2.1.3.5 Cross-Westchester Multi-Modal Tunnel

In keeping with comments received at the January 14, 2003 scoping meeting, consideration of a tunnel that would relocate all, or portions of, I-287 underground between the Hudson River and its terminus in Rye at I-95 in Westchester County was included among the Level 1 alternative elements (Figure 2-4). The tunnel would also include a four-track commuter rail or heavy rail subway system.

The means of introducing a tunnel across the county is heavily influenced by geologic conditions along the corridor, as well as the tunnel's purpose, its connectivity, existing topography, construction methodology, and suitable means of moving traffic during construction. The geology is not sufficiently well known at this time to establish the most effective approach for introducing a tunnel across Westchester County; however, consideration of purpose, connectivity, and construction provides insight into the factors that will affect the development of tunnel alternatives.

Even in the absence of sufficiently detailed geologic information, it is possible to envision three conceptual profiles for a tunnel across Westchester:

- A shallow cut-and-cover tunnel that would rise to the surface to meet the existing roadway network at critical interchanges.
- A shallow cut-and-cover tunnel that would pass beneath the interchanges and create new underground interchanges.
- A deep-bored tunnel that would pass beneath the interchanges and forge deep underground interchanges.

2.1.4 River Crossings

A suite of complementary river crossing alternative elements has been identified that considers the modification or replacement of the Tappan Zee Bridge as well as supplemental crossings of the Hudson River. Both bridge and tunnel crossing structures were considered, and crossing locations both close to and removed from the existing Tappan Zee Bridge were explored. In addition, roadway and pedestrian/cyclist pathway connections to complement new or modified crossings were included with alternative elements that can appropriately incorporate them.

The Level 1 river crossing alternative elements covered a broad range of options with different characteristics related to modes served, river crossing type, and location.

2.1.4.1 Retain the Existing Tappan Zee Bridge

The existing Tappan Zee Bridge has been in service since 1955. It continues to be functional, safe, and structurally sound while serving considerably more traffic than it was designed to carry. Its functionality, safety, and structural integrity have been achieved through an ongoing rigorous program of inspection, maintenance, and repair. The alternative elements for retaining the Tappan Zee Bridge included:

- Preserving the bridge.

- Rehabilitating the bridge to current seismic and structural standards.
- Rehabilitating and widening the bridge.

Within the third option, sub-options were considered that include widening to meet current geometric standards for lane widths, widening to increase general-purpose traffic capacity, and widening to introduce exclusive transit modes.

2.1.4.2 Replace the Tappan Zee Bridge

The potential for replacing the existing Tappan Zee Bridge with an entirely new river crossing provides opportunities for exploring a wider range of transportation modes, types of structure, and crossing locations along a variety of alignments. Each of these possibilities was considered, and a broad spectrum of alternative elements was identified for analysis in Level 1 screening.

For discussion purposes, potential alignments for replacement crossings were grouped into three generalized bands including a band adjacent to the existing bridge crossing, one to the north of it, and the other to the south (Figure 2-5). Although these appear to capture most of the promising alignments, they are not intended to exclude other possibilities or constrain the development of more effective alignments in the course of more detailed study.

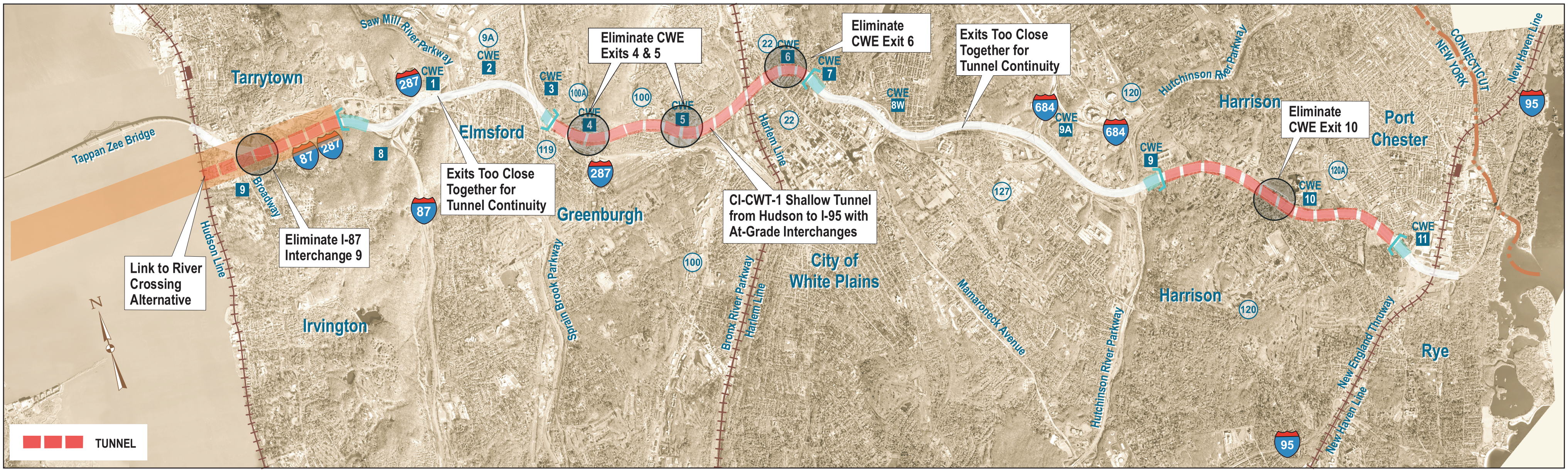
The band adjacent to the existing crossing includes possible alignments generally parallel to, and immediately north or south of the existing bridge. Any new alignment would need to be placed at sufficient distance away from the existing bridge so as to not undermine the bridge foundations since the bridge must continue to provide safe and dependable service until the new crossing is opened. The offset distance of such a new alignment is dependent on the type of structure to be constructed, its relationship to the existing foundations, and local geological conditions.

The north band explores the possibilities that may be available along the eastward extension of the corridor's line in a tunnel under Nyack and the opportunities for efficient linkage on the east shore. The south band explores the possibilities that may be available along a path that swings further south on the west shore and generally aligns with the existing corridor on the east shore, connecting with I-87/I-287 between Interchanges 9 and 8 depending on the type of construction and the specific alignment.

Replacement Bridge

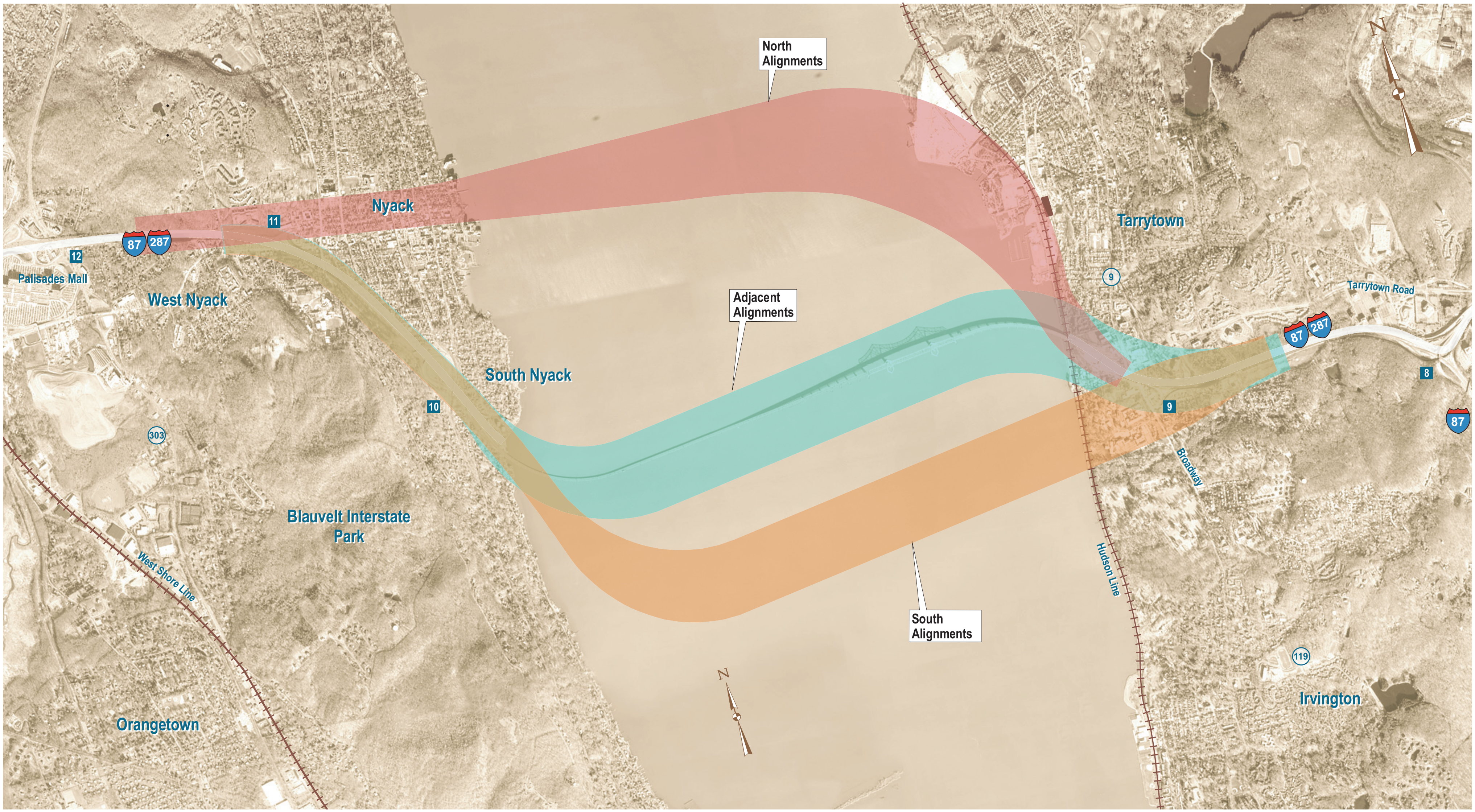
A new bridge could be constructed to carry the highway and any effective combination of transit services, all in accordance with current structural, highway, and transit codes, criteria, and standards. It is anticipated that a new bridge crossing would include pedestrian and bicycling facilities. The new bridge would take advantage of the advancements in materials and construction technology of the last 50 years, and garner the unique aesthetic opportunities offered by those advancements. In addition, all but the end connections of such a bridge could be constructed adjacent to, or at some distance from, the existing bridge without interfering with existing traffic. The existing bridge would be demolished once the new bridge was placed in service.

A new bridge crossing would consist of a main span combined with a series of shorter spans arranged to suit navigation requirements and other river uses (Figure 2-6). The main span, supporting either a highway or highway and transit, would likely be of suspension, cable stayed, or arch type, each of which uses high strength steel and concrete decks in combination with very high capacity steel cables and the associated connectivity technology. Both options could be constructed from material supplied from land or sea and could be arranged to have minimal effect on the river traffic during construction. Factors that



Cross-Westchester Tunnel

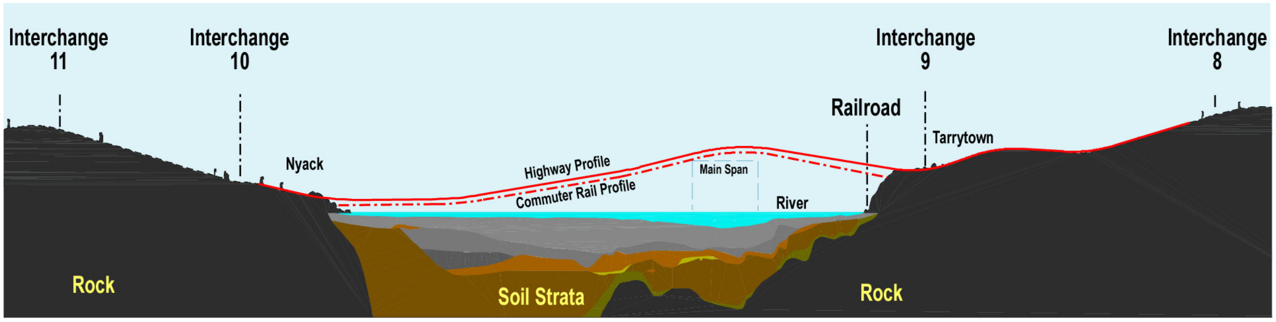
Figure 2-4



Potential Alignments for Replacment Crossings

Figure 2-5

would influence the choice of bridge would include mode-specific requirements, deck arrangement, sub-surface soil conditions, interaction with transit, environmental considerations, aesthetics, and cost. The shorter bridge spans should be related to the main spans in either geometry or form. The advent of a single- or dual-level bridge deck for the main spans would influence the form of the shorter spans.



Profile of Possible Replacement Bridge

Figure 2-6

A new bridge could be constructed to carry six possible modal combinations:

- Replacement bridge with eight general-purpose lanes.
- Replacement bridge with eight general-purpose lanes and two-lane busway.
- Replacement bridge with eight general-purpose lanes and commuter rail.
- Replacement bridge with six general-purpose lanes, two busway or high occupancy toll (HOT) lanes, and commuter rail.
- Replacement bridge with eight general-purpose lanes and LRT.
- Replacement bridge with eight general-purpose lanes, commuter rail, and LRT.

Replacement Tunnel

Under this alternative element, a new tunnel would be constructed to carry the highway and any effective combination of transit services, all in accordance with current structural, seismic, highway, and transit codes, criteria, and standards. The tunnel could be constructed independently of the existing bridge, without interfering with existing bridge traffic other than at the end connections to I-87/I-287, provided adequate space is available for the portals and their approaches. The existing bridge would be demolished once the new tunnel was placed in service.

Tunnel vertical and horizontal alignments are dependent on geological conditions and the mode of transportation the facility is to serve. Tunnels can readily accommodate road and passenger rail gradients. Freight rail gradients would need to be flatter, and as such would tend to extend the overall length between portals in topographically challenging settings such as the Hudson River Valley. Tunnels of the length considered for crossing the Hudson River do not generally accommodate pedestrian or cyclist requirements, primarily due to concerns with safety, air quality, and visual quality.

Two different methods of tunnel construction were evaluated: bored tunnel and immersed tube tunnel.