



Francis Scott Key Bridge (Outer Harbor Crossing)

The Outer Harbor Crossing was the planning name for the 11-mile-long Baltimore Beltway toll facility between MD-10 and MD-151, and it includes the 1.6-mile-long Francis Scott Key Bridge over Baltimore Harbor.

The southern, western, and northern portion of the I-695 Baltimore Beltway (with six or more lanes) was completed between MD-2 south of the city and US-40 northeast of the city by 1962. The beltway between US-40 and MD-151 at Edgemere was opened 1973.

The Outer Harbor Crossing, an 11-mile-long toll facility between MD-10 Arundel Freeway and MD-151 North Point Boulevard, was opened to traffic on March 23, 1977, and this completed the Baltimore Beltway. The Outer Harbor Crossing was planned as a two-lane freeway on four-lane right-of-way, with a single-tube two-lane 6,200-foot-long harbor tunnel. The two-lane freeway was placed under construction, the causeways (landfill for roadway across a water body) for the tunnel portals were built, and when the tunnel was advertised for construction in 1970, the bids received on July 30, 1970 were so high that it was determined that a four-lane high-level bridge could be built for about the same cost as the revised estimate for the tunnel project, about \$50 million. So the bridge was built, well-known to motorists as the Francis Scott Key Bridge. The prime engineering consultant for the bridge's design was J. E. Greiner Co., Inc., of Baltimore, Maryland. Piers for the high-level approaches were constructed on the causeways and in the harbor. The bridge is 8,636 feet (1.6 miles) long, and the main span of the bridge consists of a continuous steel truss span with 185 feet of vertical navigational clearance and 1,200 feet of span length.

Actually, the design of the 2,644-foot-long central 3-span section of the bridge which has the overhead steel truss structure, is a combination design which includes elements of cantilever, steel truss, arch, and suspension, as most of the roadway length in the 1,200-foot-long main span is a plate girder structure suspended by cables from the steel cantilever arch structure. The two 722-foot-long back spans have the roadway structure integral with the steel truss structure.

Key Bridge substructure contract: An *Engineering News-Record* magazine article "Substructure under estimate for Baltimore harbor bridge", August 24, 1972, page 16, announced the low bid of \$19.5 million for the substructure of the bridge, which was \$1.1 million under the engineer's estimate. The substructure contract involved building all the reinforced concrete vertical piers for the bridge, from the foundations up to the tops of the piers. This contract was a joint venture of The Balf Company and Savin Brothers, Inc., both of Bloomfield, Connecticut; and Whaling City Dredge & Dock Corp., of Groton, Connecticut. J. E. Greiner Co., Inc., of Baltimore, Maryland, was cited as the prime engineering consultant for the entire bridge project, as well as the designer of the main piers and the 2,644-foot-long continuous truss structure which includes the 1,200-foot-long main span and two 722-foot-long back spans. The approach spans were designed by Singstad, Kehart, November & Hurka, of New York City, New York; with Zollman Associates, Inc. of Philadelphia, Pennsylvania, and the individual spans range from 200 to 300 feet long. The article mentioned the original two-lane tunnel plan that would have been \$15 million more expensive than the four-lane bridge.

Key Bridge superstructure contract: An *Engineering News-Record* magazine article "High-level bridge bid near estimate", October 19, 1972, page 14, announced the low bid of \$30.7 million for the superstructure, which was 5% above the engineer's estimate, by Pittsburgh-Des Moines Steel Company of Pittsburgh, Pennsylvania. Construction industry experts had predicted that the low bidder for the superstructure contract would be the American Bridge Division of U.S. Steel Corp. (Ambridge) of Pittsburgh, Pennsylvania, because they had a large marine fleet that was completing the contract for the parallel Chesapeake Bay Bridge about 20 miles to the south, as Ambridge had assembled many sections of that bridge in its Baltimore yard and barged them to the bridge site, but on the bidding for the Key Bridge superstructure contract, Ambridge was in third place at \$32.3 million. The superstructure contract involved building all the spans of the bridge, across the tops of the piers built in the substructure contract. The 2,644-foot-long 3-span continuous truss section of the bridge, the plate girder approach spans, and the reinforced concrete roadway deck, were built under this contract. The three approach spans over water on the west side of the truss structure, and the six approach spans over water on the east side of the truss structure, were designed and built in 300-foot-long one-span units and then installed on the bridge piers, to reduce fabrication costs. The steel erection subcontractor on this contract was John F. Beasley Construction Company of Dallas, Texas. The article also announced the award of the \$19.5 million substructure contract to the joint venture of three Connecticut firms, and mentioned that the entire 11-mile-long Outer Harbor Crossing project was fully under construction, with a total projected cost of \$136 million. The total cost of the two bridge contract awards (substructure and superstructure) was \$50.2 million.

Engineering News-Record magazine had a feature article about this bridge project, "Heavy-lift floating and traveling derricks team to erect truss bridge, January 15, 1976. The article cited Sidney Sherman, project engineer for Greiner Engineering Sciences, Inc., Baltimore, the company which designed the main truss and who was chief consultant to the state for the Key Bridge project, and he said that the company studied using a suspension bridge at the site but rejected that design because of high anchorage costs. He also said that the structure was the longest continuous truss bridge in the U.S.

The administrative agency for the Outer Harbor Crossing is the Maryland Transportation Authority (MdTA). The MdTA Fact Sheet gives \$60.3 million as the total cost of the bridge itself, and that would include design engineering as well as construction of the bridge and causeways. It also mentions "the bridge, at an estimated cost of \$110 million", but I think that is a reference to the entire 11-mile long highway facility. These figure differences need to be resolved through inquiry to MdTA.

The originally planned two-lane tunnel concept explains why the Key Bridge was built with two-lane approaches. The south approach between MD-10 and the Key Bridge, includes a bridge with a bascule drawspan over Curtis Creek, and the drawspan when closed has 60 feet of vertical navigational clearance over a marine channel; and the whole south approach was built with two lanes and was dualized to four lanes by 1981. The 3.5-mile-long north approach was built as a two-lane elevated viaduct over Bear Creek, and it also skirted the edge of the Sparrows Point Bethlehem Steel complex, and the viaduct when built crossed at least 16 roads and 2 railroads all along the section on Sparrows Point, including the intersection between Bethlehem Boulevard and Dundalk Avenue (the Dundalk Avenue Bridge over Bear Creek has since been closed and removed). Four-lane widening of the Bear Creek Bridge, and elimination of the rest of the viaduct with a ground-level four-lane roadway, and simplification of the MD-151 interchange with Bethlehem Boulevard, and simplification of the Bethlehem Boulevard interchange with Peninsula Expressway, at a total project cost of \$89.5 million, was completed by MdTA in January 2000. The large reduction in employment at the Sparrows Point Bethlehem Steel complex in the years after the original beltway segment opened, led to much lower volumes of traffic on the local roads near the original viaduct, allowing some of the local roads to be reconfigured into a simpler design with fewer roads needing to cross the I-695 beltway, and whereas the original viaduct was justified when it was built around 1970 because of the many road and railroad crossings that needed to be passed over, by 1995 a simpler surface-level design was possible with the reconstructed highway between the Bear Creek Bridge and MD-151 North Point Boulevard. The entire eastern portion of the Beltway now has four lanes (two each way) at the minimum. It is unusual for an urban freeway to have had only two lanes for 23 years, but the tremendous capacity (12 lanes) of the two inner harbor crossings (I-95 and I-895) has kept the traffic volumes reasonable on the Outer Harbor Crossing.

Current other major structures along the 11-mile-long Outer Harbor Crossing include 3,379-foot-long (0.64 mile) parallel bridges over Curtis Creek and 3,907-foot-long (0.74 mile) parallel bridges over Bear Creek, near Bethlehem Steel's Sparrows Point plant. Those mileage figures are from the MdTA Fact Sheet, and then converted to feet.

Francis Scott Key Bridge - Vital Facts	
Bridge design	Steel truss cantilever arch main spans, plate girder approach spans
Bridge length	8,636 feet (1.6 miles)
Continuous truss length	2,644 feet
Main span length	1,200 feet
Back span length	722 feet
Vertical navigational clearance under main span	185 feet
Highway class	Freeway, built to Interstate highway standards
Highway route	Interstate I-695, Baltimore Beltway
Water bodies crossed	Baltimore Harbor and shipping channel
Total number of lanes	4 lanes
Speed limit	55 mph
Toll facilities	Electronic tolling plus cash lanes, toll plaza in Dundalk
Toll	\$2 for 2-axle vehicle, commuter discounts available
Administrative agency	Maryland Transportation Authority (MdTA)
Design Prime Consultant	J. E. Greiner Co., Inc.
Contracting method	Agency public bid contracting, 3 construction contracts
Construction Began	August 1972
Substructure prime contractor	Balf/Savin/Whaling City joint venture
Superstructure prime contractor	Pittsburgh-Des Moines Steel Company
Final cost total for design, right-of-way and construction	\$60.3 million
Funding method	100% MdTA toll revenue bonds
Facility opened to traffic	March 23, 1977
Traffic Volumes as of December 2005	Average about 31,000 vehicles per day, 10% large trucks

Outer Harbor Crossing - Vital Facts	
Facility length	11.3 miles
Highway class	Freeway, built to Interstate highway standards
Highway route	Interstate I-695, Baltimore Beltway
Water bodies crossed	Baltimore Harbor, Curtis Creek, Bear Creek
Total number of lanes	4 lanes
Speed limit	55 mph
Toll facilities	Electronic tolling plus cash lanes, toll plaza in Dundalk
Toll	\$2 for 2-axle vehicle, commuter discounts available
Administrative agency	Maryland Transportation Authority (MdTA)
Contracting method	Agency public bid contracting
Construction Began	1972
Final cost total for design, right-of-way and construction	\$136 million
Funding method	100% MdTA toll revenue bonds
Facility opened to traffic	March 23, 1977



Above, Key Bridge, looking north, taken in April 1978. The south approach was two lanes, and was widened to four lanes by 1981. Note that the road was MD-695 originally. Notice the safety nets hanging under main span, as the original painting was finishing up.



Above, Key Bridge under construction in 1976, looking north. The Route 695 Sparrows Point Viaduct, and the Bethlehem Steel complex is in the background. The steel plant is across almost two miles of water from the photo-shooting point.



Above, Key Bridge, taken from a similar vantage point as the previous photo. Photo by Jim K. Georges, July 1999.



Above, on the Key Bridge, northbound, just north of the continuous truss span, looking toward the toll plaza, and the Bear Creek Bridge (Sparrows Point Viaduct) in the distance. Photo taken July 5, 1999, the Monday that was the holiday for Independence Day in 1999; at about 3:00 PM, near the end of a holiday weekend which is one of the highest interstate travel days of the year. The 3.5-mile-long widening project to widen the 2-lane Sparrows Point section was still under construction. As you can see, the eastern portion of the I-695 Baltimore Beltway has capacity to spare. This should provide an effective I-95 bypass for many years into the future. Click the photo for [large image](#) (112K).



Above, eastbound Curtis Creek Bridge on I-695, on the Outer Harbor Crossing, three miles west of the Key Bridge. This crossing is comprised of twin bridges, each with two lanes, and each with a bascule drawspan with 60 feet of vertical navigational clearance when closed. Click the photo for [large image](#) (178K). Photo offered to this website, August 2002, by Rush Wickes of Blacksburg, Virginia.

[Maryland Transportation Authority](#) link to [Francis Scott Key Bridge](#). Excerpt (in blue text):
 This outer crossing of the Baltimore Harbor opened in March 1977 as the final link in I-695 (the Baltimore Beltway). Including its connecting approaches, the project is 10.5 miles in length. In January 2000, the Authority completed an \$89.5 million project to replace the northern approach's former two-lane viaduct with an at-grade, four lane roadway. More than 11-million vehicles used the bridge during fiscal year 2001. The toll for a two-axle vehicle is \$2; each additional axle is \$2. The E-ZPass electronic-toll-collection system is available at the Francis Scott Key Bridge.

That 2001 traffic volume is an average of about 30,300 per day, well within the capacity of a four-lane freeway.

[MdTA Francis Scott Key Bridge Fact Sheet](#). Excerpts (in blue text):
 By the early 1980s, the Baltimore Harbor Tunnel (Interstate 895), the first crossing of Baltimore's Harbor, had reached its traffic capacity, and motorists encountered heavy congestion and delays almost daily during rush hours. The State Roads Commission, predecessor of the Maryland Transportation Authority, concluded there was a need for a second harbor crossing and began planning a single-tube tunnel under the Patapsco River, downstream from the Harbor Tunnel. The proposed site was between Hawkins Point and Sollers Point. Plans also were underway for a drawbridge over Curtis Creek to connect Hawkins Point to Sollers Point.

Contractors took borings of the harbor bottom in the spring of 1969. Bids for construction of the proposed tunnel were opened on July 30, 1970, but price proposals were substantially higher than the engineering estimates. Officials drafted alternative plans, including the concept of a four-lane bridge. The bridge, at an estimated cost of 110 million, represented the best alternative because it allowed for more traffic lanes and carried lower operating and maintenance costs than a tunnel. In addition, a bridge would provide a route across the Baltimore Harbor for vehicles transporting hazardous materials (these materials are prohibited from both the Baltimore Harbor and Fort McHenry [Interstate 95] tunnels).

[About the Maryland Transportation Authority](#). Excerpt (in blue text):
 Since 1971, the Maryland Transportation Authority has been responsible for managing, operating and improving the State's toll facilities, as well as for financing new revenue-producing transportation projects. The Authority's seven facilities - a turnpike, two tunnels and four bridges - help keep both private and commercial traffic moving in Maryland. All of our projects and services are funded through tolls paid by customers who use our facilities.

[I-695 Quarantine Road Interchange/Truck Security/Weigh Inspection Facility](#), MdTA website. Excerpts (in blue text):
 This project involves the reconstruction of the I-695 interchange with Quarantine Road. The plan for the reconstruction of the interchange also includes a new truck security/weigh inspection facility.

The above Quarantine Road project is intended to provide a new truck security/weigh inspection facility as a checkpoint to protect the Francis Scott Key Bridge and motorists from potentially overweight and unsafe commercial vehicles prior to crossing the bridge, and to add capacity and modify the interchange to reduce traffic delays, congestion, and potential accidents along I-695. Construction is scheduled to begin in mid-summer 2006 and will last about two years. Estimated construction cost is \$26.5 million. The project will be funded by MdTA.

[A view of Francis Scott Key Bridge](#), by D. L. Pietryka.

Photos of the Key Bridge and approach Highway, by [AARoads](#) (the Outer Harbor Crossing is between Exits 2 and 42)
[Interstate 695 / Baltimore Beltway, Inner Loop: Exits 32 to 44](#)
[Interstate 695 / Baltimore Beltway, Inner Loop: Exits 1 to 16](#)
[Interstate 695 / Baltimore Beltway, Outer Loop: Exits 44 to 33](#)
[Interstate 695 / Baltimore Beltway, Outer Loop: Exits 16 to 1](#)

Terraser images of Outer Harbor Crossing, taken in 1994

[Key Bridge](#)
[Curtis Creek Bridge](#)
[Sparrows Point Viaduct](#)

[Fort Carroll](#) - Baltimore, Maryland has been a significant seaport since well before the American Revolution. Today, commerce continues daily as ships steam up the Patapsco River and pass under the soaring structure of the Francis Scott Key Bridge, crowded with trucks and cars from Interstate 95. Few of those in the ships or in the vehicles pay much attention to a large dark hexagonal bulk sitting in the water just to the southwest of the Key Bridge. Long abandoned and forgotten, this nearly three and a half acre man made island of brick and stone was once a symbol of American military might and engineering ability—Fort Carroll. By [Brian Hawley](#).

[A Visit to Fort Carroll](#), Maryland, by Gene Feldman.

[I-695 Baltimore Beltway Widening - Sparrows Point](#) - *Roads to the Future* article with three photos of the four-lane widening and elimination of most of the Sparrows Point Viaduct.

[Baltimore Harbor Crossings](#) - *Roads to the Future* article with a photo of the Key Bridge and a photo of the completed widening and reconstruction of I-695 on Sparrows Point.

All photos taken by Scott Kozel except for the two noted.

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By Scott M. Kozel, [Roads to the Future](#)

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