TAPPAN ZEE BRIDGE/I-287
ENVIRONMENTAL REVIEW

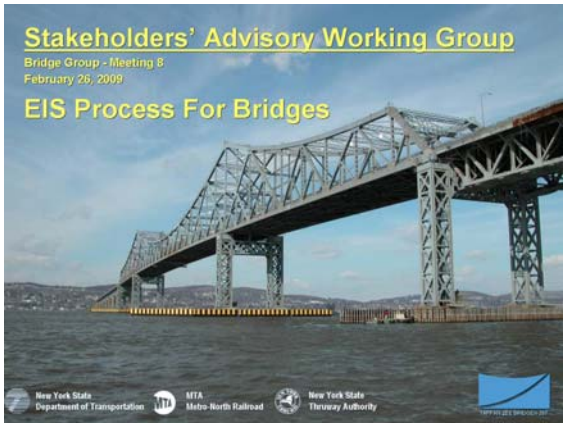
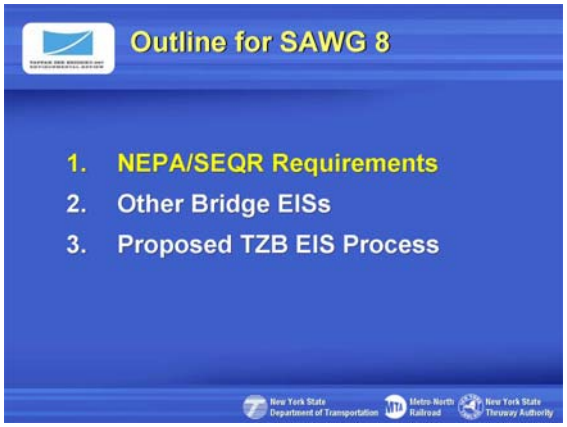
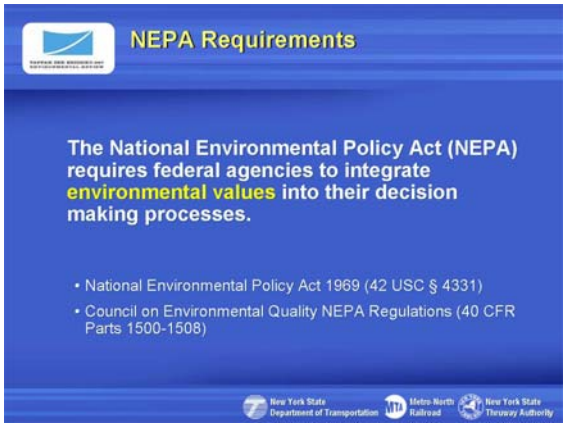
New York State Department of Transportation
Metropolitan Transportation Authority Metro-North Railroad
New York State Thruway Authority

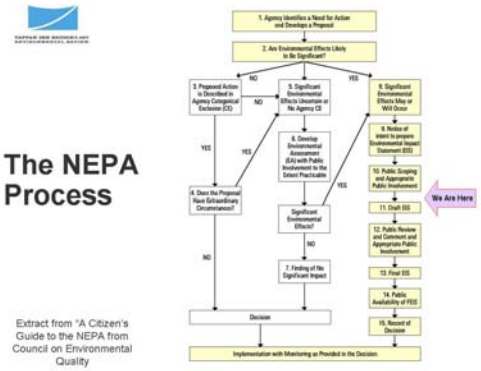
Presentation

Stakeholders' Advisory Working Group
Bridge Meeting 8

Tappan Zee Bridge/I-287 Corridor
Environmental Review

February 26, 2008

	**Slide 1** Title slide.
	**Slide 2** Title slide for Part 1 of the presentation outlining NEPA/SEQR requirements.
	**Slide 3** Congress enacted NEPA in 1969. NEPA established national environmental policy. To implement these policies, NEPA requires agencies to undertake an assessment of the environmental effects of their proposed actions prior to making any decisions.



Slide 4

This slide shows the NEPA process and is an extract from the NEPA document *The Citizens Guide to the NEPA* which is available on the web.

The TZB/I-287 Environmental Review follows the process highlighted by the yellow boxes on the slide. Currently, we are completing Scoping and commencing the DEIS.

Slide 5

NEPA requires federal agencies to develop there own regulations and also stipulates that agencies, such as FHWA and FTA, look at various alternative courses of action in a project.

If a project satisfies NEPA requirements, it meets the state's SEQR requirements too.

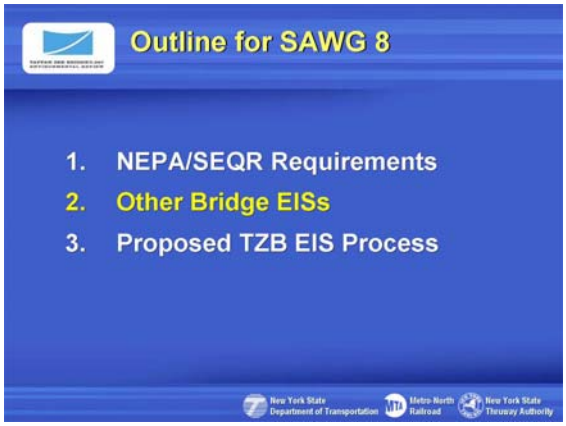
Of note in the FHWA NEPA requirements, shown on this slide, the objective is a *balanced* consideration of efficient and safe transportation and environmental impacts.

Slide 6

Beyond the requirements of NEPA, there are additional regulatory and permitting requirements. This slide shows many of the different agencies that are involved.

The number of agencies and their requirements are extensive and providing sufficient information to these agencies is a major activity during the EIS. The TZB/I-287 Environmental Review has begun to engage these agencies at a preliminary level.

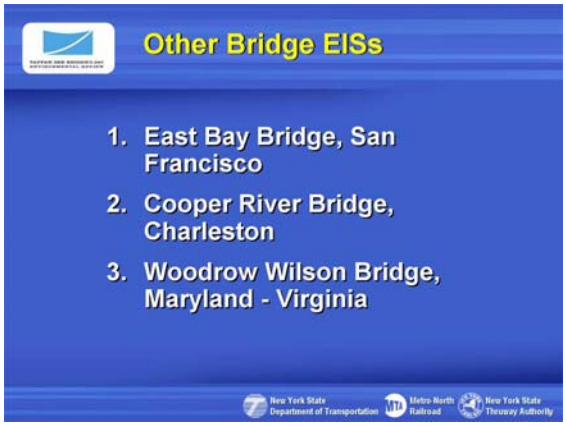
The documentation prepared for the EIS also serves to provide the necessary information to these agencies.



Slide 7

Title slide for Part 2 of the presentation.

Part 2 looks at the process and environmental considerations of other recently constructed bridges.



Slide 8

This slide lists the three bridges to be discussed.

In each of these three bridge projects, the Alternatives in the DEIS were not associated with bridge type or form but instead the Alternatives with focused on the bridge alignment. Effectively, the EIS considered how the bridge fit into the overall environment.

Notably, the final bridge type and form was not determined during the EIS for each of these three bridges but was identified as part of a type selection process, or design competition, after the EIS was completed.

Overall, these projects follow the general process outlined in the first Bridge SAWG meeting of May 31, 2007 "*Form* follows *Fit* follows *Function*".

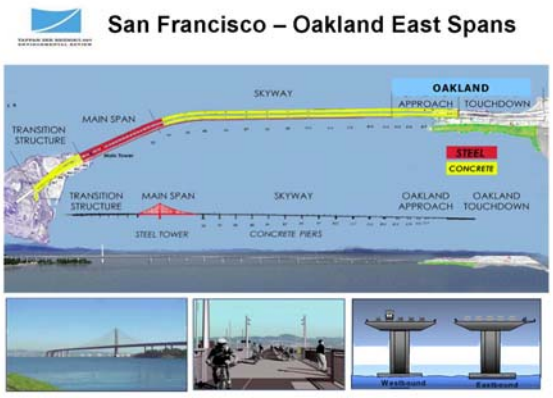
For the TZB/I287 Environmental Review the first part of this process is complete as the overall functional requirements of the recommended Replacement Bridge were established in the *Transit Mode Selection Report* which is available on the project website. As recommended in this report the Replacement Bridge will support 8 general purpose lanes, 2 lanes for BRT, 2 CRT tracks and a shared use path for pedestrians and cycles.

Slide 9

This slide shows the Main Spans of the existing and Replacement Bridge for the east spans of the San Francisco Oakland Bay Bridge (SFOBB). The Main Spans are currently under construction and due to be completed in 2013.

Project is similar to TZB in that there are soft soils in the project area and it is not entirely founded on rock. Other similarities include the number of lanes (a total of 10 lanes), the Main Span length, the long Approach Spans, the accommodation of transit and the pedestrian/cycleway.

Overall the east spans of the SFOBB are about 80% of the overall length of the TZB.



Slide 10

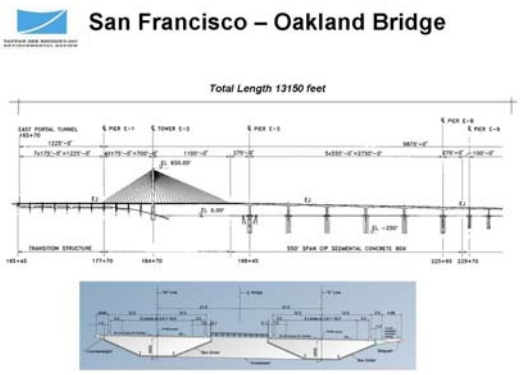
While the previous slide shows the main spans for the SFOBB it would be a mistake to consider only the Main Spans. The Main Spans only represent one sixth of the overall bridge length. For the TZB the Main Spans represent one eight of the overall length of the bridge.

It is the Approach Spans on each side of the Main Spans that are the bulk of the bridge and it is these spans that warrant close study in the EIS, particularly at the landings and in the river.

In bridges with long Approach Spans it is necessary to focus on the Approach Spans to ensure an overall efficient structure.

The slide also shows a visualization of the pedestrian/cycleway.

The bridge was designed to accommodate commuter rail transit in the future with rail occupying one of the existing highway lanes and shoulder in each direction.



Slide 11

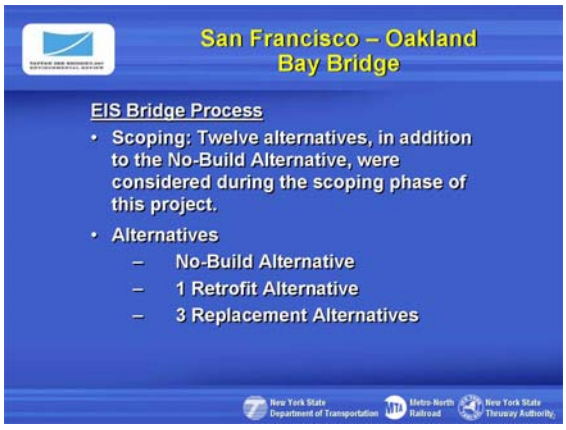
This slide shows both a side view and a cross section of the east spans of the SFOBB.

In the side view it is possible to see the profile of the bridge – the profile is the overall grade and elevation of the bridge. Because of the potential for future rail the overall grade on the bridge is shallow and the bridge has a constant grade from the Oakland landing to the Main Spans.

A similar, smooth grade would be needed to accommodate CRT for the Replacement Bridge for the TZB/I287 Environmental Review. This overall profile would differ from that of the current TZB which has a long length that is flat near the Rockland Landing. A preferred overall profile of the Replacement Bridge will need to be established as part of the upcoming DEIS.

Similarly, it will be necessary to establish the general cross-section of the Replacement Bridge as part of the TZB/I287 Environmental Review. For the SFOBB the existing bridge has two levels with westbound traffic above eastbound traffic. However, the new bridge has only one single level with eastbound and west bound traffic side by side.

The SFOBB, used long Approach Spans up to 550 feet between piers. These long spans reduced the number of piers in the water and concentrated the foundation construction requirements at only a few points to limit environmental impacts.



Slide 12

This slide provides a summary of the Alternatives from the SFOBB EIS process.

The Alternatives for the SFOBB included a Rehabilitation Alternative in the EIS. A Rehabilitation Alternative is not included on the EIS for the TZB/I287 Environmental Review as this alternative was not found to be reasonable for the reasons outlined in the *Alternatives Analysis for Rehabilitation and Replacement of the Tappan Zee Bridge Report*.

Slide 13

Each of the Replacement Bridge Alternatives differed only in their alignment. All the alternatives assumed the same bridge type(s) which were developed as part of an overall engineering report.

Contemporary with the EIS, a Engineering and Design Advisory Panel was created to make recommendations on the technical requirements of the replacement bridge. One of the key recommendations was that two bridge types be progressed to a more detailed design stage to further evaluate technical options.

After these studies a preference for a suspension bridge type was included in the FEIS.

Slide 14

This slide was taken from the Oakland side of the bridge during construction. You can see the existing dual level bridge with the new bridge piers for the new bridge on the right.

The area on bottom left was used as a construction staging area during construction. A similar construction staging area would be needed for a Replacement Bridge as part of the TZB/I287 Environmental Review. Because of the lack of space at the landings a temporary platform may be necessary in the river.

Slide 15

This photo (right) shows a hammer used for driving foundation piles. The piles are large steel tubes with diameters up to 8-feet.

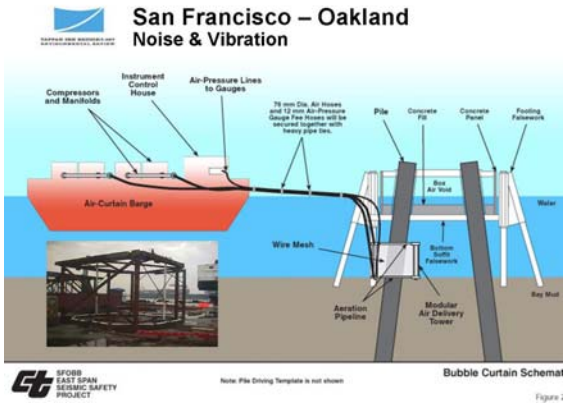
The foundations for the SFOBB used large diameters in association with the long spans. To confirm pile capacities and to test noise levels a series of test piles were constructed in advance of the main construction. These tests confirmed the capacities of the piles and resulted in the introduction of special noise and vibration control measures.

Pile capacity and construction noise are issues to be examined in the DEIS for the TZB/I287 Environmental Review.

Slide 16

This image gives a good impression of the size of the foundation pile. The construction worker stands beside an 8-feet diameter section.

In the studies to date for the TZB/I287 Environmental Review a 4-feet diameter steel pile has been used. However, further engineering studies remain to be completed to determine if a larger pile size but reduced number of piles would be possible or advantageous.



Slide 17

This image shows the methodology used for the SFOBB to control noise and vibration during the installation of the pile foundations.

The method uses bubbles of air around the foundation components to reduce noise and vibration.

The image shows the actual rig used during construction.

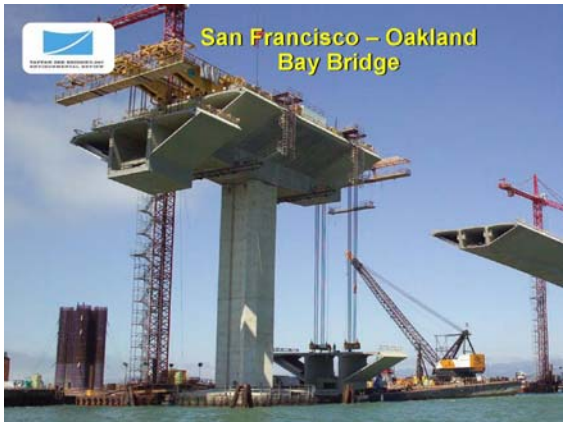
Slide 18

This slide is one of four that shows how the construction of the bridge advanced. In this slide the piles have been installed and the pilecap that holds the piles together is under construction. Note the number of vessels in the river necessary to support construction.

The impacts of these types of construction vessels to the river and aquatic life is to be considered in the TZB/I287 Environmental Review.

Slide 19

This image, the second of four construction sequence images shows the construction of a pie above the pilecap. For the SFOBB the piers were concrete and were cast-in-place. In many other modern bridges pre-fabrication of the piers offsite is used to limit the period of construction on site and possible environmental impacts.



Slide 20

This image, the third of four, shows the construction of the superstructure above the piers. For the SFOBB, the superstructure was pre-fabricated offsite and brought in sections to the bridge by barge.

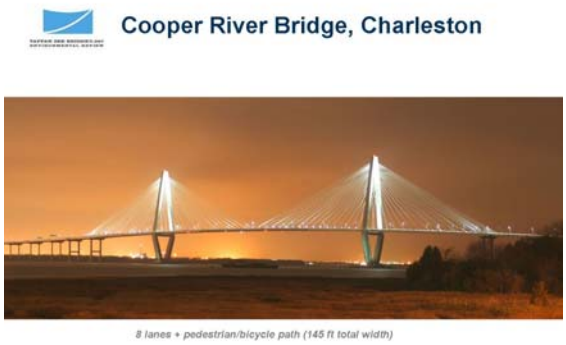
Once at the site, each superstructure segment was lifted into position and tensioned against the previous segment. This process results in very quick construction of the bridge and reduces the overall construction duration.

Slide 21

This slide, the last in a series of four, shows an aerial view of the nearly constructed Approach Spans. As can be seen the new bridge is formed of two parallel structures which are wider than the existing bridge.

The wider structure results in an increase in the shadow area and has implications for aquatic life. Studies assessing the implications to aquatic life will be part of the TZB/I287 Environmental Review.

On the right, there is a rendering of the shared use path for cyclists and pedestrians, and of the construction staging area that is located miles away from the bridge construction.



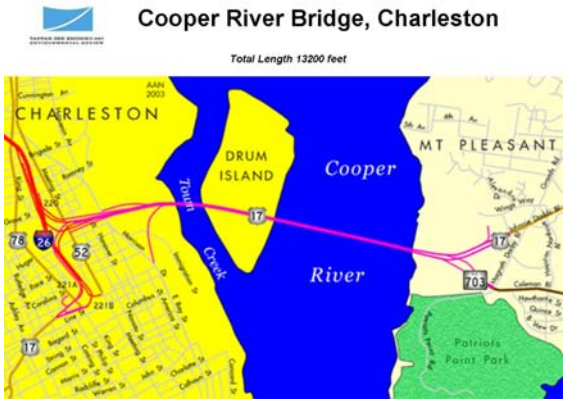
Slide 22

The next bridge to be looked at is the Cooper River Bridge in Charleston, South Carolina. Its EIS was published in 1992 and the FEIS in 1993. The bridge was opened in 2005.

Similar to the SFOBB, the Cooper River Bridge had Main Spans and long Approach Spans. In the case of the Cooper River Bridge, a Cable-Stay type bridge is used for the Main Span.

Distinct from the SFOBB which used long spans for the Approach Spans, the Cooper River Bridge used a series of short spans.

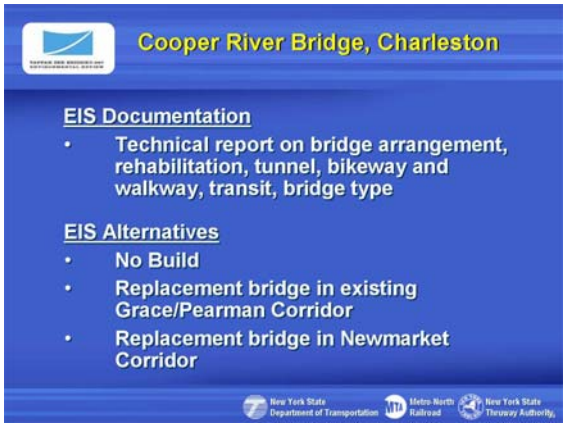
For the Replacement Bridge Alternatives in the TZB/I287 Environmental Review, both long and short spans for the Approach Spans are to be considered.



Slide 23

The total project was 2.5 miles long. The project was more than just a new bridge; it also included major highway interchanges on both ends.

For reference, the main span of the bridge was located immediately to the right of Drum Island.

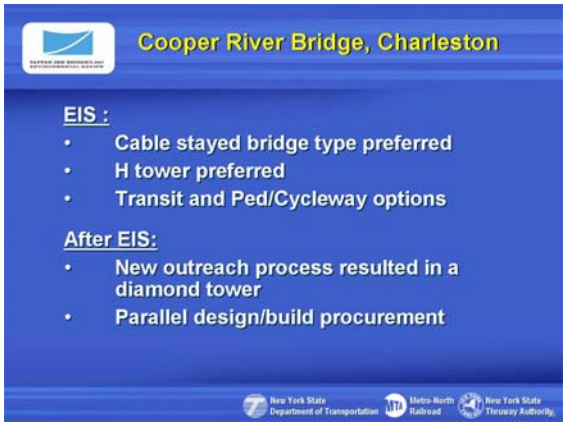


Slide 24

The EIS established basic requirements of the bridge and identified engineering needs and design criteria.

Alternatives centered on what alignment to use, as that would be the driving force in identifying impacts.

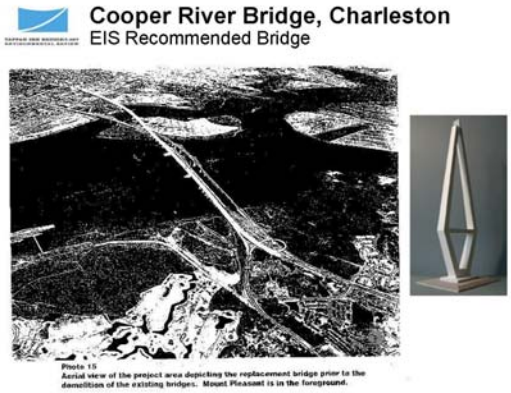
Similar to the SFOBB, a technical report was prepared to establish the primary engineering components of the bridge.



Slide 25

Initially, a cable stayed bridge using an H-type tower was preferred in the EIS because of the design's reputation as simple, cheap and modern.

However, after the EIS, further development of the bridge type instigated by the local communities resulted in the adoption of a diamond shaped tower.



Slide 26

This slide shows the new roadway structure as it parallels the old. In the larger image, extracted from the original EIS document, the H type tower is just visible.

The diamond style tower, on the right, was the final tower type adopted.

Slide 27

Though the Main Spans of a new bridge are typically the subject of much attention, they are only a small part of the overall bridge. As shown in the two images here, the overall bridge is much more than the Main Spans.

These views in particular highlight the extent of the bridge construction at the landings and how the bridge fits into the shore environment.

One of the most important initial areas of study for the TZB/I287 Environmental Review is to examine how a replacement bridge fits into the existing highway right-of-way boundaries at both the Rockland and Westchester landings.

Slide 28

These pictures show the bridge's foundation construction for the Cooper River Bridge. All the images show the construction of the foundations for the diamond towers.

Surrounding the towers is an artificial island made up of fill material. This island was necessary to prevent errant ships from colliding with the piers. The need and implications for the island were a major area of study during the EIS and design process.

For the Replacement Bridge in the TZB/I287 Environmental Review measures that provide protection against ship collision will also be necessary. While an artificial island is not likely for the TZB additional structures surrounding the piers are likely to deflect impacts. The environmental implications of these structures will be evaluated as part of the EIS.

Slide 29

The photo on the left shows the completed artificial island for the Cooper River Bridge.

This image also shows part of the existing bridge being demolished and debris falling into the river. This is an environmental impact and would not be allowed for the TZB.

The second image shows the short Approach Spans for the Cooper River Bridge as well as a temporary platform that was built to access the piers for construction. It is likely that a temporary pier would also be required as part of the replacement for the TZB.

Slide 30

This slide shows the explosive demolition method used for removal of the Main Spans of the old Cooper River Bridge. This type of demolition is unlikely for the TZB because of the resulting impacts to the river and possible impacts to aquatic life.

However, as part of the TZB/I287 Environmental Review, the method of demolition has to be studied.

Slide 31

This slide shows the final and proposed lighting arrangement for the Main Spans of the Cooper River Bridge.

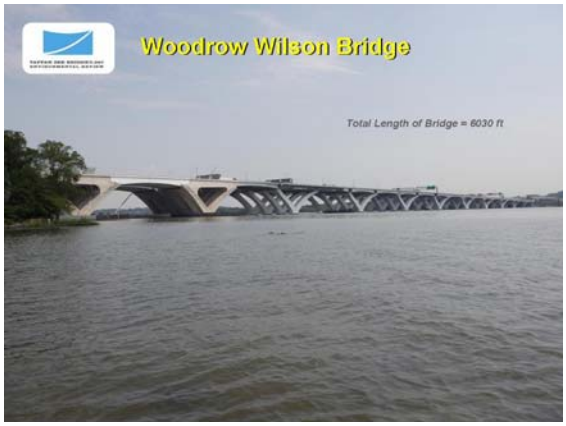
As part of the development of the bridge details after the EIS, lighting was the subject of significant discussions in the outreach process.

Though a final lighting design would not be available for a Replacement Bridge as part of the TAB/I287 Environmental Review, environmental impacts associated with lighting will be assessed as part of the EIS.

Slide 32

This image shows the final Cooper River bridge from the view point of the driver while the inset image shows a detail of the pedestrian/cycleway around the pier.

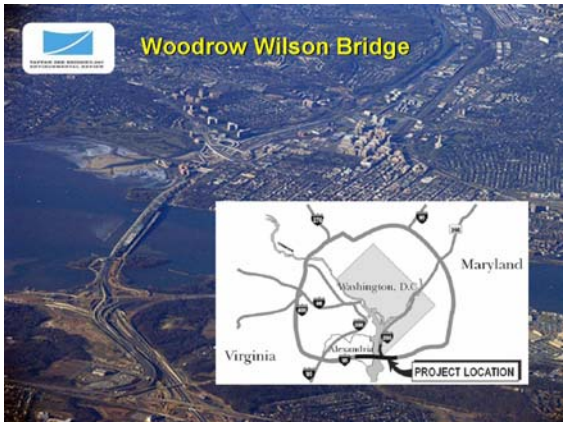
In the future stages of the development of a possible Replacement Bridge as part of the TZB/I287 Environmental Review, the views of all users from the bridge need to be considered, not just the views towards the bridge.



Slide 33

The Woodrow Wilson Bride carries I-95/495 over the Potomac River in Washington, DC. The EIS was completed over a long period of time, from 1989 to 2000. The bridge opened in 2008.

Unlike the previous two bridge examples, this bridge does not have a long Main Span with towers than reach above the deck. Instead the Woodrow Wilson Bridge has a bascule span that opens to allow ships to pass.



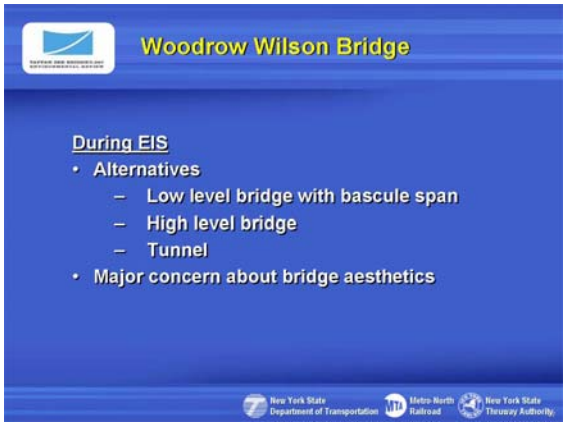
Slide 34

The full length of this project is 2 miles. In addition to the bridge, there are new interchange connections on both sides.

Slide 35

This is a plan view of the location of the bridge. The navigation channel is near the Alexandria, Virginia side of the bridge on the left. As can be seen the bridge is wider than that existing and there are impacts to properties at the landing.

Unlike the TZB, the width between the highway right-of-way boundaries was insufficient for the width of the new bridge and some properties were displaced.

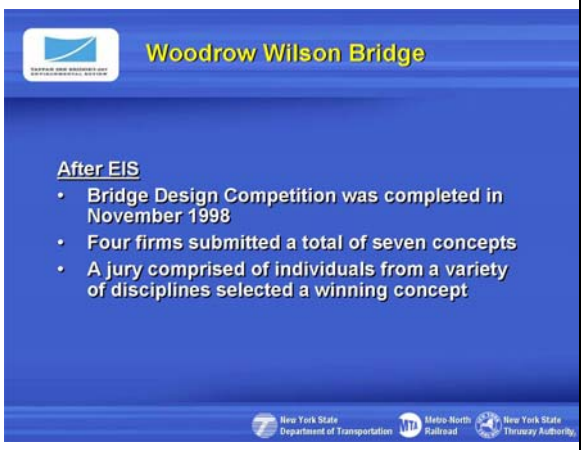


Slide 36

Because of the close proximity of properties to the end of the bridge and also the close proximity of the shipping channel to one of the landings, the height of the bridge was a major concern. The higher the bridge the longer and larger the landing length required.

As seen from the list of Alternatives the height of the bridge was the major differentiator between the Alternatives included in the EIS.

The preferred Alternative resulting from the EIS was the low level bridge. This achieved a balance of shipping accommodation and function while not compromising community impact.



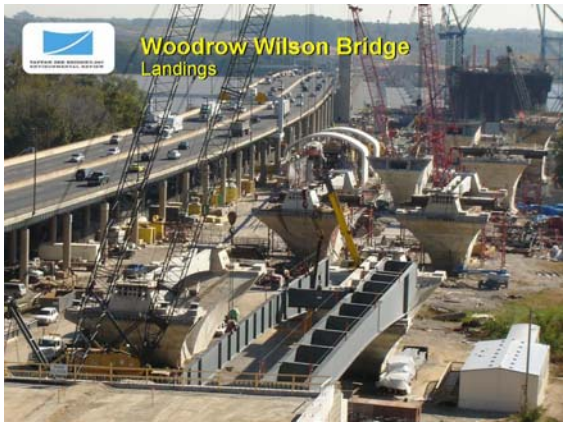
Slide 37

It was not until after the EIS that the form of the bridge was determined. The process utilized a design competition and a continuing public outreach process to identify the final bridge form.

Slide 38

These images show the overall construction sequence for the Woodrow Wilson Bridge. The order of construction is piles, foundations, pilecaps, piers and then the deck.

For the TZB/I287 Environmental Review the overall construction sequence and construction duration will be studied. In particular, the interaction of construction with aquatic life needs to be understood.



Slide 39

This slide shows the construction of the Woodrow Wilson Bridge at one of the landings. The image shows the existing highway in operation and construction of the full width of the replacement bridge.

This differs from the likely construction sequence for the Replacement Bridge as part of the TZB/I287 Environmental Review, for which only one half of the new bridge would be constructed at the landings at any one time.

Slide 40

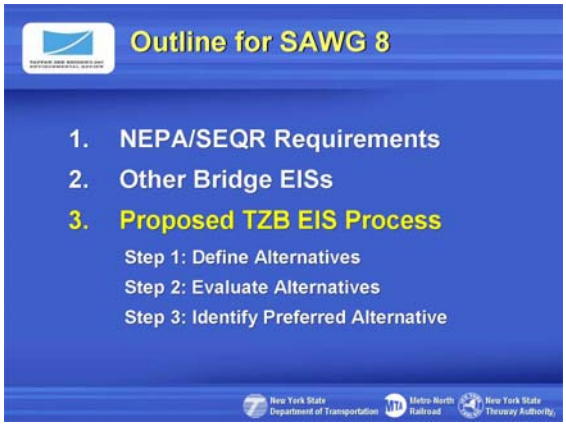
This image again shows the new Woodrow Wilson Bridge at one of the landings. The new bridge is at a higher elevation than that of the existing bridge.

A similar condition may occur at the landings for the Replacement Bridge as part of the TZB/I287 Environmental Review depending on the depth of the deck structure, river clearances and the positioning of CRT on the bridge. As part of the initial studies in the EIS it is necessary to understand the possible range of bridge arrangements to fully quantify possible impacts.

Slide 41

This slide shows the locations of the environmental mitigation measures undertaken as part of the Woodrow Wilson Bridge reconstruction.

The environmental measures are located at some distance from the site of the bridge construction and include the creation of new wetlands, a new bald eagle sanctuary and a new fish reef off of the Chesapeake Bay. Similar environmental mitigation measures may be necessary as part of the TZB/I287 Environmental Review.

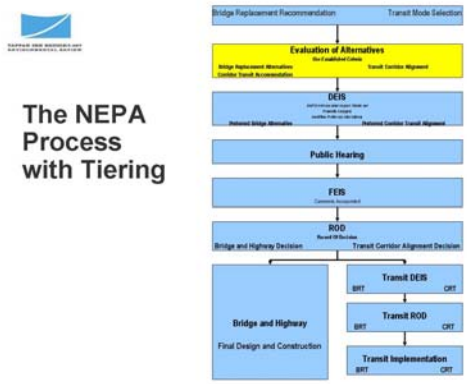


Slide 42

Title slide for Part 3 of the presentation.

Having considered in Part 2 how other large projects developed Part 3 looks at the proposed process for the Replacement Bridge in the TZB/I287 Environmental Review.

Overall a three step process is planned.

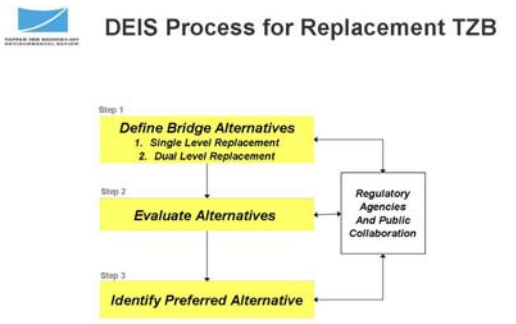


Slide 43

Before outlining the three steps, this slide outlines the overall process for the Replacement Bridge within the overall tiered EIS.

The study is currently completing Scoping and the yellow box entitled *Evaluation of Alternatives* indicates where we are in the overall process. We are commencing the DEIS which will be followed by a Public Hearing, FEIS and Record of Decision (ROD). After the ROD, final design and construction would commence for the Bridge and Highway work.

Final design and construction of the Transit components across the corridor would commence only after a further Transit EIS and ROD.



Slide 44

This slide shows the three steps anticipated for the development of the Replacement Bridge Alternatives.

Step 1 starts with defining the alternatives beyond the simple titles of Single Level or Dual Level that resulted from the *Alternatives Analysis of Rehabilitation and Replacement of the Tappan Zee Bridge Report.* In this step the possible alignments, profiles and cross-section of the bridge would be developed and typical foundations and bridge types would be identified. This step would conclude with the detailed description of the bridge alternatives in a technical report.

In Step 2 the Bridge Alternatives would be evaluated to identify impacts and any mitigation that may be necessary. The details of this evaluation would form the heart of the EIS document for the Bridge.

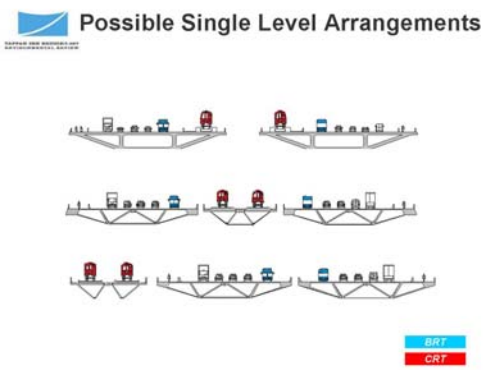
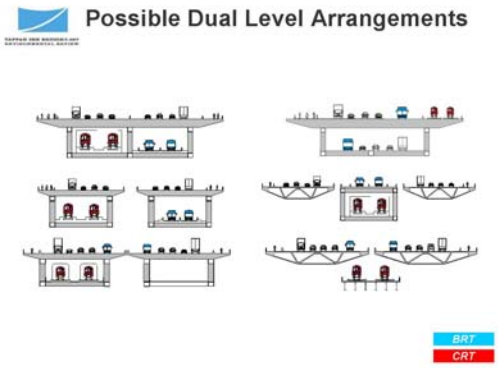
In Step 3 a preferred Alternative for the Bridge would be determined.

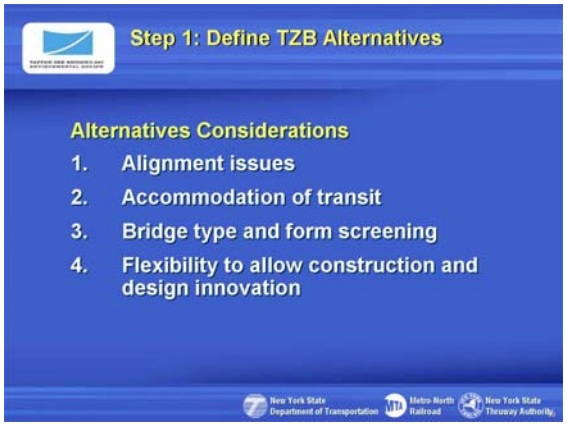
Slide 45

This slide shows the Bridge Alternatives resulting from the *Alternatives Analysis of Rehabilitation and Replacement of the Tappan Zee Bridge Report.* In this report two Alternatives were determined to be reasonable and recommended for inclusion in the EIS. These were:

1. A Single Level Replacement bridge
2. A Dual Level Replacement bridge

The referenced report highlighted that the bridge arrangements (cross-section) developed for these Alternatives were representative and that further assessment of the possible bridge arrangements was warranted in the DEIS. This further assessment would be completed during Step 1.

	**Slide 46** This slide shows a range of possible of arrangements for the Replacement Bridge in the Single Level Alternative to be considered as part of Step 1.
	**Slide 47** This slide shows a range of possible of arrangements for the Replacement Bridge in the Dual Level Alternative to be considered as part of Step 1.



Slide 48

This slide lists the specific issues to be considered as part of the Step 1 technical report. This includes the following:

- Various alignments for the bridge will be considered
- Where to position CRT and BRT within the bridge cross-section will be considered
- Bridge types and forms that are not technically suitable will be identified
- A range of practical foundation types, span lengths will be established

Notably, rather than identifying for example only one foundation type, the technical report will present a range of practical foundation types to be evaluated in the EIS. By keeping a range of foundation types, the designers and contactors that will be responsible for construction of the Replacement Bridge would have the greatest flexibility.

Slide 49

This slide lists some of the specific issues to be addressed to establish the overall alignment of the bridge to fully understand the potential impacts.

Key in this list is the existing landing right-of-way as it is one of the goals and objectives of the TZB/I287 Environmental Review to eliminated and/or minimize impacts.

Slide 50

This slide lists some of the specific issues to be addressed to optimize the accommodation of transit.

In particular, the positioning of transit on a Replacement Bridge is greatly affected by any stations or other facilities at the landings, grade limitations and the need to connect CRT to the existing Hudson Line.

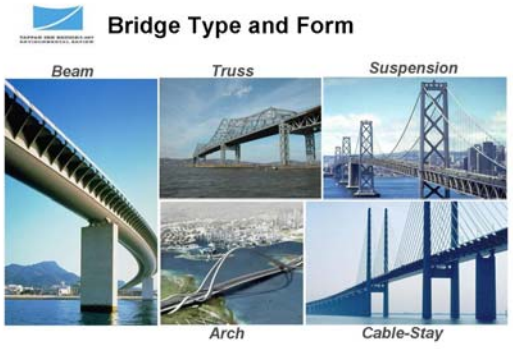
All of these issues would be addressed during Step 1.

Slide 51

As part of the DEIS process is intended that a final bridge type or form will be identified as impacts are common to many bridge types.

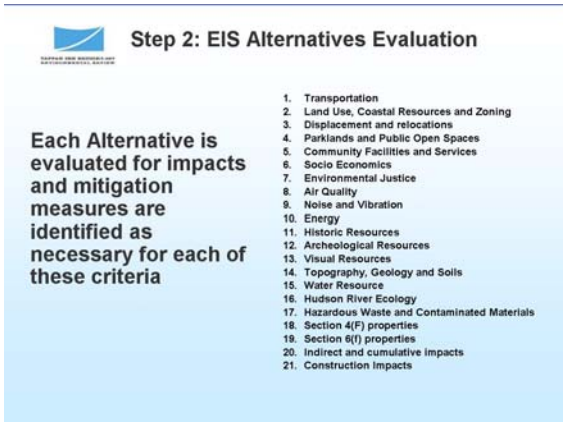
Instead, the DEIS documentation would identify those bridge types that are not practical and may warrant exclusion in subsequent design phases.

Different bridge types would be considered for the Approach Spans and the Main Spans.



Slide 52

This slide shows the five general types of bridges that will be considered. The five types are included in this meeting to ensure that we all have the same terminology.



Slide 53

This slide lists the 21 technical subjects that form the basis of the evaluation of the Replacement Bridge Alternatives in Step 2. Each subject corresponds to a specific chapter in the EIS report.

Each of the Replacement Bridge Alternatives will be evaluated for each of these criteria and the associated impacts and mitigation measures will be identified and will be outlined at future Bridge SAWG meetings.

Slide 54

This slide shows the overall Hudson River at the existing TZB. The slide is a reminder of what an asset the river is and how we must conduct our evaluations in sufficient detail to fully understand any impacts.

To support the evaluations, many baseline studies of the river aquatic life have been prepared. This includes a fish survey as well as much sediment testing. The results from these and other baseline studies will inform the evaluation process.

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Slide 55

This slide shows a view of the highway at the Nyack shore. This is an area to focus on in future meetings.

Slide 56

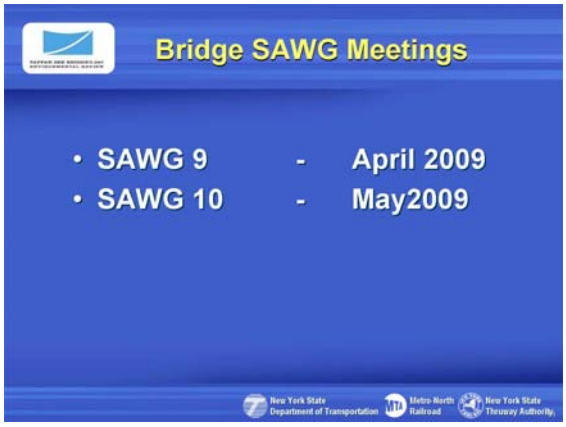
This slide shows an aerial view of the Tarrytown shore. This is an area to focus on in future meetings.

Slide 57

This slide lists the anticipated recommendations from the EIS process for the Replacement Bridge in Step 3.

Primarily it is anticipated that the process will result in a recommendation for a Single or a Dual Level Replacement Bridge. This would included a recommendation on a preferred alignment and on the accommodation of transit (where is it in the cross-section).

A single preferred bridge type would not be identified but instead all bridge types that are practical would be listed.



Slide 58

These are proposed dates for future bridge SAWG meetings.