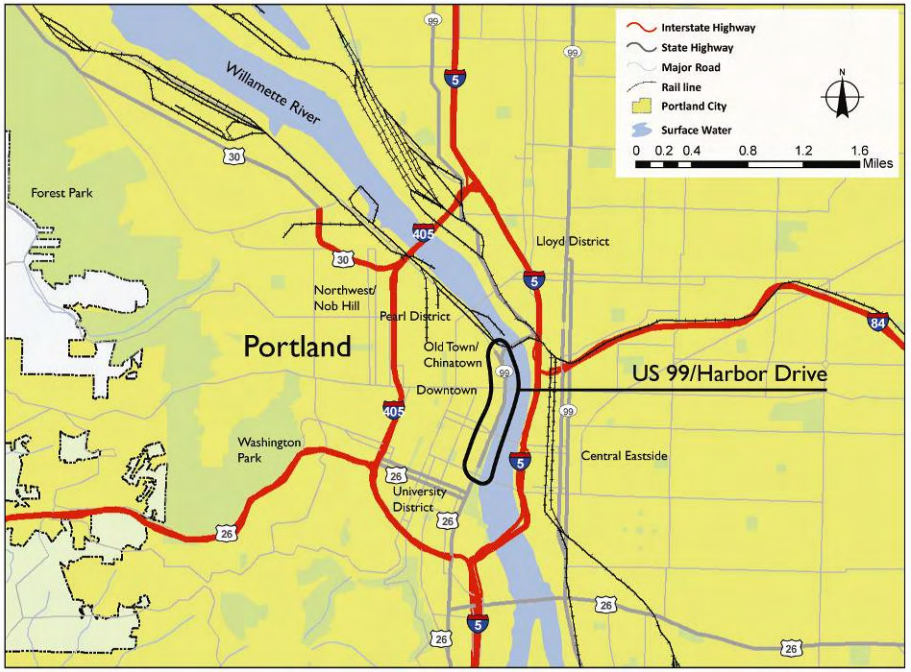
US 99W/Harbor Drive

	US 99W	I-81
Project Type	removal of an at-grade waterfront highway	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	yes	yes
Vehicles /day	25,000	100,000
Project Length	3 miles	1.4 mi.
Context	downtown: Willamette River waterfront	downtown
City	Portland, OR	Syracuse, NY
Population	437,000	140,658
Timeline	planning 1966-1968; freeway removed 1974	unknown
Cost/Cost per mile	not available	unknown

Regional Context: Portland



Project Location



This project replaced a riverfront highway, US 99W, with a park and boulevard. The opportunity to make this change came about with the construction of I-5, which paralleled US 99W on the east side of the Willamette River. Despite the increased freeway capacity provided by I-5, the Oregon DOT proposed to widen route 99W. This instigated a waterfront planning process, which eventually recommended in 1968 that the riverfront be reclaimed as a public park. I-405 was then completed in 1973, providing another parallel north-south route through Portland, and further obviating the need for the capacity provided by 99W. In 1974, Harbor Drive/99W was closed to traffic, and the Tom McCall Waterfront Park was constructed. No congestion was reported with the closure, and the park has proven to be a highly valued place in Portland.

What was the decision-making process?

A citizen's task force formed to develop a waterfront plan once the Oregon DOT announced plans to expand Harbor Drive/99W. This group eventually recommended closing the road and establishing a park, which was embraced by the city leaders and the public.

Source: National Agricultural Imaging Program (NAIP) Aerial Photo, NRCS

What were the outcomes?

This project is considered highly successful. Due to the availability of parallel routes, the traffic impacts were minimal, and the new park has helped revitalize the Willamette River waterfront. Further, the changes stimulated redevelopment in surrounding areas which increased property values, expanded the tax base, and helped encourage a more compact, sustainable development trend for the city.

Are there parallels to *The I-81 Challenge*?

The role and function of 99W was vastly different from I-81, as it served much lower traffic volumes and had two parallel interstate corridors in the immediate vicinity. This project was also conducted in a different era in terms of funding, regulation, and design practices.

What can we learn from this project?

Traffic Circulation and Urban Mobility: The construction of I-5 and I-405, parallel to this corridor, made the decision to remove the 99W highway much easier. Both of these roads provide alternative high speed through routes, as well as access to downtown.

Economic Development/Urban Design: Providing an opportunity for redevelopment and removing obstacles to public waterfront access have resulted in substantial economic and quality of life benefits for the city and the region. The park is immensely popular, and property values in the area have increased relative to other parts of the city.

Political/Public Process: The implementation of this freeway conversion, which occurred much earlier than others in this report, came about due to the cooperation of a grass roots organization and the local political establishment.

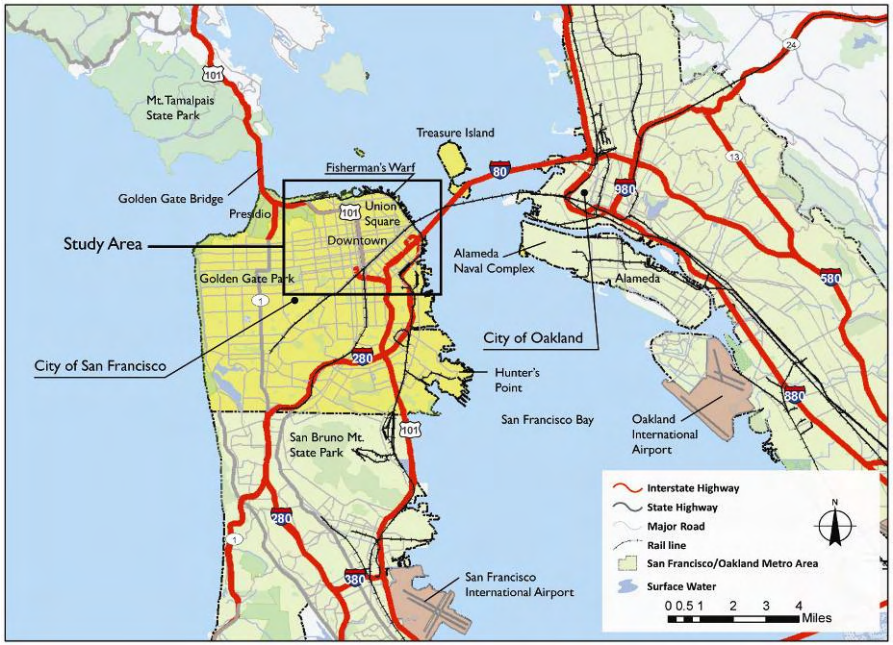
For More Information:

http://www.westcoastroads.com/oregon/portland.html

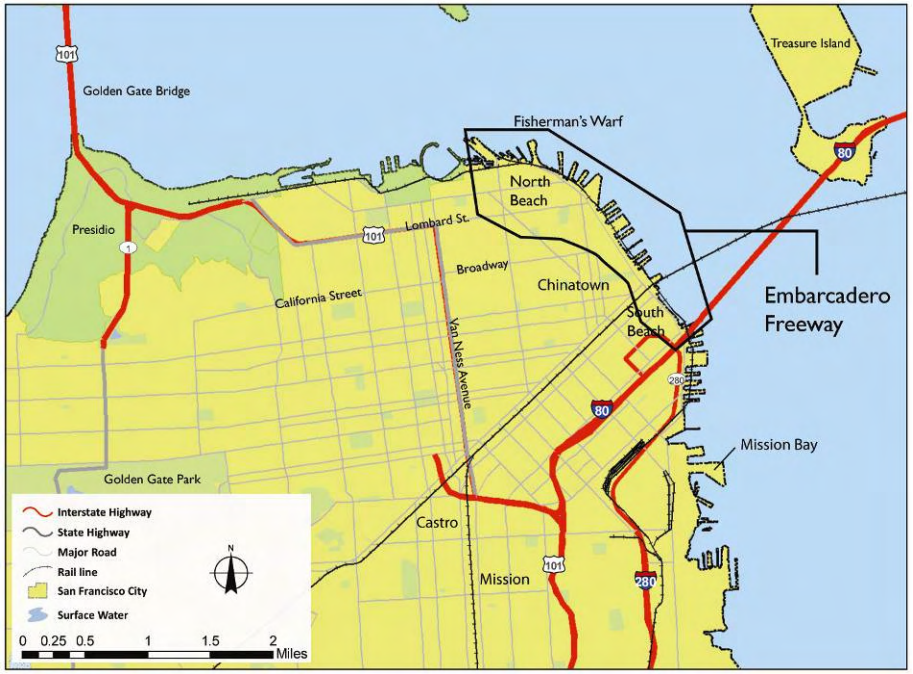
Embarcadero Freeway

	Embarcadero	I-81
Project Type	replacement of an elevated highway with a boulevard	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	no: spur highway to downtown	yes
Vehicles /day	61,000	100,000
Project Length	1.6 miles	1.4 mi.
Context	downtown: San Francisco Bay waterfront	downtown
City	San Francisco, CA	Syracuse, NY
Population	724,000	140,658
Timeline	planning and design 1983-1990; earthquake collapse 1989; construction 1991-2001	unknown
Cost/Cost per mile	$171 million/ $107 million per mile	unknown

Regional Context: San Francisco



Project Location



The Embarcadero Freeway was originally planned as a through route between the Bay Bridge (I-80) and the Golden Gate Bridge (Hwy 101), but was abandoned after the first leg was built due to growing concerns about the freeway's impacts on surrounding neighborhoods. In 1985, the City of San Francisco Board of Supervisors moved to eliminate the freeway and replace it with a boulevard and trolley, but this measure failed in a 1987 vote, primarily due to fear of ensuing traffic congestion. In 1989, the Loma Prieta earthquake caused a section of the freeway to collapse, and the freeway was closed.

As the city grew accustomed to the freeway closure, there was a growing realization that traffic had adapted to the new network with few problems, and support for reconstruction waned. The decision-making process culminated in a 6-to-5 City Board of Supervisors vote that called for the highway to be torn down and

replaced with a boulevard, trolley line and waterfront park. The councilors who favored reconstruction did so largely out of concern that freeway removal would isolate the Chinatown neighborhood, located adjacent to the highway. In 1991, the Embarcadero Freeway was removed.

Precedent Design Study, Washington U. 2008

What were the outcomes?

The project is considered highly successful. The waterfront park is extremely popular, and the surrounding area has received significant levels of private investment. The Embarcadero Boulevard carries about 26,000 cars per day, about half the original freeway volume. The remaining traffic has either found other routes or switched to other modes of transportation.

Are there parallels to *The I-81 Challenge*?

Traffic volumes on the Embarcadero Freeway were lower than I-81, and, as a spur, the highway did not have the same function in the regional transportation network. (Although originally planned as a through route, only the first leg was built.) However, this case provides a model of how local access to a downtown can be provided without a freeway. Traffic proved highly adaptable in this case, likely due to the availability of a robust local street network and a well-developed transit system.

Credit: Bruce Turner

What can we learn from this project?

Traffic Circulation and Urban Mobility: This project illustrates the ability of urban traffic to adapt to a significant change in the network, as drivers seek to avoid congestion and find their most favorable routes. The conversion to a boulevard allowed the route to support not only a significant number of cars, but also pedestrians and transit.

Economic Development/Urban Design: This project illustrates how the removal of an elevated freeway can increase property values and spur redevelopment. The freeway ran along the waterfront in an area with outstanding scenic value. As a result, the boulevard has attracted substantial economic development.

Political/Public Process: The process that led to the freeway removal decision had a number of unique characteristics. Since the freeway was closed after an earthquake, the city had to adapt quickly to the loss of capacity. The City Board of Supervisors took a stand against replacement of the freeway through a vote, which enabled the removal to proceed.

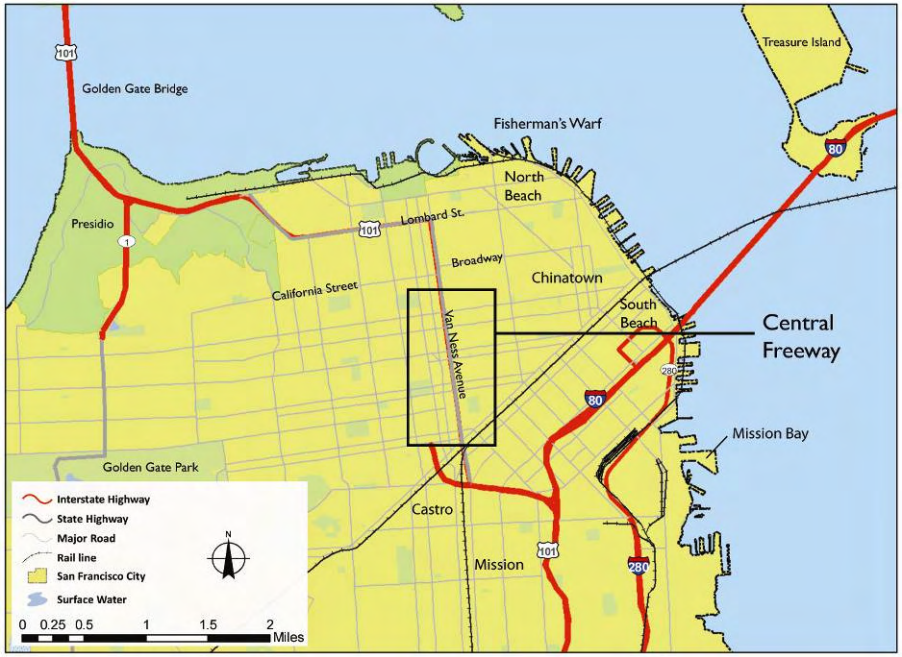
For More Information:

http://www.streetfilms.org/archives/lessons-from-san-francisco/
http://courses.washington.edu/gehlstud/Precedent%20Studies/Embarcadero.pdf

Central Freeway

	Central Freeway	I-81
Project Type	replace an elevated highway and with a boulevard	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	no: spur highway to downtown	yes
Vehicles /day	93,000	100,000
Project Length	0.6 miles	1.4 mi.
Context	downtown	downtown
City	San Francisco, CA	Syracuse, NY
Population	739,000	140,658
Timeline	earthquake causes closure 1989; planning and design 1989-2001; construction 2003- 2005	unknown
Cost/Cost per mile	$50 million/ $83 million per mile	unknown

Project Location



Similar to the Embarcadero Freeway, the Central Freeway was intended to eventually cross the City of San Francisco as a through route, but the movement that arose in opposition to urban freeways prevented its completion. Therefore, the Central Freeway functioned as a spur, but it carried significant traffic volume--over 90,000 cars per day. Damage from the Loma Prieta earthquake also forced this highway to close, and support to demolish rather than rebuild the freeway gradually took hold. As time passed, drivers adapted to the loss of the freeway and it became apparent that the freeway closure had many positive effects on the neighborhood, such as lower noise levels and less traffic. However, after the earthquake, the California Department of Transportation (CalTrans) proceeded with plans to repair the elevated freeway, which was re-opened with a single deck serving two directions (rather than the previous double-deck design) in 1996.

Octavia Boulevard - Credit: Bill Lieberman

There were two attempts at ballot initiatives brought by the "San Francisco Neighbors Association" calling to tear down the highway between 1994 and 1999. There was also a competing measure introduced by organizations representing neighborhoods to the west, which feared that the freeway removal would cause

unbearable congestion. During this time, a proposal by Alan Jacobs and Elizabeth MacDonald of UC Berkeley to replace the freeway with a multi-way boulevard gained support. Finally, there was a vote with conclusive results in 1999, when two separate measures were approved: one to tear down the freeway, and the second to build Octavia Boulevard. The freeway was demolished in 2002, and Octavia Boulevard opened in 2005 as a replacement for the Central Freeway. It now carries 45,000 cars per day, about half the volume of the freeway.

What were the outcomes?

The project has successfully addressed the need for traffic capacity, with nearly half of the prior traffic volume finding other routes or changing modes. The city has conducted counts of neighborhood streets surrounding the boulevard, and has not found any significant increases from the diversion. The neighborhood around the new boulevard has seen increased residential and commercial investment. The multi-way boulevard is largely considered successful, although some design issues at the intersections, particularly conflicts between the side access roads and cross street traffic, continue to require refinement.

Are there parallels to *The I-81 Challenge*?

The traffic volumes served by the Central Freeway are comparable to those on I-81, although this freeway only provided downtown access, did not carry through traffic, and was not an Interstate facility. There are limited parallels in terms of metropolitan area characteristics; San Francisco has a significant transit system and dense, urban grid of local streets that can offer travelers alternate routes. The Central Freeway decision-making process also occurred under unique circumstances, prompted by an earthquake that forced the freeway to be closed.

What can we learn from this project?

Traffic Circulation and Urban Mobility: This project offers one more example of the ability of traffic to re-route itself in an urban network and find routes that result in the least delay. A study conducted by the University of California Transportation Center[6] concluded that most freeway drivers switched to other driving routes, and very few switched to public transit. The project also shows that a multi-way boulevard is worthy of consideration as a design option that can carry significant traffic volumes and still provide a friendly edge for urban, pedestrian-oriented development.

Economic Development/Urban Design: The urban environment in the neighborhood adjacent to this freeway was dramatically improved by the project, through the reduction in noise and traffic, and improvement for other modes in the corridor. Even though there are still over 40,000 cars per day traveling on Octavia Boulevard, they do so at a slower speed. Redevelopment of newly available property will bring additional revenue to the city.

Political/Public Process: The process was highly politicized, with three different votes, and conflicting views from different neighborhoods. The planning process did not result in a consensus decision.

For More Information:

http://www.sfcta.org/content/view/309/156/
http://www.sfgov.org/site/sfdpw_page.asp?id=32258

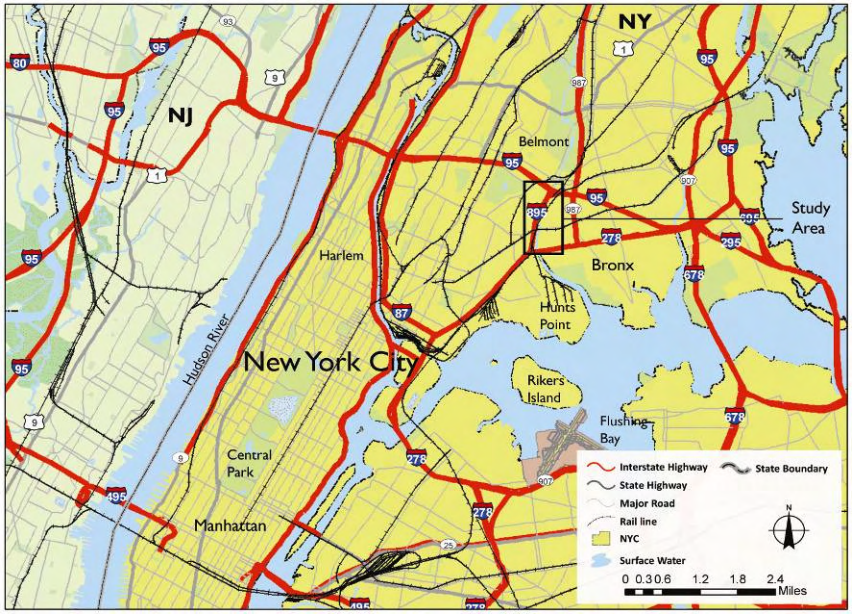
Credit: Bill Lieberman

CASE STUDIES FOR PLANNING AND DESIGN PROJECTS

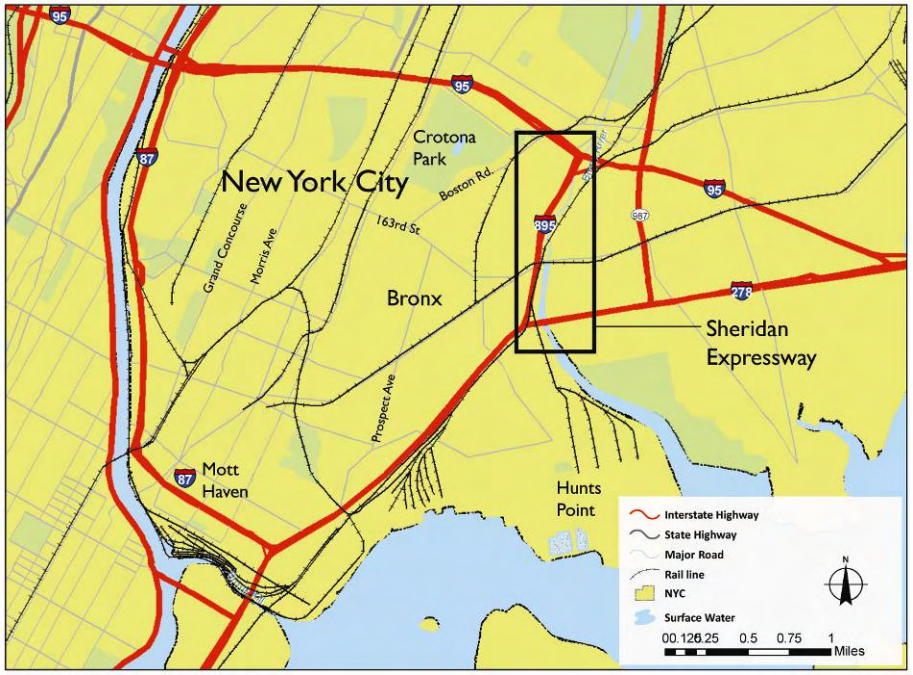
I-895/Sheridan Expressway

	Sheridan Expressway	I-81
Type	at grade highway	existing elevated highway - TBD
Interstate Highway?	yes	yes
Through Traffic?	yes	yes
Vehicles /Day	41,000	100,000
Project Length	1.25 miles	1.4 mi.
Context	urban core	downtown
City	Bronx, NYC, NY	Syracuse, NY
Population	1,373,659 (Bronx only)	140,658
Project Stage	EIS	planning
Estimated Cost	$413 million	unknown

Regional Context



Project Location



The Sheridan Expressway was the only completed segment of a highway that was intended to run parallel to the Bronx River Parkway through the Bronx and Westchester County. The highway is at grade level and runs along the shoreline of the Bronx River between the Bruckner and Cross Bronx Expressways. There is currently an ongoing EIS for improvements to the Bruckner Expressway, an elevated highway which has an interchange with the Sheridan. A coalition of local environmental, religious, and social equity organizations has created a plan to redevelop the Sheridan corridor with housing, a riverfront park, and alternative transportation choices. The EIS process has prompted calls by the community to eliminate this interchange and "de-commission" the Sheridan, which has low traffic volumes, especially by New York City standards. This would allow the redevelopment of the riverfront as envisioned by the community.

What was the decision-making process?

This project has benefited from a highly engaged community. A coalition of groups, including the South Bronx Watershed Association, Sustainable South Bronx, Youth Ministries for Peace and Justice, Tri-State Transportation Campaign, and Mothers on the Move, has been engaged in the New York State Department of Transportation (NYSDOT) EIS process since it began. The community worked to develop a comprehensive vision for the area, with transportation improvements and economic and residential development (see site plan on the following page), and have been seeking alternative designs that will allow the implementation of this plan.

The community vision alternative was in jeopardy early in the EIS process based on the outcome of a highly quantitative, technical analysis of alternatives. The community alternative, which included removal of the Sheridan along with street and transit improvements, ranked poorly in the traffic modeling results, which indicated high levels of congestion. An independent analysis of the modeling results concluded that a modeling error explained the disproportionate levels of congestion for the community vision alternative. In addition, the economic impact analysis did not include any of the economic benefits from the envisioned redevelopment of the Bronx River waterfront, further slanting the technical analysis against the community vision alternative. NYSDOT proved to be responsive to these concerns, and revised their traffic and economic analyses accordingly. .

In the next phase of the public involvement process, two lists of criteria were developed including qualitiative and quantitive measures. A community stakeholder group provided the qualitative ranking of alternatives and NYSDOT provided the quantitive measures using models and other technical analyses. A summary of the overall project goals and objectives that were developed by these groups, focused on both transportation and community development is shown to the right.

Table 1
Project Goals and Objectives

Goal		Objective	
1	Improve Transportation System Efficiency and Reliability	1.1	Minimize travel delays within the primary study area
		1.2	Minimize delays resulting from incidents on expressways
		1.3	Enhance traffic network infrastructure
		1.4	Promote public transit service
		1.5	Improve bicycle and pedestrian travel
2	Enhance Quality of Life	2.1	Reduce the number of trucks on local streets
		2.2	Improve access to parks
		2.3	Minimize disruption to the community resulting from highway construction and operation
3	Support Economic Development	3.1	Provide direct truck access to Hunts Point peninsula markets
		3.2	Maintain and improve rail freight service to South Bronx industries and Hunts Point Markets
		3.3	Reduce truck miles and hours traveled
		3.4	Promote waterborne freight access to Hunts Point
4	Reduce Accidents	4.1	Increase pedestrian safety and reduce accidents, accident rates, and severity at busy primary study area intersections
		4.2	Reduce accidents, accident rates, and severity on the expressway system in the primary study area
5	Minimize Adverse Environmental Impacts	5.1	Reduce truck emissions in residential areas
		5.2	Minimize and mitigate adverse environmental impacts resulting from highway construction and operation
6	Support Environmental Enhancements	6.1	Provide access to planned parkland and recreational facilities
		6.2	Support the development of regional bicycle/pedestrian routes
		6.3	Support the development of river-front open space on the Bronx River and on the East River
7	Financial Viability	7.1	Minimize capital cost while meeting project objectives
		7.2	Maximize the cost effectiveness of transportation system investments
8	Maintain Security	8.1	Maintain alternative routes and delivery systems for vital freight needs in the event of a security breach on key interstate facilities

Listing of Project Goals and Objectives, NYSDOT

The NYSDOT and community stakeholders group agreed that while quantitative models can provide helpful information, there should be a qualitative review and ranking as well. NYSDOT convened a panel of stakeholders to develop qualitative rankings for many of the measures, following a process where the rankings from each panel member were averaged (see example of results in the next table). This proved to be an effective way to combine technical analysis and local perspectives into a transparent decision-making process.

Table 4
Qualitative Screening of Alternatives

Expert Panel		Objective	Max /Min	Rank-based Weight	Alternative								
					1A	1B	2A	2B	2C	2D	3A	3B	3C
Transportation Efficiency and Security	1.1	Minimize travel delays within the primary study area.	Min	4.29	1.3	2.3	3.0	3.0	3.5	3.5	1.3	2.3	1.0
	8.1	Maintain alternative routes and delivery systems for vital freight needs in the event of a security breach on key interstate facilities	Max	0.97	1.5	2.0	2.5	4.0	2.5	3.0	2.5	3.5	2.5
Environmental Issues and Impacts on Quality of Life	2.2 6.1	Improve access to parks Provide access to planned parkland and recreational facilities	Max	3.39	3.7	2.2	0.2	0.2	0.5	0.2	0.0	1.2	2.0
	2.3	Minimize disruption to the community resulting from highway construction and operation	Min	3.16	3.7	3.3	0.2	0.2	0.5	0.0	0.0	0.8	1.0
	2.1 5.1	Reduce the number of trucks on local streets Reduce truck emissions in residential areas	Min	7.79	3.7	3.7	0.8	0.5	1.2	0.8	1.2	2.0	0.6
	5.2	Minimize and mitigate adverse environmental impacts resulting from highway construction and operation	Min	2.5	3.7	3.3	0.2	1.0	1.7	0.6	0.0	1.2	2.0
	1.5 6.2	Improve bicycle and pedestrian travel Support the development of regional bicycle/pedestrian routes	Max	2.08	3.7	2.7	0.3	0.3	0.5	0.4	0.0	0.2	1.4
	6.3	Support the development of river-front open space on the Bronx River and on the East River	Max	2.45	3.7	2.8	0.0	0.0	0.0	0.0	0.0	0.2	1.8
Economic Development	3.1	Provide direct truck access from expressways to Hunts Point peninsula markets	Max	5.53	0.1	0.1	1.2	0.3	4.0	3.1	0.2	2.0	0.1
	3.2	Maintain and improve rail freight service to South Bronx industries and Hunts Point markets	Max	2.26	0.2	0.2	1.0	0.1	3.9	3.1	0.1	2.1	0.1
	3.3	Reduce truck miles and hours traveled	Min	2.68	0.1	0.1	1.2	0.3	4.0	3.2	0.2	2.0	0.1
System Safety	4.1	Increase pedestrian safety and reduce accidents, accident rates, and severity at busy primary study area intersections	Min	4.08	0.3	0.5	2.2	2.5	3.5	2.0	2.5	3.7	1.0
	4.2	Reduce accidents, accident rates, and severity on the expressway system in the primary study area	Min	2.58	0.3	0.5	2.2	2.5	3.5	2.0	2.5	3.7	1.0
NYSDOT	7.1	Minimize capital costs while meeting overall project objectives	Min	0.29	0.0	2.0	1.0	1.0	1.0	3.0	4.0	2.0	4.0
				Total	89	84	51	45	101	74	37	86	43

Note: Shaded area shows highest ranking alternatives carried forward to Quantitative Screening

Qualitative Ranking of Alternatives based on average ranking of stakeholder group members

What can *The I-81 Challenge* learn from this effort?

The relationship between NYSDOT and the local community had seen its highs and lows during the course of this project, but currently, both sides are working collaboratively on a planning process that includes evaluation of broad community goals. Of particular interest is the process of qualitative ranking of alternatives. These techniques, where a panel of local experts is convened to provide a community perspective on various criteria, are being used more frequently for major transportation projects, and could apply to the I-81 project.

Community Vision Plan for the Sheridan Corridor

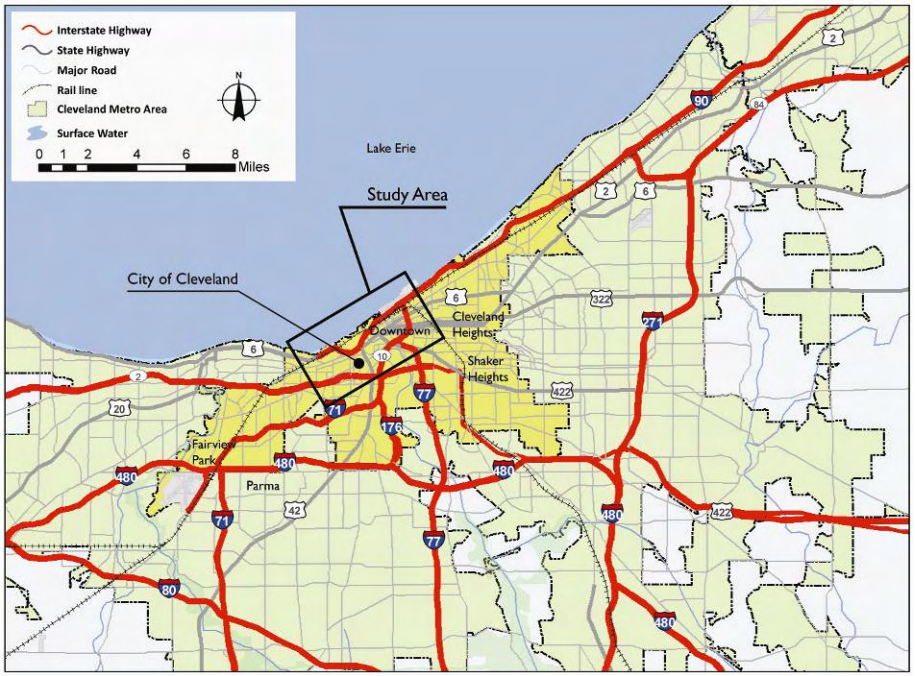
For More Information:

https://www.nysdot.gov/regional-offices/region11/projects/project-repository/bese/index.html

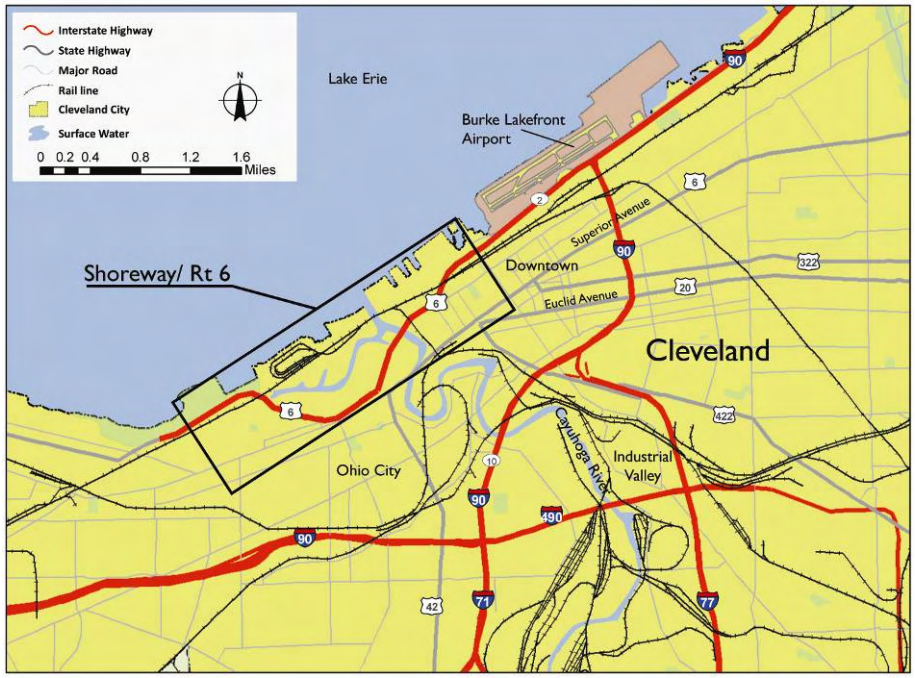
Cleveland Memorial Shoreway/Route 6 (West)

	Cleveland Memorial Shoreway	I-81
Type	at grade limited access highway	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	no-spur highway	yes
Vehicles /Day	45,000	100,000
Project Length	8 miles	1.4 mi.
Context	downtown waterfront	downtown
City	Cleveland, OH	Syracuse, NY
Population	596,974	140,658
Project Stage	planning	planning
Estimated Cost	$77 million	unknown

Regional Context



Project Location



The Cleveland Memorial Shoreway serves as the primary highway access between downtown Cleveland and the near west side suburbs. While it provides convenient transportation, it also creates a barrier between downtown and Edgewater Park, a significant urban recreation resource. As part of a downtown freeway reconstruction project, an option to convert the limited access, high speed Shoreway into a tree-lined, 35 mph boulevard gained wide appeal among the local neighborhoods served by this corridor.

What was the decision-making process?

This project was the subject of protracted disagreements between the City of Cleveland and the Ohio Department of Transportation (ODOT). The reconfiguration was initially rejected by ODOT due to traffic and funding issues, but the city

remained resolute that this was the best option. Cleveland officials reduced the speed limit of the road from 50 to 35 mph, and argued that state law enabled this because the road passed through Edgewater Park. Initially, the ODOT did not agree, but eventually, the concept gained approval. The conversion to a boulevard is now planned as a "Phase II" of the highway reconstruction project, which includes some other downtown freeway improvements. Construction is planned to begin in 2013.

Source: Creative Commons, FreewayFan2007.

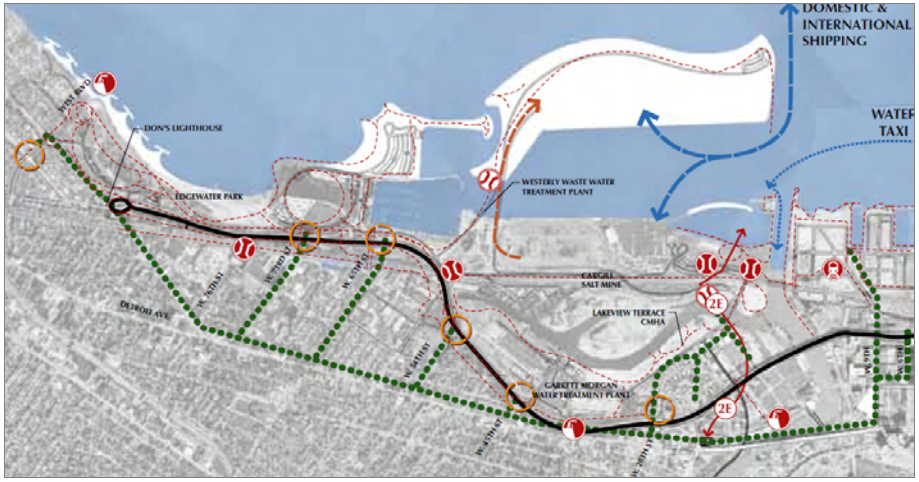
What can *The I-81 Challenge* learn from this effort?

The Shoreway was constructed with the intention of connecting commuters conveniently with the downtown, but has served to be a substantial barrier between the Detroit Avenue neighborhood and Edgewater Park, on the Lake Erie shore. The Cleveland Waterfront District Plan has recognized the desire to address these impacts with the proposed boulevard plan, at odds with the ODOT concepts.

Since the decision to convert this highway to a boulevard, private investment in the Detroit Avenue/Shoreway neighborhood has already been increasing based on optimism about the potential benefits of the boulevard and the enhanced accessibility to Edgewater Park that it would allow.

For More Information:

http://blog.cleveland.com/metro/2008/12/plan_to_turn_clevelands_west_s.html

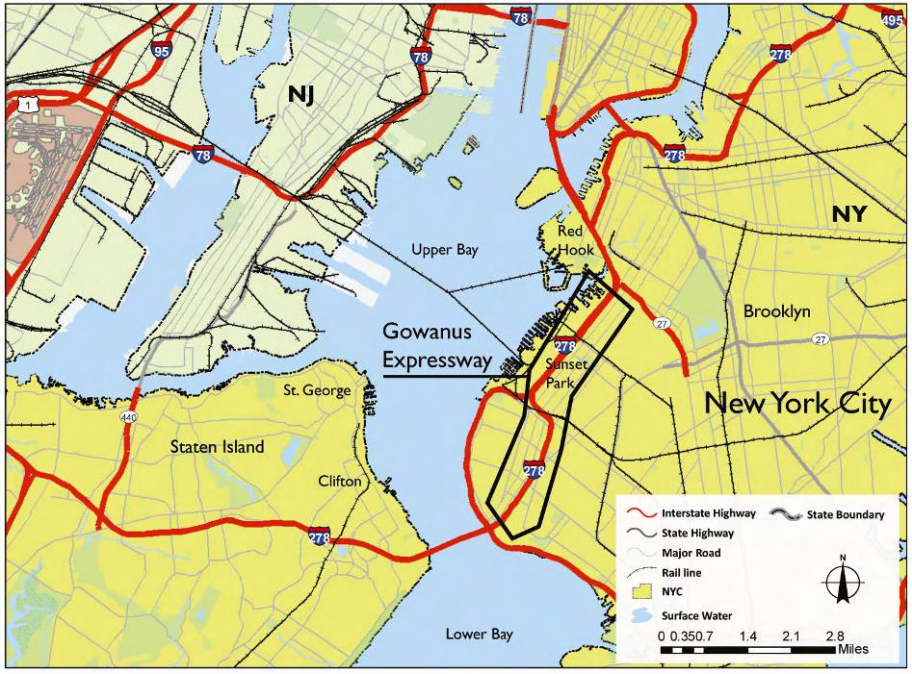


Plan to Improve Connectivity to Shoreway and Edgewater Park

Gowanus Expressway

	Gowanus Expressway	I-81
Type	elevated highway	existing elevated highway - TBD
Interstate Highway?	yes	yes
Through Traffic?	yes	yes
Vehicles /Day	198,000	100,000
Project Length	3.8 mile viaduct section	1.4 mi.
Context	urban core	Downtown
City	Brooklyn, NYC, NY	Syracuse, NY
Population	2,528,050 (Brooklyn)	140,658
Project Stage	EIS	planning
Estimated Cost	$2.4-$12.8 billion	unknown

Project Location



The Gowanus Expressway is a major highway that runs from the Verrazano-Narrows Bridge to the Brooklyn-Battery Tunnel/Brooklyn-Queens Expressway Interchange, with connections to the Shore Parkway and the Prospect Expressway. It is an elevated highway, constructed in 1941 in the Robert Moses era. Traffic volumes grew over time, and it was expanded in the 1970s to three lanes in each direction. Some members of the community have blamed the highway for economic decline in the Red Hook neighborhood adjacent to the expressway, as well as for high asthma rates in this part of Brooklyn.[7]

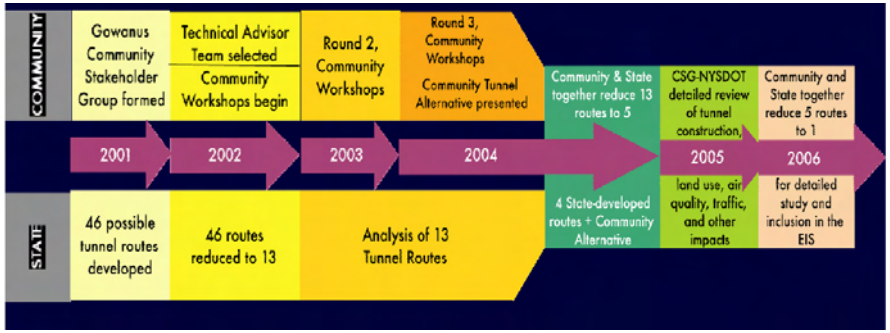
What was the decision-making process?

In 1985, the New York State Department of Transportation (NYSDOT) initiated discussion of reconstruction options for the elevated expressway, which was showing signs of deterioration, and began technical studies. In 1992, NYSDOT announced their intention to reconstruct the elevated portion in sections over a ten year period. During the construction of each segment, the highway would be closed to traffic, which was to be re-routed onto local streets. For a number of reasons, the plan met strong opposition from the community. The potential impacts during the construction period, including significant harm to communities that were already suffering economically, were felt to be untenable. Further, many community members wanted to see a broader range of alternatives considered, including removing the freeway and replacing it with a boulevard or a tunnel. The Environmental Impact Statement (EIS) had only analyzed a single "build" alternative.

In 1997, the Gowanus Expressway Community Coalition filed a lawsuit against the NYSDOT, which stalled the project. In 2001, NYSDOT and the coalition reached an agreement to essentially re-start the planning process with much greater input and

collaboration from the community. The agreement established a Community Stakeholder Group (CSG), and provided funding for a "Community Engineer" to advise the CSG through the EIS process.

Between 2001 and 2006, a wide range of options were explored in the renewed draft EIS process. At this time, the draft EIS is considering two alternatives, including a tunnel alternative supported by the community and an alternative that reconstructs the elevated highway.



At the start of the renewed process, all parties agreed that there should not be loss of vehicular capacity, so alternatives that included removal of the freeway and replacement with a boulevard have not been considered. However, transit and other surface street improvements to repair the street network have been incorporated into the CSG tunnel alternative. The *Tunnel Alternative Report*, prepared by the CSG, describes some potential alignments for the tunnel alternatives.

What can *The I-81 Challenge* learn from this effort?

There are some important parallels between the Gowanus Expressway and *I-81*. They are both aging urban viaducts that are carrying more traffic than the designers ever envisioned. However, the Gowanus is far more deteriorated and carries substantially more traffic. With the delays in the EIS process, maintenance activities are frequently required which are costly and exacerbate congestion on the corridor.

The new process that was initiated following the lawsuit has been far more successful in drawing in and actively considering community input. However, complications regarding the feasibility of a tunnel, and the high costs of constructing one, are concerns that could prevent the selection of this community-supported alternative in the end.

The process of finding a solution for the Gowanus Expressway has now stretched beyond 20 years. This case exemplifies the risk of delayed action for the I-81 corridor if consensus cannot be reached.

German Tunnel Boring Machine – 46 feet in diameter

Alternative Tunnel Routes

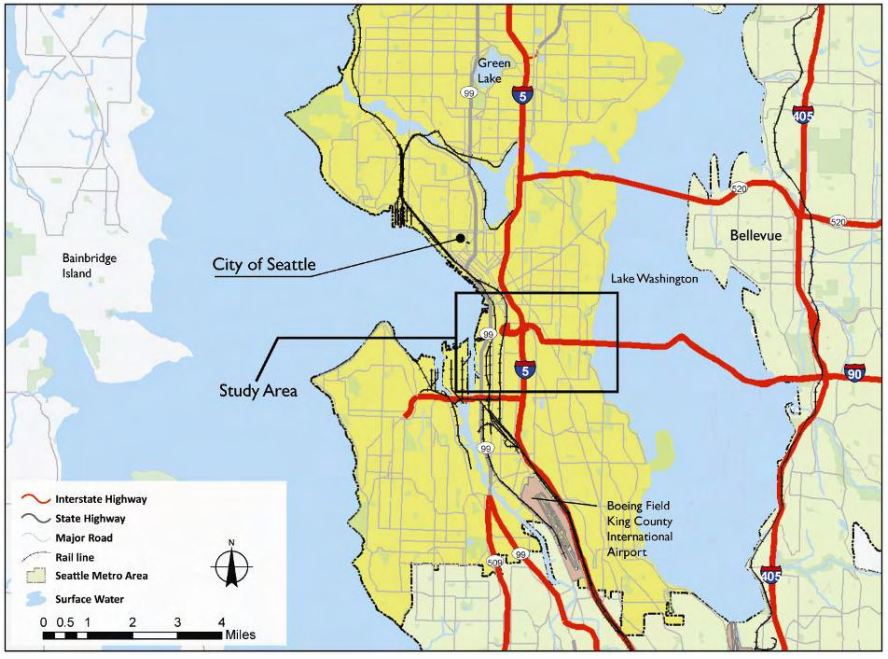
For More Information:

https://www.nysdot.gov/portal/page/portal/regional-offices/region11/projects/gowanus-project

Highway 99/Alaskan Way Viaduct

	Highway 99	I-81
Type	elevated highway	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	yes	yes
Vehicles /Day	103,000	100,000
Project Length	2.8 miles	1.4 mi.
Context	waterfront	downtown
City	Seattle, WA	Syracuse, NY
Population	582,454	140,658
Project Stage	EIS	planning
Estimated Cost	$1,913 million (bored waterfront tunnel alternative)	unknown

Regional Context: Seattle



Project Location

The Alaskan Way Viaduct carries State Route 99 through Seattle along its Puget Sound waterfront. It is a double-deck highway with four lanes in each direction, and carries over 100,000 vehicles per day. The highway structure is considered an eyesore by residents and a barrier between downtown and the city's active waterfront. There has been strong interest in exploring alternatives.

What was the decision-making process?

The viaduct was damaged by an earthquake and is at risk of more serious damage or failure if another significant earthquake occurs. Alternatives that have been considered include a new replacement structure, which would be even larger than the existing facility in order to meet modern engineering standards. Several options for full or partial cut-and-cover tunnels, requiring complicated construction plans and high costs, have also been considered. Another alternative, which has been called "Streets and Transit," includes replacement of the viaduct with a boulevard, reconnecting and improving the downtown street grid's traffic capacity, and increasing transit service to and through downtown.

In March 2007, Seattle voters were asked to vote on two of these alternatives: a new elevated highway and a new tunnel. The public voted "no" on both, indicating that perhaps the "Streets and Transit" alternative was the preferred option. Construction of both the new elevated highway and the tunnel alternatives would have required closing the viaduct for several years. For some members of the community, this begged the question: if we can live without the viaduct for five years during construction, why can't we live without it forever?

Since the vote, a renewed, collaborative effort between Washington State DOT (WSDOT), the City of Seattle, and King County was initiated to look more broadly at alternatives. This included the development of a Study Advisory Committee that established a list of "Guiding Principles" for all alternatives and proposed broad performance measures that reflect these principles. The alternatives development started with a set of "building blocks" representing a variety of urban mobility elements, including surface street improvements, highway improvements, transit improvements, and travel demand management strategies (e.g. land use strategies, parking management). These building blocks were then mixed and matched into alternatives.

This renewed, collaborative process has resulted in the City of Seattle, King County, and the WSDOT agreeing to proceed with a bored tunnel alternative. This tunnel would be substantially deeper than the other "cut and cover" tunnel alternatives that were considered previously, and it would provide no intermediate access points along its length. The bored tunnel is the highest cost alternative, but one factor in its favor is that it could be constructed while the existing viaduct remains open.

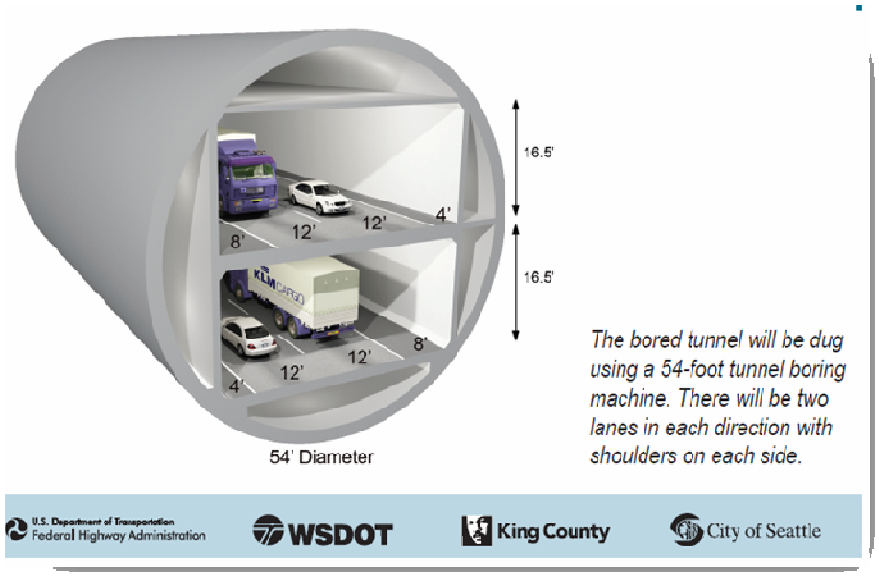


Illustration of the Proposed Double-Deck Bored Tunnel (WSDOT)

What can *The I-81 Challenge* learn from this effort?

The traffic volume and function of the Alaskan Way viaduct is comparable to the I-81 viaduct through downtown Syracuse. However, it is not an interstate highway, and only about 20% of its traffic is through moving.

The city has seen high levels of investment and redevelopment in and around the downtown area, and the viaduct is a substantial barrier between the downtown and the city's scenic waterfront. There is strong consensus in the city that replacing the viaduct is not an appropriate alternative, and would prolong a mistake from an earlier era.

The renewed approach to the planning and design process has utilized some innovative methods that are worthy of consideration in Syracuse. The first step was to come to consensus on a set of guiding principles, which helped set the basis for the subsequent development of performance measures. Another was the use of "building blocks," which included construction, transit, and demand management components (i.e. parking pricing), that could be mixed or matched as appropriate in the development of alternatives.

For More Information:

http://www.wsdot.wa.gov/projects/Viaduct/

http://www.seattle.gov/Transportation/awv.htm

Washington State Department of Transportation | King County | City of Seattle

Alaskan Way Viaduct
Guiding Principles
February 2008

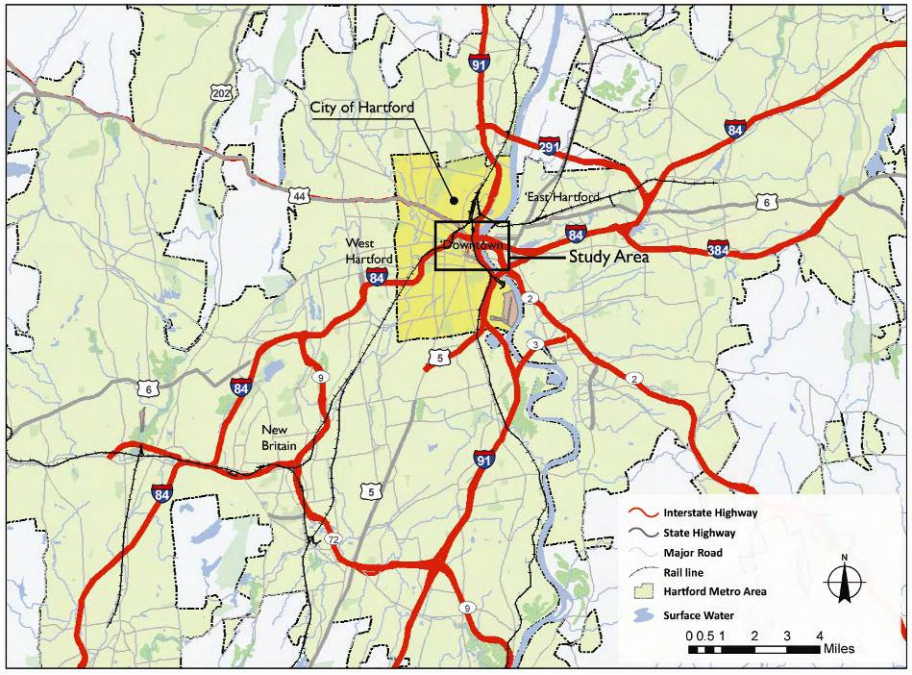
Any solution to the Alaskan Way Viaduct is to be grounded in the city, state and county's recognition of, commitment to and integration across a set of six guiding principles. These guiding principles are as follows:

- ***Improve public safety.*** Replacing the viaduct is an urgent public safety issue. Any solution to the Alaskan Way Viaduct must improve public safety for current viaduct users and along the central waterfront.
- ***Provide efficient movement of people and goods now and in the future.*** Any solution to the Alaskan Way Viaduct must optimize the ability to move people and goods today and in the future in and through Seattle in an efficient manner, including access to businesses, port and rail facilities during and after construction.
- ***Maintain or improve downtown Seattle, regional, the port and state economies.*** Any solution to the Alaskan Way Viaduct must sustain the city, region, port and state's economic vitality during and after construction.
- ***Enhance Seattle's waterfront, downtown and adjacent neighborhoods as a place for people.*** Any solution to the Alaskan Way Viaduct must augment Seattle's reputation as a world-class destination.
- ***Create solutions that are fiscally responsible.*** Any solution to the Alaskan Way Viaduct must make wise and efficient use of taxpayer dollars. The state's contribution to the project is not to exceed $2.8 billion in 2012 dollars.
- ***Improve the health of the environment.*** Any solution to the Alaskan Way Viaduct must demonstrate environmental leadership, with a particular emphasis on supporting local, regional and state climate change, water quality and Puget Sound recovery initiatives.

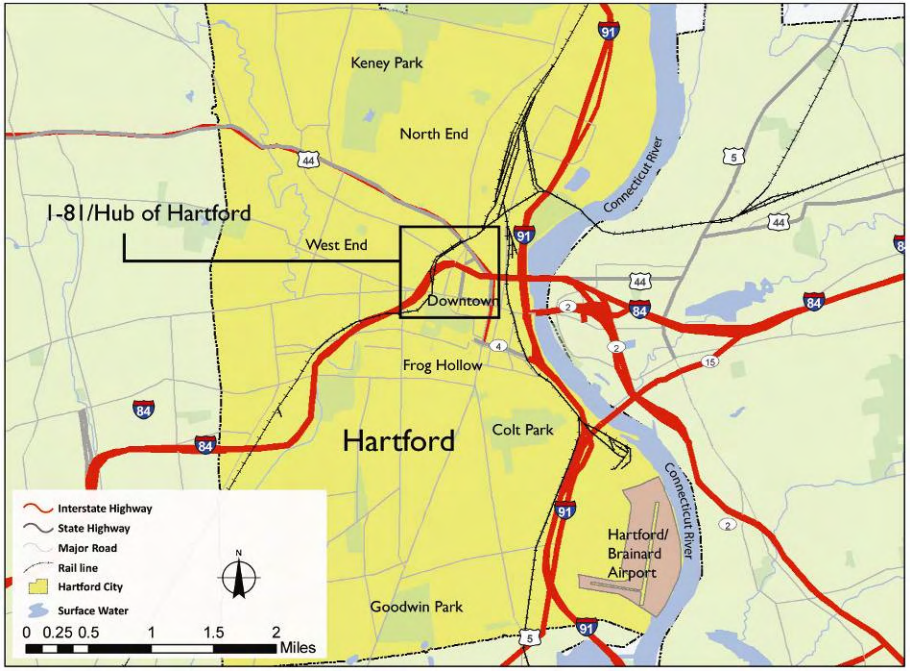
I-84/Hub of Hartford

	I-84	I-81
Type	elevated highway	existing elevated highway - TBD
Interstate Highway?	yes	yes
Through Traffic?	yes	yes
Vehicles /Day	172,000	100,000
Project Length	1 mile	1.4 mi.
Context	downtown	downtown
City	Hartford, CT	Syracuse, NY
Population	124,512	140,658
Project Stage	planning	planning
Estimated cost	unknown	unknown

Regional Context: Hartford



Project Location



When the Connecticut Department of Transportation (CTDOT) announced that $100 million was to be spent on repairing the Aetna Viaduct, which carries I-84 through downtown Hartford, many people, particularly neighbors of the structure, objected, concerned that this investment would prolong the life of a structure that is thought to contribute noise and blight to the downtown area. Since that time, the CTDOT project has been scaled down to only include immediately necessary safety repairs and has funded a broad exploration of alternatives with the Connecticut Regional Council of Governments.

What was the decision-making process?

In 2006, the Aetna Viaduct Alternatives Committee was formed to raise awareness about the impacts of the highway on surrounding neighborhoods through which it passes. Meanwhile, the Capital Region Council of Governments (CRCOG) convened a study group to consider long range alternatives to reconstruction of the viaduct. The viaduct carries more than 180,000 cars per day and the area around it has felt the impacts of the highway, including noise, dust, and the visual presence of the elevated structure. The "Hub of Hartford" steering committee includes representatives from the City of Hartford, the major employers in the city (Aetna, The Hartford, etc.), neighborhood representatives, the CTDOT, and the CRCOG. The steering committee's mission statement reads, "Using the redesign and de-emphasis of I-84 as the central theme for change, the Hub of Hartford can become a lively and walkable, mixed-use, mixed-income urban place, and a regional crossroads where business, government, community and recreational uses integrate seamlessly in a historic context supplemented by compatible new development."

What can *The I-81 Challenge* learn from this effort?

The Aetna Viaduct carries somewhat higher traffic volumes than does the I-81 viaduct in Syracuse. However, this project does have several similarities to *The I-81 Challenge*. The sizes of the metropolitan areas and the regional significance of these interstate highways are comparable.

The primary goal of the Hub of Hartford is to explore ways to repair the damage and impact of the I-84 viaduct. While efficient transportation will be a critical consideration, the urban environment shares equal priority among members of the steering committee. A study of alternatives that is currently underway will include, "a comprehensive assessment of how each alternative might help improve the quality of life in surrounding neighborhoods, support existing businesses, and promote economic development[8]."

The "Hub of Hartford" committee emphasizes employer and neighborhood representation. Their initial effort is not leading directly to an EIS, but rather is a broad-reaching urban planning and design effort that will precede the highway planning and design process, perhaps comparable to the *University Hill Transportation Study* in Syracuse.

For More Information:

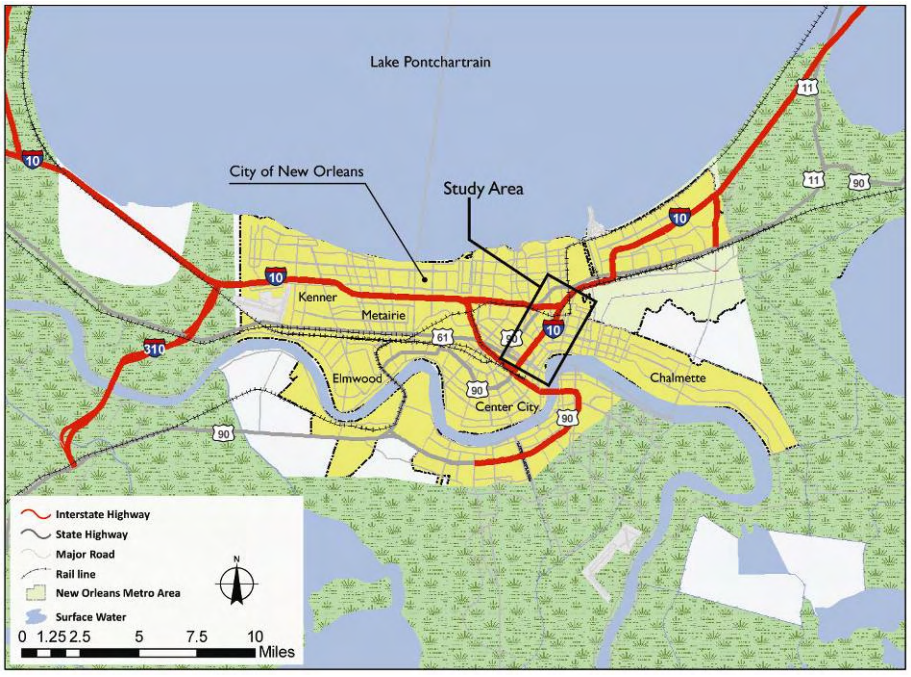
http://www.crcog.org/viaduct.html

http://www.hartfordinfo.org/issues/documents/transportation/htfd_courant_041308_2.asp

I-10/Claiborne Expressway

	I-10	I-81
Type	elevated highway	existing elevated highway - TBD
Interstate Highway?	yes	yes
Through Traffic?	yes	yes
Vehicles /Day	69,000	100,000
Project Length	2 miles	1.4 mi.
Context	downtown	downtown
City	New Orleans, LA	Syracuse, NY
Population	288,000	140,658
Project Stage	planning	planning
Estimated cost	unknown	unknown

Regional Context



Project Location

A portion of Interstate 10 was constructed as an elevated route on top of Claiborne Avenue in New Orleans in the 1960s. This dramatically altered the neighborhoods in the area, as many buildings were demolished to make room for the freeway, and the remaining structures were impacted by noise and shadows.

What was the decision-making process?

Since Hurricane Katrina, the Unified New Orleans Plan (UNOP) has been considering significant changes to the city's infrastructure, including the conversion of I-10 to an at-grade Claiborne Boulevard, more closely resembling its historic role and character. The overall goals of the UNOP include community stabilization, transit expansion, and repairing local infrastructure. Removing the Claiborne Expressway,

and establishing a boulevard similar to what was in place before the highway, should serve these goals[9].

Historic Claiborne Avenue, Times Picayune Archives

The regional transportation impact of this conversion could be limited because I-610, constructed in the 1970s, provides a direct alternative for long distance travel. The potential for improved local traffic circulation provided by an at-grade boulevard has great appeal, as do the slower speeds and ability to create a more attractive, tree-lined street.

What can *The I-81 Challenge* learn from this effort?

The traffic volumes on I-10 are comparable to those on I-81; and an alternate route exists that does not require significant additional travel time for through traffic. Current planning for a replacement to I-10 is multimodal and includes substantial transit improvements. A primary motivation of the project is redevelopment of the corridor, and the city has concluded that traffic redistribution onto the local street network can be a factor to stimulate economic development.

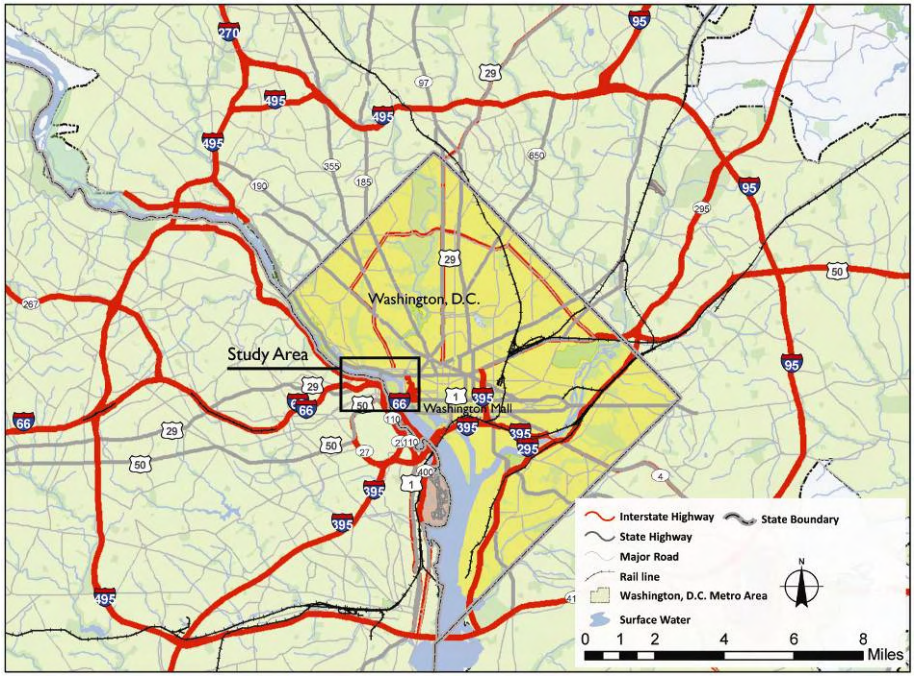
For More Information:

http://www.unifiedneworleansplan.com/home3/section/136/city-wide-plan

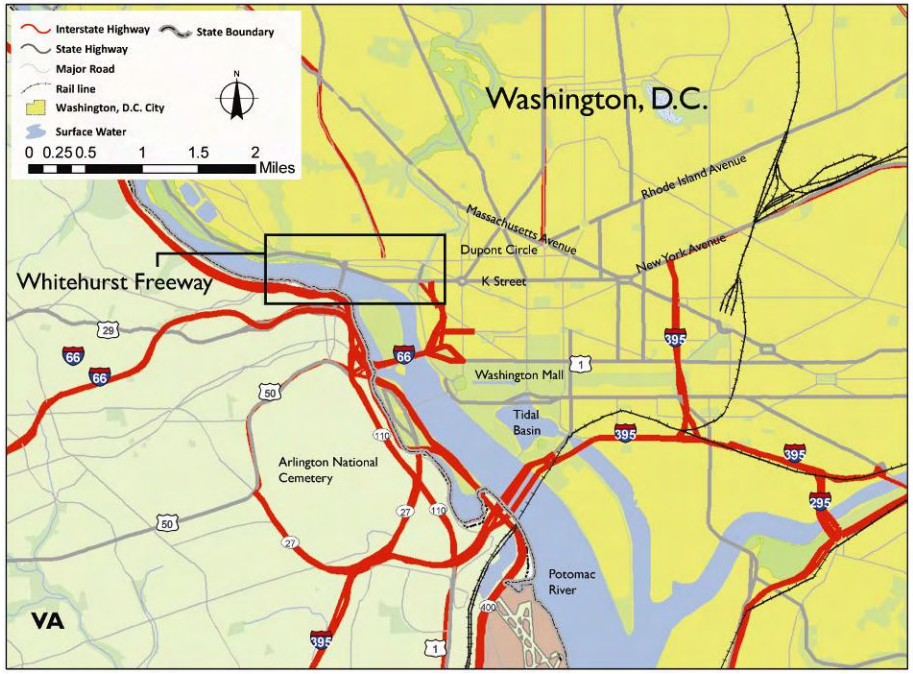
Whitehurst Freeway

	Whitehurst Freeway	I-81
Type	elevated highway	existing elevated highway - TBD
Interstate Highway?	no	yes
Through Traffic?	yes	yes
Vehicles /Day	42,000	100,000
Project Length	0.6 miles	1.4 mi.
Context	waterfront	downtown
City	Washington, DC	Syracuse, NY
Population	591,833	140,658
Project Stage	planning	planning
Estimated cost	unknown	unknown

Regional Context



Project Location



The Whitehurst Freeway is a short section of limited access highway that connects Georgetown to central Washington DC. It is used primarily by commuters and functions as a spur route serving the local area. It is elevated and has substantial noise impacts on surrounding neighborhoods.

What was the decision-making process?

In the mid-1980s, the Capital District Department of Transportation initiated a study to look at the feasibility of deconstructing the freeway. The study, which was also to serve as an Environmental Impact Statement (EIS), focused on a broad range of issues, including traffic operations, transit and pedestrian services, and possibilities for improved access to a waterfront park along the Potomac River in Georgetown. Urban design and environmental features were considered important factors.

Part way through the study, it was halted by the mayor of Washington, D.C. due to opposition to removal from commuters and local residents who feared increased traffic on their local streets. At the present time, there is no official consideration of removal of this road, although there continues to be discussion in the community.

What can *The I-81 Challenge* learn from this effort?

The Whitehurst Freeway has much lower traffic volumes and fewer geometric design issues than I-81 in Syracuse. It serves primarily commuter traffic into Washington, D.C. The process that considered options of removing the freeway proved to be divisive within the community, with some strongly supporting removal and others fearful of the traffic impacts. In addition, commuters from Maryland and Virginia suburbs expressed strong opposition to removal, eventually leading to cancellation of the study. The process failed to develop a consensus solution, and some of the stakeholders were not involved early enough in the process.

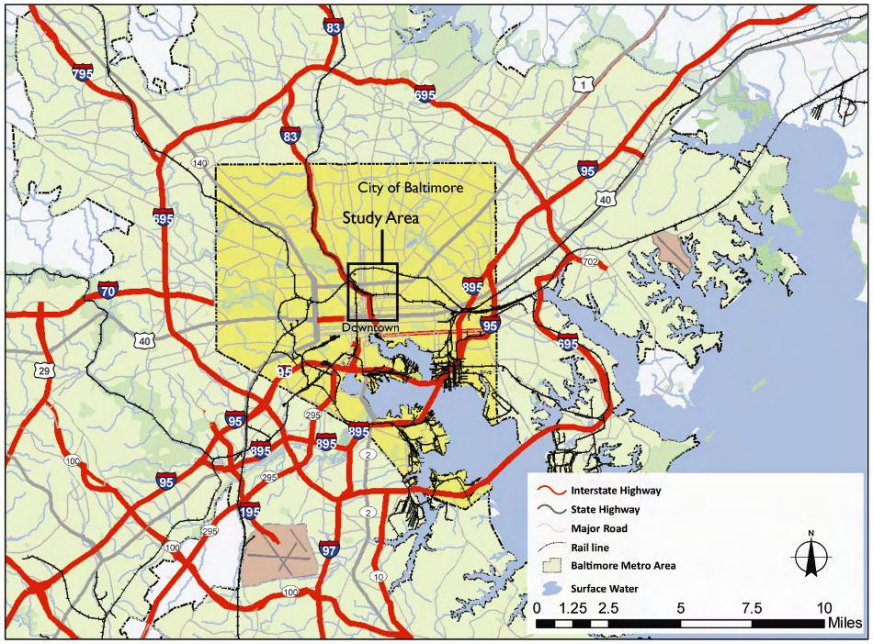
For More Information:

http://www.ddot.dc.gov/ddot/cwp/view,a,1249,q,625355.asp

I-83 Jones Falls Expressway

	I-83	I-81
Type	elevated highway	existing elevated highway - TBD
Interstate Highway?	Yes - I-83	yes
Through Traffic?	spur	yes
Vehicles /Day	55,000	100,000
Project Length	1 mile	1.4 mi.
Context	downtown	downtown
City	Baltimore, MD	Syracuse, NY
Population	631,366	140,658
Project Stage	concept	planning
Estimated Cost	$1,000 million (preliminary estimate)	unknown

Regional Context



Project Location

The partially elevated Jones Falls Expressway, which connects to I-95 and carries I-83 into downtown Baltimore, has long been considered a physical barrier and detriment to urban redevelopment by community members and city planners, who argue that the highway divides the Johns Hopkins Medical Campus from downtown and has a negative influence on adjacent neighborhoods. In May 2009, a study was initiated by the City of Baltimore to explore a broad range of options and issues related to the possible replacement of the Expressway with a boulevard. This effort is very early in the concept stage.

What can *The I-81 Challenge* learn from this effort?

A few elements of this project are similar to those in Syracuse: the corridor is an interstate highway, serves high volumes of commuter traffic, and is seen as a barrier between a university hospital campus and downtown.

The area underneath the elevated expressway has found some utility in the form of a weekly farmers market that is sheltered from rain and sun by the highway. However, given the educational and employment resources in the vicinity of the highway, many in the community believe that there likely would be opportunities for an improved economic environment if the highway was removed or its impacts mitigated. At this time, the study of future options has not reached any conclusions.

For More Information:

http://www.baltimoresun.com/business/bal-bz.jfx17may17,0,7643521.story

Credit: James George

International Examples

This section of the report presents some examples of freeway projects from beyond the United States. In comparison with U.S. examples, it is more difficult to develop comprehensive international case studies, due to limited access to data. Also, these examples have limited direct applicability to domestic situations, due to very different policies, regulations, design standards, and cultural expectations. However, this cursory overview offers some compelling design concepts.

In Europe, there are very few highways that have penetrated city centers, as European cities have primarily developed ring road networks with streets and transit entering the city cores. It is common for European cities to go to great lengths to separate highways from their cities, as shown in the photo at left of an elevated highway constructed in a manner that protects the village below.

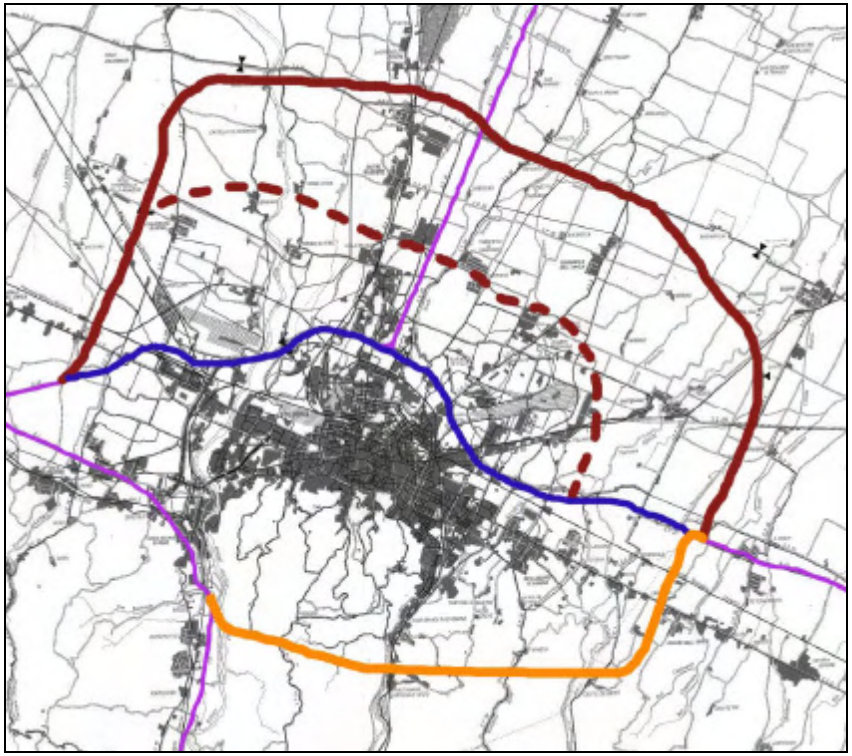
Bologna, Italy

Located at a central transportation crossroads, Bologna is creating a long-term transportation program as part of its strategy to become an increasingly important economic development center and to reverse the trend of declining population yet expanding urban area. Like Syracuse, Bologna is promoting "the knowledge economy," highlighting the University of Bologna, the oldest university in the western hemisphere, which is currently home to 70 departments and over 100,000 students. In the center city, pedestrian movements are given very high priority. This choice is facilitated by the mix of perimeter parking areas and the strength of the transit system.

Proposed transportation projects include upgrades for the rail, transit, and highway systems. Rather than expand the highway, which runs along the edge of the central district, the region is creating a new northern by-pass as a secondary growth corridor.

To help strengthen the city center and the regional economy, the proposed *"Passante Nord"* bypass will be supplemented by a monorail linking the train station/central business district and the airport, the new tram-subway line, expanded perimeter parking lots outside the central city, and upgraded transit (rail and bus) facilities and services. The new highway corridor will make an old 1950s East-West Freeway obsolete. The city is planning to redevelop the former freeway corridor, including demolition of the 50-year-old tangential

highway and construction of an "eco-boulevard" with a high-tech surface "green" tram and landscaped parallel service streets.



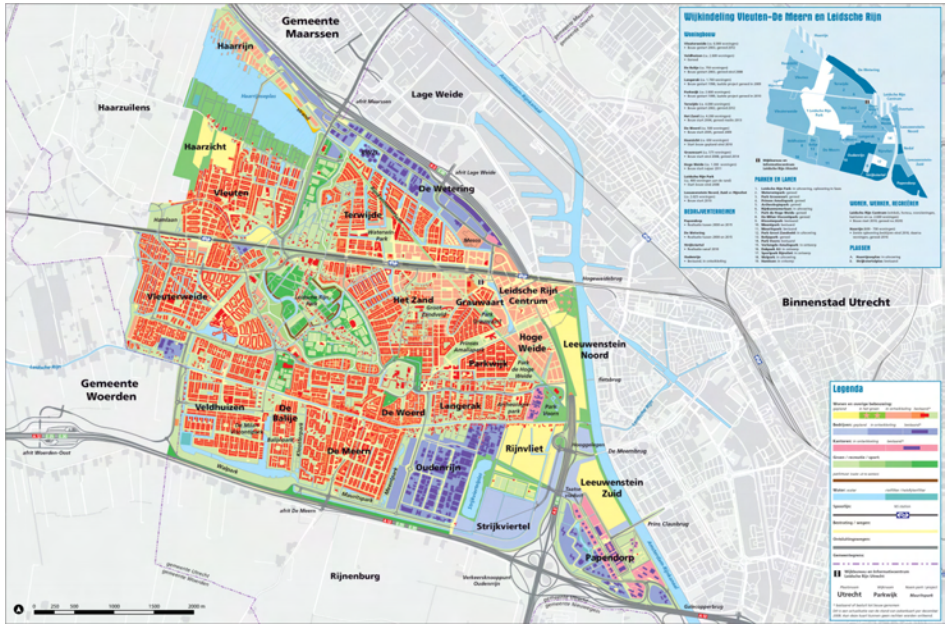
Regional Transportation Plan showing the new Passante Nord alternatives in red, and the "Nuovo Eco Boulevard" in blue. Images to the right show simulations of growth planned for the Eco Boulevard, along the former highway right-of-way.

Bologna Master Plan for the Freeway Corridor

http://www.avoe.org/bologna2020.html (images used with permission)

Utrecht, The Netherlands

This city is combining the development of a new growth area with the expansion and modernization of an existing major motorway. The widened highway will be covered through the area where new residential growth is planned. The new development area will be served by transit and a bicycle network, while the highway will serve primarily through traffic and will have limited connection to the new development. The design reinforces the European approach where major highways are limited to long distance travel, and intra-city travel is by the slower modes: transit, bicycling and walking.



Source: Gemeente Utrecht, Projectbureau Leidsche Rijn (used with permission)

Sydney, Australia

As part of the 2030 vision, Sydney is working on a long term plan to remove the barriers that separate three key attractions: Darling Harbour, the western waterfront, and Pyrmont-Ultimo. One element of the plan is to bury the Western Distributor highway, which would improve pedestrian access to the western waterfront, and create a new urban park at the Darling Harbour. Substantial redevelopment would be possible with this scheme, including an expanded convention center.

Before

After

Seoul, South Korea

Seoul's Cheonggyecheon elevated expressway, constructed over a stream starting in 1958, was demolished in 2004, allowing the corridor to be restored as a linear park. This project had significant and positive economic and revitalization impacts. The highway had served about 170,000 cars per day, and the freeway removal was accompanied by a new bus rapid transit network and travel demand management policies for downtown Seoul.

Before: Cheonggyecheon Freeway

After: River Front Park and Boulevard

Conclusions

In each of these cases, there is recognition of the economic importance of creating high quality urban environments while continuing to provide transportation facilities. The reduction or elimination of the highway structure from these important community centers also included significant additional transportation investments in local and regional street and transit systems.

End Notes

[1] Traffic Impact of Highway Capacity Reduction, S Cairns, C Hass-Klau and PB Goodwin, ITE Journal, July 1998.

[2] The Genie in the Bottle: The Interstate System and Urban Problems, 1939-1957. Richard F. Weingroff, Public Roads Magazine, Turner Fairbanks Research Center, Federal Highway Administration. September/October 2000.

[3] Property Values and Highway Expansions: An Investigation of Timing, Size, Location and Use Effect. Siethoff and Kockleman, Presented at the 81st Annual Meeting of the Transportation Research Board, 2002.

[4] Big Dig pushes bottlenecks outward, Boston Globe, November 16, 2008.

[5] The Boston Indicators Project, www.bostonindicators.org.; The Boston Foundation Report on Transportation Indicators, http://www.tbf.org/uploadedFiles/10-Transportation.pdf

[6] *Freeway Deconstruction and Urban Regeneration in the United States*, Robert Cervero, University of California Transportation Center, 2006.

[7] *Gowanus Expressway Case Study*, prepared for the Gowanus Community Stakeholder Group, prepared by the Institute for Civil Infrastructure Systems at the Wagner Graduate School of Public Service, New York University, www.icinyu, 2006.

[8] Hartford I-84 Viaduct Study, Capital Region Council of Governments (CT), www.crcog.org.

[9] Unified New Orleans Plan (UNOP), Recovery Project Planning, District 4, Removal of I-10.