

APPENDIX B – PRECEDENT STUDIES

New Mississippi Bridge – St. Louis, MO USA

- Project Type: New construction – New I-70 span across the Mississippi River
- Length of Vehicular Corridor: 3.5 miles from East St. Louis, IL to St. Louis, MO
- Changes in Developable Land: Decrease of approximately 42 acres
- Economics: Estimated Cost: \$667 million
- Time Frame: Planning and Construction: 2001 - 2014
- Impact on Traffic: Traffic volume increased with the addition of new highway
- Impact on Access: New road creates option to bypass Downtown on I-70. Connects commuters with north side of Downtown.

General Overview:

“The New Mississippi River Bridge project created a new gateway between Illinois and Missouri and provided better connections to and through St. Louis. The project included a landmark bridge structure and the realignment and reconstruction of I-70 and numerous local roads on both sides of the state line. The project provided needed increased traffic capacity, improved system linkages, improved travel times and enhanced economic growth.”

Financing Strategies:

The State of Illinois contributed \$313 million, State of Missouri \$115 million and Federal funding of \$239 million. Future phases will bring total project cost between \$1.8 billion and \$2.2 billion.

Sources: newriverbridge.com



During Construction (2012)



After Construction (2016)

I-74 Iowa-Illinois Corridor – Davenport, IA USA

- Project Type: Plan – Removal of I-74 Bridge over Mississippi River and replacing with larger arch span
- Length of Vehicular Corridor: 7+ miles from Avenue of the Americas in IL to Route 6 in IA
- Changes in Developable Land: Decrease in amount of developable land
- Economics: Estimated Cost: \$126.9 million
- Time Frame: Planning and Construction: 2010 – Ongoing
- Impact on Traffic: The need for a bridge that carries a greater volume of traffic
- Impact on Access: The Interstate will be widened and several arterial road access points will be improved. Possible parks on top of the freeway in some locations.

General Overview:

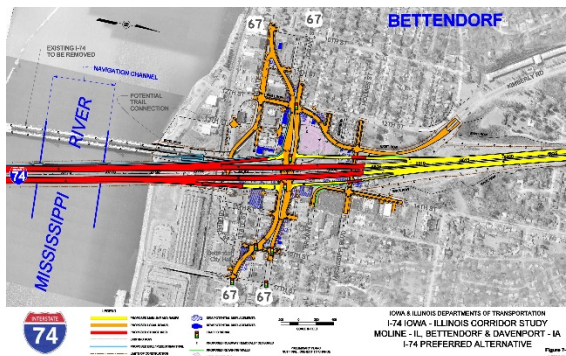
The I-74 corridor provides a vital link between Iowa and Illinois and an important gateway to the Quad Cities region. The current configuration of roadways and bridges does not provide consistent travel times along this major transportation corridor.

The objective is to develop a gateway corridor solution for I-74 that will improve traffic flow, respect the environment, and enhance economic development.

Financing Strategies:

Illinois Department of Transportation will contribute \$73 million. The State of Iowa will contribute \$53.9 million.

Sources: iowadot.gov



I-74 Proposed Street Connection



Rendering of proposed I-74 span

Arthur Ravenel Jr. Bridge – Charleston, SC USA

- Project Type: Reconstruction – Route 17 Bridge over Charleston Harbor
- Length of Vehicular Corridor: 2.8 miles from Charleston, SC and Mt. Pleasant, SC
- Changes in Developable Land: Increase of 7.5 acres
- Economics: Estimated Cost: \$700 million
- Time Frame: Planning and Construction: 1985 - 2005
- Impact on Traffic: Traffic volume increased; addition of 4 traffic lanes; 2 in each direction
- Impact on Access: Two new ramps on the Charleston side of the harbor allow for additional access with the City streets
- Safety: Bridge includes pedestrian and bicycle lanes

General Overview:

The Arthur Ravenel Jr. Bridge replaced two aging spans that no longer met the requirements of modern day transportation needs. The main span is slightly south of the old span, but it connects into Charleston north of the old bridge. This opened up around 7.5 acres of land that, as of now, is used as passive open green space.

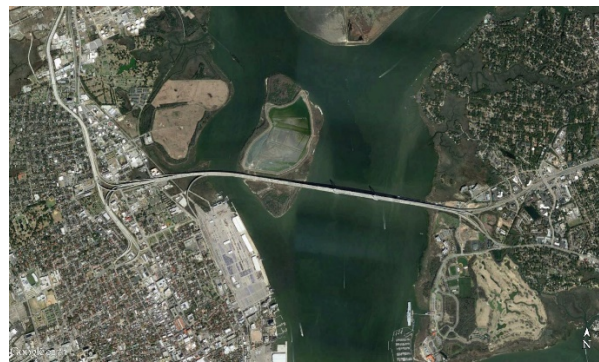
Financing Strategies:

Federal and State funding totaling \$135.2 million. South Carolina Transportation. Infrastructure Bank (SCTIB) loan of \$215 million and a SCTIB grant backed by motor fuel tax, truck registration fees, local taxes and tolls of \$325 million.

Sources: www.stantec.com, www.mercercountyparks.org, www.pkmarkiii.com



Before (2002)



After (2016)

I-65 Bridge Replacement – Louisville, KY USA

- Project Type: Reconstruction and Rehabilitation – New bridge and rehabbed old bridge
- Length of Vehicular Corridor: 1.5 miles from Jeffersonville, IN to Louisville, KY
- Changes in Developable Land: No change
- Economics: Estimated Cost: \$2.5 billion
- Time Frame: Planning and Construction: 2002 - 2005
- Impact on Traffic: Traffic volume increased
- Impact on Access: Allows greater vehicular access between Downtown Louisville and the Indiana suburbs
- Safety: Nearby railroad bridge was rehabbed to accommodate pedestrians and cyclists

General Overview:

The existing John F. Kennedy Memorial Bridge which carries I-65 across the Ohio River was rehabbed and converted to south bound traffic only. Immediately to the north, the Abraham Lincoln Memorial bridge was constructed and carries only north bound traffic into Indiana. As a part of this project, a nearby decommissioned railroad bridge was converted into a pedestrian and bicycle bridge which connect two different parks on either side of the river.

Financing Strategies:

The State of Kentucky contributed \$536 million and the State of Indiana contributed \$432 million. The two states used a combination of traditional funding and toll-based funding. They will share the toll revenues.

Sources: <http://www.usatoday.com/story/travel/nation-now/2015/10/12/louisville-ky-interstate-65-bridge/73817236/>



Before Construction (1998)



After Construction (2016)

South Riverwalk Park – Trenton, NJ USA

- Project Type: New construction – Linear park on top of Route 29 along Delaware River
- Length of Vehicular Corridor: 1.4 miles
- Changes in Developable Land: Increase of 6 acres
- Economics: Estimated Cost: Tunnel - \$72 million, Park - \$10.4 million
- Time Frame: Completed between 1998 - 2002
- Impact on Traffic: Traffic volume increased
- Impact on Access: 4 lane highway below allows for vehicular traffic with pedestrian traffic above
- Safety: Bridge includes pedestrian and bicycle lanes

General Overview:

Commissioned by the county in 2004, the six-acre park has a historic interpretive area illustrating the history of Trenton and its connection to the Delaware River in five different sections, each spanning 100 years of history. This urban park complements and enhances the tunnel project, lessens its impact, provides streetscape improvements, offers access to the river waterfront and improves quality of life for local residents.

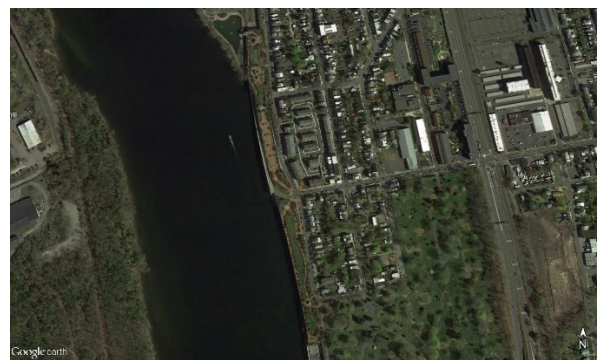
Rallying Support:

NJDOT engaged with the community in planning this project. Residents expressed concern about losing views and access to the river. The rooftop park was the solution desired by citizens which allows passive and active recreation.

Sources: <http://www.mercercountyparks.org/#!/parks/south-river-park/>,
<http://www.nj.gov/dep/srp/brownfields/success/trentontnl/>



Pre-Construction (1999)



Pre-Construction (2016)

Freeway Park – Seattle, WA USA

- Project Type: Reconstruction – Addition of park – covered deck atop a freeway
- Length of Vehicular Corridor: 0.2 miles (in two sections)
- Changes in Developable Land: Increase of 5 acres
- Economics: Estimated Cost: \$23 million
- Time Frame: Completed between 1974 - 1976
- Impact on Traffic: Traffic volume unaffected
- Impact on Access: Connects the commercial core and First Hill neighborhood
- Safety: Bridge includes pedestrian and bicycle lanes

General Overview:

Designed by Lawrence Halprin, it was the first park to be constructed over a freeway, thereby “healing the scar” that I-5 created in Downtown Seattle. This park was envisioned to restore pedestrian access between Downtown, Capitol Hill and First Hill neighborhoods. The park underwent a landscape renovation in 2010 as much of the vegetation had become so mature that squatters became common in the dark corners of the space. Once again, the park is a “series of bright grassy plazas and array of seasonal blooms throughout the year.” - Freeway Park Association

Financing Strategies:

The Federal Highway Administration and State of Washington DOT contributed \$5.5 million, the City of Seattle funded the municipal parking garage for \$4.2 million (King County approved Forward Thrust Park Bonds). Several entities including HUD, the Metro Transit contributed \$4.1 million and private developers contributed \$9 million.

Sources: <http://freewayparkassociation.org/about-park/>, <http://www.seattle.gov/parks/find/parks/freeway-park>



Pre-Construction



Post-Construction



Current Condition

The Cap at Union Station – Columbus, OH USA

- Project Type: Addition of 1-story retail atop existing interstate along existing bridge
- Length of Vehicular Corridor: 0.1 miles
- Changes in Developable Land: Increase of 1 acre
- Economics: Estimated Cost: \$8.5 million
- Time Frame: Planning - 2002, Construction – 2002 - 2004
- Impact on Traffic: Traffic volume unaffected
- Impact on Access: Connects Short North District to North Market and the Arena District
- Safety: Increased bike / pedestrian safety

Rallying Support:

Plans to widen this portion of the interstate quickly received opposition by adjacent communities (for fear of further isolation from Downtown, as well as concerns about pedestrian connections).

Corresponding Redevelopment Activity:

26,000 sf of retail development was constructed by Continental Real Estate Companies. The City of Columbus made a deal with the developer to build these retail buildings rather than putting the project out to bid in return for a pedestrian arcade over I-670. This retail space costs 20% more than other retail space in the area due to higher development costs.

Lessons Learned:

- Utilities, service entries, and parking have been the biggest challenges for the businesses along this development but the overall project has been very well received by adjacent communities.
- Obtaining air rights was never a problem, but many delays occurred due to leasing agreement negotiations between the FHWA and ODOT.
- Key elements that were necessary for a successful project include: An active roadway construction project; a well-organized citizenry; willing developer; a City Council willing to advocate and champion the project and make it a priority; and a mature-enough retail environment to support the development.

Sources: http://articles.chicagotribune.com/2011-10-27/news/ct-met-kamin-highway-caps-20111027_1_cap-union-station-interstate-highway, <https://casestudies.uli.org/the-cap-at-union-station-5/>



Pre-Construction (2002)



Post-Construction (2016)

Margaret T. Hance — Phoenix, AZ USA

- Project Type: Construction of park-covered deck over 10-lane freeway
- Length of Vehicular Corridor: 0.5 miles
- Changes in Developable Land: Increase of 29 acres
- Economics: Estimated Cost: \$118 million
- Time Frame: Planning and Construction: 1983 - 1990
- Impact on Traffic: Traffic volume unaffected
- Impact on Access: Connects Downtown business core with Downtown Gateway District and single family residential area
- Safety: Increased bike / pedestrian safety

General Overview:

Margaret T. Hance park is a 32-acre park located on the deck over the Interstate-10 freeway tunnel, between 5th ave. and 3rd St. near the heart of Downtown Phoenix. The park is home to the Japanese-Friendship Garden, Irish Cultural Center, McClelland Irish Library, Phoenix Center for the Arts, and Burton Barr Central Library.

Financing Strategies:

The Federal Highway Administration contributed \$92 million. The State and Additional Discretionary Funds contributed \$8 million and the City of Phoenix contributed \$5 million for the park deck.

Corresponding Redevelopment Activity:

- “The park has spurred recent efforts to revitalize the surrounding area, including construction of a new library, new affordable housing projects, and the expansion or renovation of nearly all the area’s museums.”
- In 2010, the park’s masterplan was updated. “The vision is to redevelop Hance Park into a vibrant urban park and signature destination that becomes a catalyst for positive change in the community. Hance Park can be a key venue for cultural, entertainment programming as well as a destination in its own right - the kind of public space that is integral to every thriving urban core in the country.”

Sources: www.phoenix.gov/parks/parks/alphabetical/h-parks/hance,
https://www.phoenix.gov/parkssite/Documents/Hance%20Park%20Master%20Plan%20_Final%20Report.pdf,
https://www.phoenix.gov/parkssite/Documents/Hance%20Park%20Master%20Plan%20_Final%20Report.pdf



During Construction



Post-Construction

Klyde Warren Park – Dallas, TX USA

- Project Type: Construction of park-covered deck over freeway
- Length of Vehicular Corridor: 0.2 miles
- Changes in Developable Land: Increase of 5.2 acres
- Economics: Estimated Cost: \$110 million
- Time Frame: Planning – 2004, Construction – 2009 - 2012
- Impact on Traffic: Traffic volume unaffected
- Impact on Access: Connects Downtown and Arts District to Uptown District
- Safety: Increased bike / pedestrian safety

General Overview:

The Klyde Warren Park was designed to attract pedestrian traffic, increase property values, and serve as a connection between Downtown and adjacent mixed-use developments.

Financing Strategies:

- The Real Estate Council provided \$1 million for the feasibility studies.
- City of Dallas issued a \$20 million bond and the TXDOT contributed \$20 million.
- The project received \$16.7 million in Federal Stimulus Funds as well as \$50 million in private donations.
- The \$2 million annual maintenance and operation costs must come from private fundraising.

Corresponding Redevelopment Activity:

- Arts District has had an estimated \$2.8 billion in redevelopment following the completion of the Park, but has not necessarily been attributed to, but rather in tandem with, the completion of Klyde Warren Park.
- Park itself has a performance pavilion, two restaurants, walking trails, a dog park, a children's park, a botanic garden, and a games area.

Lessons Learned:

- Due to the many stakeholders and their varied goals, the Woodall Rodgers Park Foundation was established to act as an independent management group for the park. It would have been extremely difficult to achieve such varied goals and take advantage of the full range of funding sources without a dedicated management organization.
- This project does encourage economic development and a more walkable corridor, but it does not minimize dependency on automobiles.

Sources: <https://www.klydewarrenpark.org/>,
<https://landscapeperformance.org/case-study-briefs/klyde-warren-park>,
<https://www.dmagazine.com/publications/d-magazine/2012/special-report-the-park/how-klyde-warren-park-was-built/>
<http://www.conservenorthtexas.org/sites/conservenorthtexas.org/files/case-study-docs/Klyde%20Warren%20-%20LAF.pdf>



Pre-Construction (2004)



Post-Construction (2012)

Utrechtsebaan Highway – The Hague, NL

- Project Type: Reconstruction – Three buildings were constructed on top of existing highways
- Length of Vehicular Corridor: 0.63 miles
- Changes in Developable Land: Increase of 515,000 square feet of varying uses
- Economics: N/A
- Time Frame: Planning and Construction: 1994 - 2002
- Impact on Traffic: Traffic volume unaffected
- Impact on Access: Several City streets were reconnected across the highway
- Safety: Increased bike / pedestrian safety

General Overview:

- The City grid of The Hague was once interrupted by the introduction of the Utrechtse Baan Highway. The government sought to stitch the city back together and this project was the solution to that desire.
- Three primary buildings were constructed, each with a different purpose. One was to serve as a “city gate” to mark the point at which the Utrechtse Baan enters the inner city.
- The buildings were created as a new civic center with metro station, parking, and a mix of uses designed to attract people to the area and promote urban vitality.
- The third building was designed to add transparency to the area and stitch together residential neighborhoods isolated by the highway.

Sources: <https://www.denhaag.nl/en/residents/getting-there-and-around/to/Rotterdamsebaan-road-project.htm>



Pre-Construction



Post-Construction

Ville Marie Expressway – Montreal, QC CAN

- Project Type: Reconstruction – Development on top of sunken highway
- Length of Vehicular Corridor: 0.9 miles
- Changes in Developable Land: Increase of 49 acres
- Economics: International Civil Aviation Organization Building - \$100 million; CDP Capital Building \$282.7 million
- Time Frame: Construction Period: 1996 - 2003
- Impact on Traffic: Traffic volume unaffected
- Impact on Access: The City street grid is uninterrupted by the expressway for this 1 mile stretch
- Safety: Increased bike / pedestrian safety

General Overview:

- The Ville Marie Expressway, constructed in the late 1960s, was realized to be a fragmenting feature in Montreal. Historic and business districts were isolated from each other. Additionally, the expressway caused challenges in pedestrian and bicycle transportation options.
- Several major projects were constructed to span over the sunken highway including the International Civil Aviation Organization and the CDP Capital Building.
- For the 0.9-mile corridor through Downtown Montreal, there is no perception of the expressway as it traverses underneath. There is a seamless transition from one neighborhood to the other where once the elevated highway created a visual and physical barrier.

Sources: <http://www.cbc.ca/news/canada/montreal/ville-marie-expressway-project-cover-park-chum-park-1.3344127>



Aerial View



Street View

Fort Washington – Cincinnati, OH USA

- Project Type: Reconstruction of sunken highway and adjacent waterfront development
- Length of Vehicular Corridor: 1.25 miles
- Changes in Developable Land: Increase of 73 acres
- Economics: Estimated Cost: \$339 million total (including added off-site bridges throughout the metro); \$146 million on FWW Corridor
- Time Frame: Planning: 1995 – 1997, Construction: 1998 - 1999
- Impact on Traffic: Traffic volume unaffected
- Impact on Access: Connects Downtown with mixed-use planned development district along riverfront
- Safety: Exit ramps and pedestrian safety were upgraded with renovation. Increased bicycle safety

General Overview:

- The Fort Washington Way reconfiguration project sought to narrow and improve safety on this stretch of highway. The original plan was to bury the highway but that plan was defeated because many people “wanted to ensure that visitors to the City would be able to see it as they traveled through. Once construction was completed, about 40% of the original width was gone as a result of the better design.
- The project was designed with gaps between City streets that could be easily capped at a future date. In 2017, discussions of capping over I-71 had begun.
- A team of professionals developed a strategic communications plan which included 200 informational presentations prior to construction, aggressive work with numerous business and civic groups to obtain strong support, and regular meetings with police, fire, traffic helicopters, and the regional traffic information system.

Financing Strategies:

- City of Cincinnati contributed \$95 million while Hamilton County committed \$21 million. The Ohio DOT contributed \$181 million as well as the Kentucky Transportation Cabinet pitched \$13 million towards the project. Additionally, the Federal Highway Administration contributed \$12 million, the Ohio-Kentucky-Indiana Regional Council offered \$14 million and the Metro Transit Authority contributed \$2 million.

Corresponding Redevelopment Activity:

- The adjacent riverfront area has seen tremendous growth and redevelopment. The Paul Brown Stadium and garage, National Underground Railroad Freedom Center, Cincinnati Reds Ball Park, parking garages, transit center, several acres of mixed-use development and an expansive riverfront park have been constructed in wake of this project.

Sources: <http://www.urbancincy.com/2010/07/reconstruction-of-fort-washington-way-redefined-cincinnati-urban-core/>

<http://www.cincinnati-transit.net/fww.html>, <http://www.cincinnati.com/story/money/2014/07/28/bridging-gap-downtown-river/13265689/>



Pre-Construction



Post-Construction

Rio Park – Madrid, ES USA

- Project Type: Reconstruction of M-30 highway; tunneled under park
- Length of Vehicular Corridor: 4 miles
- Changes in Developable Land: Increase of 300 acres
- Economics: Estimated cost: \$574 million
- Time Frame: 2007 - 2011
- Impact on Traffic: Traffic congestion diminished
- Impact on Access: Residents now have access to the riverfront which was once surrounded by highways
- Safety: Pedestrians and bicyclists were the focus of this project

General Overview:

- This project involved putting the M-30 motorway, a major urban arterial, underground which created over ten kilometers of pedestrian and cycle routes. The project is made up of 47 individual projects of which several are bridges, boulevards, and parks.

Financing Strategies:

- This project was poorly managed, delayed and cost twice as what was originally budgeted. Many say it was overly ambitious during Spain's recent boom / bust. The project contributed to Madrid's debt (the largest in Spain) and led the City into bankruptcy. Madrid residents will now have to pay for all the projects with increasing taxes for the next few decades. However, no resident can argue the transformational affect this project had on the entire City of Madrid.

Corresponding Redevelopment Activity:

- The new park is revitalizing City attractions that have languished in years past. The Matadero Madrid, a multi-discipline arts center that the highway and its tangle of ramps use to surround and cut off, as well as several once isolated parks, all now meet at the river's edge.

Lessons Learned:

- "This is beautifully demonstrated in the example of Rio Park, a project full of character that managed to turn the same motorway that used to cut off districts in to the best meeting point in Madrid."

Sources: http://www.west8.nl/projects/madrid_rio/
<http://www.gomadrid.com/beach/madrid-rio.pdf>
<http://www.gomadrid.com/beach/>, <https://landarchs.com/280-million-euros-invested-urban-revitalisation-project/>
<http://www.nytimes.com/2011/07/10/travel/recreation-on-madrid-waterfront-heads-up.html>
<http://www.ifhp.org/ifhp-blog/madrid-r%C3%ADo-%E2%80%93-project-changed-madrid>



Pre-Construction (2004)



Post-Construction (2016)

Alaskan Way Viaduct – Seattle, WA USA

- Project Type: Replacement of an elevated highway with a four-lane underground tunnel
- Length of Vehicular Corridor: 2.1 miles
- Changes in Developable Land: Increase of 20 acres
- Economics: Estimated cost: \$2.39 billion (Tunnel), \$700 million (Waterfront improvements)
- Time Frame: Planning: 2001 – 2008, Demolition: 2008 – Present, Tunnel Construction: 2013 – Present
- Impact on Traffic: TBD
- Impact on Access: Connects Belltown commercial core and the Pioneer Square planning areas to Elliot Bay
- Safety: Increased bicycle and pedestrian safety is a goal

General Overview:

- Following the Nisqually earthquake that damaged the viaduct in 2001, engineers deemed the viaduct irreparable, spawning a ten-year debate about its replacement. Both of the replacement options were voted down by the public in March 2007, so the Governor, Mayor, and County Executive met to determine the future of the viaduct.
- Major elements of the project include a two-mile long tunnel beneath Downtown Seattle, a mile-long stretch of new highway that connects to the south entrance of the tunnel, a new overpass at the south end of Downtown that allows traffic to bypass train blockages near Seattle's busiest port terminal, demolition of the viaduct's Downtown waterfront section, and a new Alaska Way surface street along the waterfront that connects SR 99 to Downtown.

Financing Strategies:

- Tunnel: A gas tax was initiated in 2005 and predicted to raise \$1.6 billion. In 2003 the Transportation Account Nickel Funding contributed \$251.4 million. In 2005, Federal Earmark Funds totaled \$209.4 million, Federal Bridge Funds contributed \$72.6 million and other funds totaling \$256.6 million.

Corresponding Redevelopment Activity:

- Waterfront Improvements: Washington State DOT contributed \$218 million, LID \$190 million, and Philanthropic donations of \$100 million. A commercial parking tax raised \$75 million, a bond was issued for a seawall totaling \$9 million, \$3 million in total from Washington State grants, and PC-1 North Bonds of \$34 million. Additionally, a Real Estate Excise tax raised \$20

million, Park District funds contributed \$4 million, and a total of \$46 million came from various other City revenue sources.

- Waterfront Seattle is a multi-year program that is taking place to gather public input for redevelopment and activity. Ideas include improved pedestrian and bicycle infrastructure, an aquarium expansion, several park extensions, and other outdoor recreation activities relating to the Elliot Bayfront.

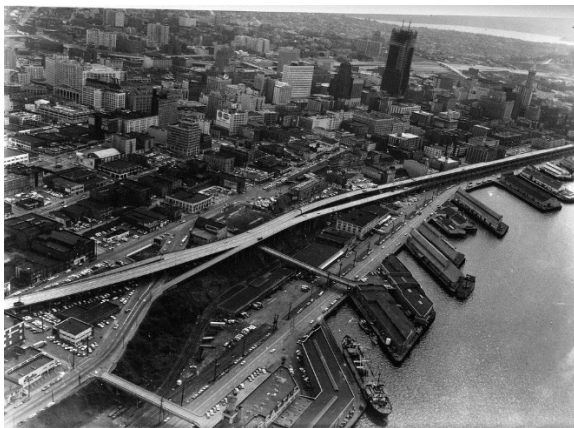
Lessons Learned:

- Prior to demolition of the existing structure, there was much concern about gridlock traffic on the other major North-South byway through Seattle. None of the “Viadom” materialized as predicted.

Sources: <http://www.wsdot.wa.gov/Projects/Viaduct/About>

<http://data.wsdot.wa.gov/publications/viaduct/AWVFEIS-AppendixG.pdf>

<https://www.portseattle.org/Supporting-Our-Community/Regional-Transportation/Pages/Alaskan-Way-Viaduct-and-Seawall.aspx>



Above-Grade Configuration (1963)



Rendering of Proposed Plan

Rose F. Kennedy Greenway – Boston, MA USA

- Project Type: Reconstruction of I-93 which was buried and a linear park was put in its place
- Length of Vehicular Corridor: 3.5 miles
- Changes in Developable Land: Increase of 17 acres
- Economics: Estimated cost: \$15 billion
- Time Frame: Proposed in 1982; Design / Construction began in 1991; Opened in 2008
- Impact on Traffic: Traffic congestion diminished
- Impact on Access: Downtown Boston and its waterfront are now connected like they use to be before the elevated highway
- Safety: Pedestrians and Bicyclists have ample facilities

General Overview:

- The project replaced Boston's deteriorating six-lane elevated Central Artery (I-93) with an eight-to-ten lane state-of-the-art underground highway, to new bridges over the Charles River, extended I-90 to Boston's Logan International Airport, and Route 1A created more than 300 acres of open land and reconnected Downtown Boston to the waterfront.

Financing Strategies:

- 80% of the project was funded by Congress as persuaded by then Speaker of the House and Massachusetts native, Tip O'Neill. There was very little money left for "surface restoration" which entailed the green space. Air rights were sold for real estate development adjacent to the greenway.

Corresponding Redevelopment Activity:

- Numerous reports have chronicled big jumps in property values. The Shawmut Peninsula (Downtown Boston) is some of the most sought-after and desirable urban real estate in the country.

Lessons Learned:

- If the project were to be done again, they would use what is called "value capture." Value capture is a way for the private sector to contribute to infrastructure based on the drastic increases in property values. System is widely used in Latin America.

- “It established a new landscape for the City to flourish all around it. Buildings once overlooking a clogged highway now have a beautiful park at their front door. That’s all it took.” - Anthony Flint

Sources: <https://www.asla.org/guide/site.aspx?id=41263>

<http://www.massdot.state.ma.us/highway/TheBigDig.aspx>

<https://www.bostonglobe.com/magazine/2015/12/29/years-later-did-big-dig-deliver/tSb8PIMS4QJUETsMpA7Spl/story.html>



Construction (1990's)



Completed Greenway (Post 2008)

Riverfront Parkway – Chattanooga, TN USA

- Project Type: Removal and conversion of highway to either 20lane road / parkway or 4-lane blvd
- Length of Vehicular Corridor: 0.75 miles
- Changes in Developable Land: Increase of 5.2 acres
- Economics: Estimated cost: \$120 million
- Time Frame: Planning: 1980; Construction: 2000 – 2004
- Impact on Traffic: Traffic congestion diminished
- Impact on Access: Connects Downtown to the Tennessee Riverfront
- Safety: Increased bike / pedestrian access to the river by shortening the crossing width

General Overview:

- An old highway barrier was replaced with an at-grade street and boulevard. With an integrated pedestrian-oriented boulevard, a vibrant and socioeconomically stable Downtown Chattanooga that exists today was created.

Financing Strategies:

- Voters approved a half-percent increase in sales tax, with half of that revenue going towards economic development. In 2001, hotel tax revenues were applied to riverfront amenities.
- Early riverfront projects were funded through a separate partnership, including foundations and a private non-profit developer, the Rivercity company.

Corresponding Redevelopment Activity:

- The visual and economic aura of the Downtown area has been revitalized, and population has consistently grown in recent years, by 30% since 1990. \$250 million has been invested since the conversion of the highway to parkway.
- A new park was created on the riverfront that complements the design of the boulevard. The residents and the businesses are not connected to the riverfront.

Rallying Support:

- Chattanooga invited broad community participation in the planning process, asking contributors to be “hopeful and helpful.” In open forums, 1,700 citizens suggested specific attainable goals. Public buy-in at the beginning helped phases proceed smoothly.

Sources: <http://www.sustainablepittsburgh.org/pdf/PCDC%20Chattanooga.pdf>
<https://www.cnu.org/highways-boulevards/model-cities/chattanooga>
https://www.fhwa.dot.gov/livability/case_studies/guidebook/appendix/app05.cfm



Limited access riverfront highway (Before)



Ross' Landing Park (After)

Harbor Drive – Portland, OR USA

- Project Type: Replacement of at-grade freeway with boulevard, mixed-use infill and park
- Length of Vehicular Corridor: 3 miles
- Changes in Developable Land: Increase of 73 acres (37 acres into park)
- Economics: N/A
- Time Frame: Planning: 1966 – 1968; Construction: 1974 - 1978
- Impact on Traffic: Traffic congestion diminished
- Impact on Access: Connects central commercial district to the Wilamette riverfront
- Safety: Crime in the area decreased by 65%; Increased bicycle / pedestrian safety

General Overview:

- Harbor Drive in Portland was a six-lane freeway that was directly adjacent and parallel to the Willamette Riverfront. In 1974, the City removed the highway to create a 36-acre riverfront park. Today, the Tom McCall Waterfront Park draws almost 700,000 people between April and November. This was one of the first examples of successful highway removal projects in the United States.

Corresponding Redevelopment Activity:

- The Yards at Union Station (650 mixed income residential units), River Place (mixed-use development and Pioneer Place (high-rise building with both office and retail space), and a hotel all have been constructed since this project was completed.
- Spawned the creation of the Downtown Waterfront Urban Renewal Area (DTWF URA).
- In 1999, the park extended further to the south, doubling in size.
- Continued investment has been made because of continuous property value increases in the decades following Harbor Drives removal.

Lessons Learned:

- Public waterfront access is highly desired, economic advantages will follow.
- Traffic engineers were highly opposed to the removal, but traffic ended up shifting to nearby streets and boulevards without issue.

Sources: https://www.researchgate.net/publication/277657946_Harbor_Drive_tear-down_in_Portland_Oregon-The_new_post_industrial_city_in_the_making
<http://www.preservenet.com/freeways/FreewaysHarbor.html>



Pre-Construction (1974)



Post-Construction (2006)

Gardiner Expressway – Toronto, ON CAN

- Project Type: Hybrid approach will keep some elevated sections and remove other sections
- Length of Vehicular Corridor: 2 miles
- Changes in Developable Land: No change; Some land underneath elevated sections will be redesigned
- Economics: Estimated Cost: \$414 million in up-front costs and \$505 million for operations and maintenance over the anticipated 100-year life span
- Time Frame: Planning began in 2013; Estimated completion in 2022
- Impact on Traffic: N/A
- Impact on Access: The City will be better connected with the waterfront
- Safety: Pedestrian and bicycle connections will be made under revamped highway boulevards

General Overview:

- The Toronto City Council recently voted to move forward with the hybrid solution to the Gardiner Expressway project. This hybrid version includes: maintaining the elevated highway in certain sections; demolishing of certain on and off ramps; and conversion of the highway into a tree-lined, six-lane boulevard. Much of the elevated structure will remain standing after rehabilitation and construction.
- ‘The Bentway’ is a 1.75 km trail that will transform the vacant and forgotten area underneath the Gardiner Expressway into a new gathering place. A series of public spaces will knit together seven neighborhoods and activate the community.

Corresponding Redevelopment Activity:

- Worries about the potential economic impacts of tearing down the expressway could have on the city - an estimated \$37 million in lost productivity per year moving forward. That figure, however, is offset by development and employment opportunities generated by tearing down the elevated stretch of highway.

Sources: <http://www.cbc.ca/news/canada/toronto/john-tory-continues-last-minute-push-to-sell-gardiner-east-hybrid-option-1.3105667>

<http://www.cbc.ca/news/canada/toronto/gardiner-expressway-vote-toronto-council-backs-hybrid-plan-1.3109935>

<http://gardinereast.ca/>

<http://www.thebentway.ca/about/>

<http://www.gardinereast.ca/sites/default/files//documents/Backgrounder%20for%20Gardiner%20EA%20--%20Hybrid.pdf>

<http://www.gardinereast.ca/sites/default/files//documents/Backgrounder%20for%20Gardiner%20EA%20--%20Hybrid.pdf>, <https://www.thestar.com/yourtoronto/once-upon-a-city-archives/2016/07/07/gardiner-expressway-big-daddys-gift-to-toronto.html>



Before (1969)



Gardiner Expressway Hybrid Rendering

The Embarcadero – San Francisco, CA USA

- Project Type: Removal of the Embarcadero Freeway and transformation to an at-grade blvd
- Length of Vehicular Corridor: 1.2 miles
- Changes in Developable Land: Negligible increase
- Economics: Estimated Cost: \$171 million
- Time Frame: First Proposed in 1986; Freeway removed in 1991; Boulevard completed in 2000
- Impact on Traffic: Traffic congestion diminished
- Impact on Access: The City was once again connected with its waterfront
- Safety: A wide pedestrian promenade is a cornerstone feature of the new Embarcadero

General Overview:

- The double decker Embarcadero Freeway was damaged during a 1989 earthquake and was subsequently removed. The community at large was concerned that the 100,000 daily cars would cause crowded streets. This phenomenon was never realized due to a reduction of car capacity that was augmented by a mid-boulevard streetcar system, a revitalized ferry service, and most importantly a reason for pedestrians to visit and linger in the area.

Financing Strategies:

- The City of San Francisco funded \$10 million utilizing general funds and the Federal Government funded the rest of the highway removal. The City then spent \$50 million to rebuild the Embarcadero as a boulevard with a wide pedestrian promenade.

Corresponding Redevelopment Activity:

- Real estate values in adjacent neighborhoods went up by 300%. Entirely new neighborhoods oriented towards the waterfront were built and thrived in areas that had been hard to develop when the freeway stood as a barrier that separated them from the waterfront.
- Housing in the area increased by 51% and jobs increased by 23%. High profile developments have transformed the waterfront.

Lessons Learned:

- Following the earthquake that damaged the original elevated Embarcadero, it was closed for rehabilitation for an extended period. Once skeptics saw that the City was not gridlocked without the freeway, it was easier to build support for the proposed boulevard.
- Even neighborhoods that were not directly adjacent to the Embarcadero freeway flourished due to the opening of the waterfront and the improvement of the roadway.

Sources: <http://www.preservenet.com/freeways/FreewaysEmbarcadero.html>

http://www.slate.com/blogs/browbeat/2017/02/22/compare_la_la_land_s_highway_dance_number_with_its_i_phone_filmed_parking.html

https://www.itdp.org/wp-content/uploads/2014/07/42.-LifeandDeathofUrbanHighways_031312.pdf



Elevated Highway (1960)



Completed Embarcadero Boulevard

Park East Freeway — Milwaukee, WI USA

- Project Type: Replacement of above-grade freeway with six-lane boulevard
- Length of Vehicular Corridor: 0.8 miles
- Changes in Developable Land: Increase of 28 acres
- Economics: Estimated Cost: \$45 million
- Time Frame: Planning: 1996 – 2002; Construction: 2002 – 2003
- Impact on Traffic: Traffic volume before removal: 54,000 / day; Traffic volume after removal 15,800 / day
- Impact on Access: Connects Downtown with three newly defined mixed-use districts
- Safety: Increased Pedestrian / Bicyclists safety

General Overview:

- In 2002, the Park East was replaced with the six-lane landscaped McKinley Avenue. In total, 26 acres of land spread out along 28 city blocks opened up for development.
- Mayor John Norquist led the process and was supported widely by several levels of community leadership. A unanimous City Council vote in 1999 voted to remove the freeway.

Financing Strategies:

- Funding used Federal Intermodal Surface Transportation Efficiency Act (ISTEA) money (\$20 million) as well as local tax increment financing (\$5 million).
- The Federal Highway Administration agreed to fund it once additional traffic studies were completed as a defense against possible lawsuits by opponents of the removal.

Corresponding Redevelopment Activity:

- As of 2007, \$340 million worth of private investments have occurred in this area.
- Three distinct neighborhoods, Upper Water Street, Lower Water Street, and McKinley Avenue District have been formed because of this project.

Lessons Learned:

- Street network was able to absorb freeway traffic, despite limited transit alternatives into the City.
- Tax revenues have increased substantially since freeway removal.
- Due to the increased development in this area, parking has started to become an issue.

Sources: <https://www.pps.org/reference/conversion-of-park-east-freeway-sparks-economic-revitalization/>



Pre-Construction (2004)



Post-Construction (2012)

Cheonggycheon River – Seoul, KR

- Project Type: Removal of an elevated highway over a pre-existing stream. A linear park now exists in its place.
- Length of Vehicular Corridor: 3 miles
- Changes in Developable Land: No change
- Economics: Estimated Cost: \$384 million
- Time Frame: Planning: 2001 - 2003; Construction: 2003 – 2005
- Impact on Traffic: Traffic diminished in the area by 43%
- Impact on Access: Residents of Seoul now have access to this once hidden body of water
- Safety: Pedestrian and bicyclists are the focus of this corridor

General Overview:

- This highway removal / stream recovery project removed three miles of elevated highway and daylighted a pre-existing stream. As a result, air pollution was substantially cut, air temperatures were reduced, bus transportation has been expanded and some 90,000 pedestrians visit the stream banks on an average day.

Financing Strategies:

- This project, a multi-partner project, was primarily government funded. Partners included the Seoul Development Institute and the Seoul Metropolitan Government. The project is expected to deliver \$3,500 million worth of social benefits.

Corresponding Redevelopment Activity:

- The reconstruction of the highway was a catalyst for increased property values. Since the project was announced in 2002, land transactions (including change in ownership, change in renter, and change in lease length) grew in the areas parallel to the project transformation. There was also an increase in the price of land by 30 - 50%; increase in the number of businesses by 3.5%; and an increase in employment in the adjacent area by 0.8% (Downtown Seoul saw a decrease of 2.6%).

Lessons Learned:

- “We’ve basically gone from a car-oriented City to a human-oriented City,” Seoul’s assistant Mayor for infrastructure. A large challenge was convincing local business owners that there would be economic benefit as a result of changing a car dependent arterial highway to usable pedestrian space. Ironically, many of the visitors to this site are the business owners who protested the project in the beginning.
- This project has been hailed as a global “best practice” example for successful urban greening in a densely populated city.

Sources: https://www.itdp.org/wp-content/uploads/2014/07/42.-LifeandDeathofUrbanHighways_031312.pdf
<https://landscapeperformance.org/case-study-briefs/cheonggyecheon-stream-restoration>
<http://www.nytimes.com/2009/07/17/world/asia/17daylight.html>
<http://www.ecrr.org/Portals/27/Cheonggyecheon%20case%20study.pdf>
<https://sustainabilitywriter.wordpress.com/2012/07/04/the-cheonggyecheon-river-restoration-project-seoul-south-korea/>



Before



After

Inner Loop East – Rochester, NY USA

- Project Type: Replacement of a below-grade expressway with an at-grade boulevard
- Length of Vehicular Corridor: 2.7 miles
- Changes in Developable Land: Increase of 6 acres
- Economics: Estimated Cost: \$23.6 million
- Time Frame: Planning: 2000 – 2013; Construction: 2014 – 2017
- Impact on Traffic: Negligible impact on traffic volumes
- Impact on Access: Connects Downtown with the East End and Park Ave neighborhoods
- Safety: New complete street includes ample facilities for bicycles and pedestrians

General Overview:

- The Inner Loop is a below-grade highway that was constructed in the 1960's as a way to move traffic efficiently throughout Downtown Rochester. With dwindling traffic volumes and the fact that it separated two revitalizing neighborhoods, it was slated for removal. In its place, an at-grade two-way street will support private development on approximately 6 acres of land.

Financing Strategies:

- Federal Transportation Investment Generating Economic Recovery (TIGER) grant of \$16.7 million, a state contribution of \$3.8 million and a City contribution of \$414,000 all combined to fund this project.

Corresponding Redevelopment Activity:

- Several new developments are slated for construction. Among them, \$35 million investment in townhomes and apartments, \$105 million expansion of the nearby Strong National Museum of Play complete with retail, hotel, parking garage and apartments. Additionally, \$27 million worth of mixed-use, \$60 million in additional apartments, \$35 million going towards the conversion of underutilized office space into mixed-use.
- An enhanced bicycle / pedestrian environment, reconnection of segmented neighborhoods, creation of mixed-use infill development sites are all slated benefits of this project.

Lessons Learned:

- Vehicle level of service should be de-emphasized on most urban / inner loop projects due to surface streets capability to accommodate traffic volumes.
- "Economic development is valid purpose."

Sources: <http://www.cityofrochester.gov/InnerLoopEast/>
<https://www.dot.ny.gov/recovery/sponsors/tiger/repository/74CDA1D23A0D90B2E0430A3DFC0390B2>
<https://www.cnu.org/highways-boulevards/campaign-cities/rochester>
https://www.nytimes.com/2016/11/02/business/old-highway-paves-road-for-recovery-in-rochester.html?_r=0



Pre-Construction



Construction (2016)

Central Freeway — San Francisco, CA USA

- Project Type: Replacement of an elevated highway to an at-grade boulevard
- Length of Vehicular Corridor: 0.7 miles
- Changes in Developable Land: Negligible amount
- Economics: Estimated Cost: \$55.4 million
- Time Frame: Planning: 2000 – 2013; Construction: 2014 - 2017
- Impact on Traffic: Traffic volumes went from 97,000 / day on the highway to 45,000 / day on the boulevard
- Impact on Access: A new park at the southern end of the boulevard serves as the new heart of the Hayes Street corridor
- Safety: Increased bicycle / pedestrian safety

General Overview:

- After the original Central Freeway was damaged in a 1989 earthquake, the slow dismantle of the freeway began. Residents of the neighborhood were originally against its removal, citing it as a way they got to their homes easily. The local streets could accommodate the freeway traffic, and, while the highway was closed for 4 months for construction, residents became accustom to lower level of noise, traffic, fumes and vibrations.
- In 1999, both the freeway retrofit and removal initiatives appeared on a ballot and voters approved the removal of the freeway and replacement with a boulevard.

Corresponding Redevelopment Activity:

- The condominium prices in the Hayes Valley neighborhood were 66% of San Francisco average prices when the Central Freeway existed. Today, they are 91% of the City average. Residents noted significant change in the nature of the commercial establishments in the area. Where it had been previously populated with liquor stores and mechanic shops, soon the area was filled with trendy restaurants and high-end boutiques.

Lessons Learned:

- Demolition of the freeway helped spur development of the Market & Octavia Plan, a comprehensive land use and transportation strategy for nearly 400 acres of surrounding neighborhood. Revenues from sales of freeway parcels were used to fund construction of Patricia's Green. Additionally, the tree-lined Octavia Boulevard functions something of a linear park itself, with its multiple medians and new sidewalk cafes.

Sources: <http://www.preservenet.com/freeways/FreewaysCentral.html>

<http://www.seattle.gov/transportation/docs/ump/06%20SEATTLE%20Case%20studies%20in%20urban%20freeway%20removal.pdf>

http://sfplanning.org/sites/default/files/FileCenter/Documents/8705Octavia_Boulevard_Hearing_Presentation_3-20-12.pdf

https://planningtools.transportation.org/290/view-case-study.html?case_id=81



Pre-Construction



Octavia Boulevard (After Construction)