

August 20, 2018

Bay Crossing Study
Maryland Transportation Authority
Div. of Planning & Program Development
2310 Broening Highway
Baltimore, MD 21224

LETTER Number 4

Greetings,

In November, 2017 the Maryland transportation administration began a project to determine the best location for another bridge across Chesapeake Bay. The public was asked to recommend one of six segments across the bay as their choice for a new bridge. Of course it will take 20 to 30 years for a new bridge to open for traffic.

This is my fourth letter to MdTA and is in response to the May, 2018 briefings. It is a follow-on to my Letter 3 and considers the complete problem of transportation across Chesapeake Bay.

Maryland is asking to decide which of six zones to use to build a bridge across Chesapeake Bay. Of course the obvious answer to this question is: none of the above. That is because the problem is much more complicated than a simple bridge, because the bridge will not exist for 20 or 30 years, and the bridge will not solve all the problems.

Maryland actually has to solve four problems:

- Immediate traffic needs
- Short-term traffic needs
- Long-term traffic needs
- Replacement traffic needs (Not considered in this letter)

The purpose of this letter is to describe possible ways to solve these problems.

1. Immediate traffic needs.

There is an immediate need because cross-Bay traffic is already at saturation. There is no time to build a solution and we have to use what we have, namely the Annapolis bridge crossing. Really there are only two options

- Decrease the number of vehicles crossing the bridges
- Increase the speed at which vehicles cross the bridges

Vehicles going north, actually northeast, could stay on the western shore. This route is about the same length as a route through Delmarva. Route 301 meets Interstate 95 near Newark, Delaware. I-95 or I-95/I-295 could provide access to the Northeast corridor. If the Delaware Tolls become a larger problem, then perhaps a bypass using US 1 and Maryland 322 could bypass Delaware.

Speeding up bridge traffic depends on the fact that the bridge is not the problem. The bridge has three lanes so traffic should flow smoothly. But it doesn't because of tollbooths and Annapolis city congestion.

Quick fixes for faster travel could be:

- Eliminate tolls
- Collect full electronic tolls at speed
- Move toll booths to the Eastern shore end of the bridge
- Move local traffic off of routes 50 and 301.

No car should be on route 50/301 unless it is getting to the bridge.

Short term traffic needs.

This includes construction that can be done quickly at Annapolis.

- Redirect I97 bridge traffic off route 50/301 and directly to the bridge.
- Route Ritchie Highway traffic directly to the bridge.
- Create a second deck for automobiles on one of the bridges (see comments below)
- Create a traffic hub at the Wye Mills end of the bridge.

I understand that the official position is that a second deck cannot be added to either Annapolis Bridge. I don't believe that. If the bridge builders were asked, I feel sure they would agree that 1 or 2 lanes, exclusively for low weight vehicles (3500 pounds limit), could be built.

2. Long-term traffic and other needs.

The real challenge being considered here is the long term solution. The obvious long term solution is a new bridge across Chesapeake Bay. This is the subject of the original MdTA study and, while it is not everything, it is very important.

Anyone thinking of building a bridge should begin by viewing the video online about the Tacoma Narrows Bridge, sometimes called galloping Gertie. It is very scary watching a steel bridge shaking itself to pieces, which fall into the gorge.

<https://www.youtube.com/watch?vj-zczJXSxmw>

The lesson is that bridge design is more art than engineering discipline. It has been observed that about one Bridge falls down per generation, after that generation of engineers take their know-

how into retirement, and leave the field to the young engineers who just have a degree and a handbook, and it is still happening: in March 2018, the Florida International University Bridge in Miami collapsed.

When developing a product for deployment 20 to 30 years in the future, it is necessary to know the environment then. Typically this is done by extrapolating from the present. For example, from the recent traffic measurements taken near the Annapolis bridge. But that assumes a surprise-free future.

Actually there are two huge surprises in the next 20 to 30 years. One is the change in the nature of automobile transport, as was described in my Letter Number 3. The other is global warming.

Global warming has been discussed since approximately 1980. A New York Times headline on August 22, 1981 said "Study Finds Warming Trend that could Raise Sea Levels."

Experts have been predicting that the planet would get warmer, partially due to the gases introduced into the atmosphere, which trap heat.

But other experts have been saying that there is no global warming. It is just the normal fluctuations of the atmosphere.

Some of those wary of global warming are being quite pessimistic and predict that global warming has progressed too far to stop. As a result this planet will become uninhabitable and all life will come to end.

"Thirty years ago we almost saved the planet. Today global transformation is underway. Since 1981, Arctic sea ice has decreased by an average of 1.3 percent per year. Since 1989, global mean temperature has increased by 1 degree Fahrenheit. By 2030, the number of people worldwide affected by floods is expected to triple. Between 2030 and 2050, climate change is expected to cause the deaths of roughly 250,000 people each year. By 2050, the Arctic Ocean is expected to be largely ice-free in the summer. By that same year, a million species will face extinction. By 2080, frequency of heat waves in the New York metropolitan area is expected to triple. By the turn of the next century, global sea levels will have risen by one to four feet, potentially turning hundreds of millions of people into refugees." 'Losing Earth' by Nathaniel Rich, the New York Times.

That disagreement still goes on today but more experts are agreeing that global warming is real because it has been quite consistent for 30 years.

When I was young and thought that Science would solve the problems, a friend who was a judge repeated the facts of political life to me. Two of his rules are pertinent here:

- Politicians never do preventive maintenance because that never gets in the newspapers. Instead they wait for a catastrophic failure and then rush in with the TV and newspapers and tell everyone how they will solve (rebuild) it.

- Politicians are all nearsighted. They cannot see past the next election. So any longer project has to have a very visible short term achievement.

Global warming fails both these tests. Nothing that the government does now will have any effect before the next election. So it is very difficult to get support money.

If the pessimists are correct and nations will not have the willpower to fight against this slow change in climate then why shouldn't we just give up? Disaster predictions are also based on extrapolation and the world is now following those paths. But at some point the world has to wake up and then the best minds will invent creative ways to solve it. Something new and completely unanticipated will be created or discovered. Solutions out of the blue like gunpowder, radio, polio vaccine, will be found and there will be a new path. But it will be a difficult path.

A report titled "The Climate Change and Sea Level Rise Adaptation Report, Kent County, Maryland" August 2016, was created by Kent County and the State of Maryland and predicted three major environmental threats in the near future

- Higher temperatures
- More storms
- More flooding

It is prudent to plan for relative sea level rise of 2.1 feet by the year 2050. On top of which storm surge would have to be factored in to judge the risk to land-based facilities. This is based on the Kent County/State hazard report.

It would be unprofessional and shortsighted for the MdTA to study the question of bridge placement without the state addressing the other related problems.

There are two major considerations

- Threat of major storms on the Delmarva Peninsula
- The need to preserve the freshwater in Chesapeake Bay

I discuss both these in the following.

Maryland is going to face 3 problems related to Chesapeake Bay in the next 20 or 30 years. It would be irresponsible for the state to address fewer than all three of these.

1. The first is vehicle access across the Bay to the Eastern shore, the original subject of this study. MdTA has stated that there are three requirements:
 - a. EPA rules must be followed
 - b. It must help solve Annapolis overcrowding
 - c. Any new bridge must attract enough new customers to pay for itself.

2. The second is emergency access to the lower Eastern shore in case of a hurricane landfall there. Hurricanes are becoming more frequent and more powerful so this is very likely to happen within the next generation. Tropical storm Isabel in 2003 caused a 7 to 9 foot storm surge here.

Today there are three accesses to the Delmarva Peninsula: the Chesapeake Bay Bridge and Tunnel at the south end, leading to Norfolk, Virginia. In a hurricane this is useless as it leads right into the storm. There are the two bridges at Annapolis. They are 150 Miles to the north. Finally there is the connection to mainland near Wilmington. It is 200 Miles to the north. The challenge is to create another access at an appropriate distance south to be used for disaster relief. There are three requirements:

- d. It must help solve Annapolis overcrowding
- e. It must connect Delmarva to appropriate disaster resources

3. The third is protection of the vast freshwater resource that is Chesapeake Bay. "The Chesapeake Bay is our state's most precious natural resource and one of our most significant ecological bodies in the nation." Peter Franchot, Maryland Comtroller.

In 20 years freshwater will become a scarce resource here as it is already in other parts of the U.S. Today the inflow of fresh water from the Susquehanna and other rivers causes an outflow into the ocean and minimizes salt water encroachment. Major rivers feeding into Chesapeake Bay are the 464 mile long Susquehanna River, 302 mile long Potomac River, the 115 mile long Patuxent River, and many smaller rivers. The total watershed is 64,000 square miles.

But as more water is drawn down from farming, business and residential, and as sea levels rise and the bay rises with them, that barrier will become weaker and more saltwater will move up the bay. As it does so, wells on both sides will become contaminated and farmland will become unusable. That cannot be allowed. The obvious solution is to narrow the bay opening so that outgoing water velocity remains the same as total flow decreases. Another option is a set of gates like the Thames River in England.

There are three requirements:

- f. Bay flooding must be controlled
- g. Water purity must be maintained

These three challenges need to be used to evaluate each of the six subarea options given by the State.

Subareas one and six

Subareas one and six have been eliminated. Subarea one because of the existence of Aberdeen proving ground. Subarea six because the bay is so wide there and there are so many wetlands on the eastern side of the bay.

Sub area two.

A bridge has been proposed between Baltimore and Kent County. The traffic needs for subarea 2 are basically for Baltimore, both commercial and non-commercial traffic.

Today the main driver is commercial traffic. Commercial traffic can come across a bridge and go north or south. Most commercial traffic will head North on the Northeast corridor. A lesser amount of traffic will proceed south down the Northeast corridor. And an even smaller amount of commercial traffic will proceed to Delmarva, primarily agricultural trucks.

Traffic up the Northeast corridor area is not helped by a bridge and highway network on Delmarva. If traffic goes north, really northeast, it will require 25 miles of new expressway. Even with that a new road across Delmarva, it is not really shorter than going up Interstate 95 on the western shore. So the decision is probably the cost across the Susquehanna River Bridge and the Delaware I95 toll plaza, compared with the cost for a new Bridge. Maryland can improve the traffic flow on the western shore, north of Baltimore, much cheaper than building a new bridge and infrastructure in Kent County. So the amount of traffic going north is questionable.

Commercial traffic going south will find that the roads from Baltimore to the existing Annapolis Bridge are almost directly in line, whereas a bridge will require 15 miles of new expressway in Kent County and a new bridge across the Chester River. In either case it will add to existing Annapolis bridge traffic. The number of new tolls is questionable; maybe traffic will just move from one bridge to another. The solution is to move other traffic south onto another bridge to make room for it (see below)

Noncommercial traffic on the Baltimore area may go anywhere. Some may follow the Northeast corridor north or south. Other traffic may head to Delmarva and if it is going south the existing roads and Annapolis bridge should serve it well.

A bridge in Subarea 2 does nothing to help disaster relief. I think the probability of new tolls on this new bridge is questionable. Therefore I think subarea two is not viable. The solution for Subarea 2 is better roads on the western shore and reduced traffic in Subarea 3 at Annapolis.

Perhaps a ferry service across the Bay would be a good solution for Sub area 2.

Sub area three

It is very important to provide relief at Annapolis. This is the location of the existing two bridges. There are no particular environmental problems at subarea three because they have already been considered before construction of the previous bridges. Another bridge here would just make local roads problems worse.

One purpose for the study is to solve the inadequate capacity at subarea three. A third bridge will just make the stress on the local roads worse. Overall a new bridge at subarea three is a marginal gain and so probably does not have financial viability. Divert Annapolis traffic to a bridge further south.

Every time I look at a picture of the newer Annapolis bridge, I believe more strongly that it is designed to have an upper deck added. I believe that there should be an upper deck for automated people mover cars. There should be a weigh scale to keep heavier vehicles out of this Lane. I believe this could be added to the bridge in 10 years and built in a modular way that has minimum impact on existing traffic. Modules would be built off-site and moved onto the bridge and installed during low traffic hours. This would help the Annapolis bridge traffic very much. And provide the dedicated Lane that auto cars prefer.

Almost all traffic will be Chartered vehicles. Annapolis and Baltimore would need transit hubs to be compatible with the rest of the system. The system would have to be complete. A partial system is likely to fail. I think another bridge lane is the only solution for Sub area 3.

Sub areas four and five.

These locations for a new Chesapeake Bay Bridge are very attractive. They spread out the bridge locations which is certainly a good idea. They cross the bay at a relatively narrow point and where there are existing roads and solid ground at both ends. Further south there is extensive marshland.

This has the largest potential for drawing more traffic and more tolls across Chesapeake Bay because it goes where most people want to go.

This option provides new capacity across the bay including traffic coming south from Annapolis and traffic from the entire southern part of Maryland and Washington. So it helps decrease traffic at Annapolis and opens an entire new area for Eastern Shore access.

But this is where environmental concerns need to be really considered.

Subarea 4 has fewer environmental concerns but a wider bay width. Subarea 5 has better highway infrastructure on the western shore and direct access to Route 50 where it turns west. And it seems to me the choice for a new bridge location is obvious, namely sector four or five. But it has to be a combined effort:

In the event of a life-threatening weather pattern, as we have witnessed his past summer in parts of the Atlantic, it would require the mass evacuation not only of Delaware and Maryland beach areas but full-time residents throughout and across Delmarva. It is estimated that 325,000 Ocean City vacationers could be there during prime summer break. All this traffic could not be funneled up across the existing bridges so a Southern Bay bridge crossing makes total sense for Max mass evacuation of Delmarva in an emergency.

And it provides better emergency access because it is further south. And it provides better access to Salisbury, which wants better access to the west.

While these are the best solutions they are not good enough solutions. Work has to be done to assure that the bridge is built and placed in a manner compatible with the needs of the Eastern shore at that point.

There are three major questions:

- Protection of environmental and historical locations
- Length of the bridge
- Supportive road network

Protection of environmental and historical locations

People are justified in having the concern that a bridge in Subareas 4 or 5 would create a situation like Kent Island, with the road side filled with fast food restaurants, automobile dealerships, and boat storage yards. That has to be avoided.

It is my understanding that the laws for access to a highway come from English common law. They state that every citizen has a right of access to the public road. The only change to this was when the Interstate highways were built. They contained a rule limiting access. Here in the East only interstate interchanges exist on the interstate highways. There are places in the West where the Interstate replaced the only existing road and so there are ranch driveways opening onto the interstate. Perhaps the road should be raised so that no side roads can connect to it. Perhaps it should be made an extension of one of the Interstates around Washington

Figure 2 shows the Cambridge, Blackwater national wildlife refuge area and was produced by the Chesapeake Bay foundation. It shows that there is ample room for a bridge approach following the route of present Route 16 and this would feed into route 50 beyond Cambridge. The Harriet Tubman historical Center is also at the refuge center.

This location for a new Chesapeake Bay Bridge is very attractive. It spreads out the bridge locations which is certainly a good idea.

It crosses the bay at a relatively narrow point and where there are existing roads and solid ground at both ends. South of there is widespread marshland.

Length of the bridge

There is concern that a bridge in subareas 4 or 5 would be too long. Of course the best (shortest) location for a bridge was used with the original bridges at Annapolis. But a bridge does not have to go across the entire Chesapeake Bay.

Figure 1 shows the San Mateo Bridge across San Francisco Bay, about halfway between the mouth at San Francisco and the source at San Jose. The bay there is 7 miles wide and the picture is taken with an extreme telephoto lens. That explains the dogleg which is actually about 15°.

The bridge itself is about 2 miles long and the causeway is about 5 miles long. The bridge has a 134.5 foot clearance. It carries 93,000 vehicles per day. The westward cost is five dollars, eastward is free. A series of high-voltage line towers is adjacent to the bridge. The causeway is supported by pre-stressed hollow concrete pipes each 60 to 90 feet long. There are six lanes, three each way and the speed limit is 65 mph.

Supporting Road Network

A bridge is not effective unless the road network at each end can carry the bridge flow rate. The road network needs to be improved at the existing Annapolis bridge and at any New bridge. Today that is not true except possibly for Maryland 301 east of Annapolis. Route 50 needs to be improved to bypass the busy business areas at Easton and Cambridge. A new bridge needs a new road network.

Because many vehicles in 2030/ 2050 will be leased, parking lots will be less important; the leasing companies will provide their own hubs. The road network should look more like a railroad network than an automobile network. There should be a travel hub at the east end of each bridge.

I picture a facility like the rest area at the Garden State Parkway and I78 in northern New Jersey. It has a large parking lot but also does not delay through traffic. It has a rest area and food court and special shower facilities for truckers. It has travel lockers for people who travel often. It includes a bus stop interchange facility.

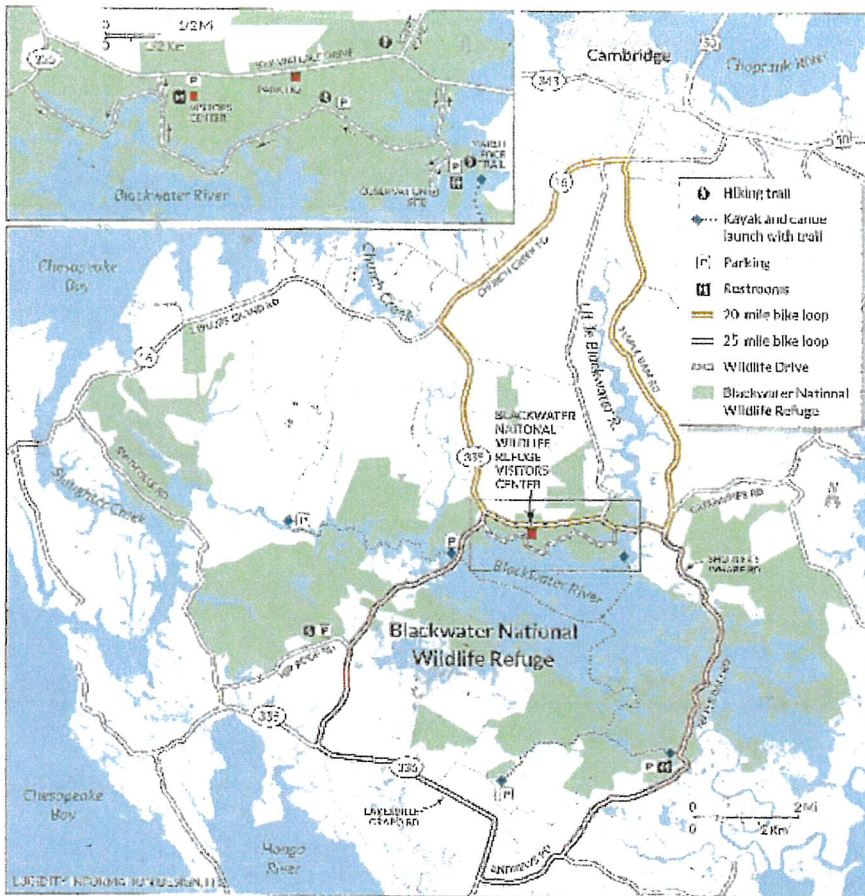
For travelers to depend on the transit service, it must be available 24/7. During busy hours buses would run on schedule. At other times a ride could be summoned by phone or email. It might be a Robo-car but no one would ever be stranded.

These three goals should be worked on as a joint venture and they lead strongly to the decision that another bridge should be further south. In fact I believe the decision is obvious. Another bridge needs to be built in sub areas four or five.

Summary

I believe it is clear that Maryland's attention, in the next 20-30 years, should focus on all three major needs so that a solution can support all of them. To do this another bridge should be constructed in sub area 4 or 5.





Blackwater National Wildlife Refuge

- History:** Blackwater was established in 1933 as a waterfowl sanctuary for bank wading along the Atlantic Flyway.
- Geography:** The refuge encompasses more than 20,000 acres of forest, tidal marsh, meadows, fields, and shallow water.
- Wildlife:** Blackwater's diverse habitats host over 250 bird species, 35 species of reptiles and amphibians, 165 species of plants, and numerous mammals.
- Contact:** www.bws.gov/office/Blackwater
 2145 Key Wallace Drive, Cambridge, Maryland 21613
 410/228-2677



With both short and long trails and many places to stop and enjoy the scenery, Blackwater National Wildlife Refuge is a great place to visit by bike.



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