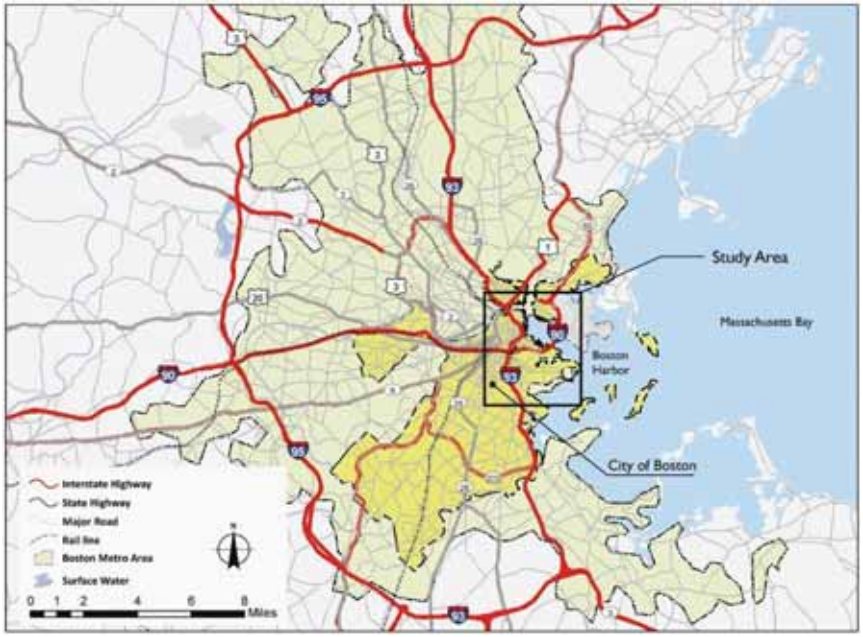
I-93 (Central Artery), a.k.a. the "Big Dig," Boston

	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