Existing Channels and Anchorages near HRBT

HRBT Expansion Project Maritime Interface

- North Trestle Bridge
- Tunnels
- South Trestle Bridge
- Willoughby Spit/Bay
  - Oastes Creek
  - Mason Creek
- North Trestle Bridge
- Tunnels
- South Trestle Bridge
- Willoughby Spit/Bay

**North Trestle Bridge Phases**

**Phase 0 | Current Configuration**

- **West Bound:** 2 General Purpose Lanes
- **East Bound:** 2 General Purpose Lanes
PHASE 1 | Build the New EB North Approach

- 2 to 4 Lanes Depending on the Conflict with the Existing

PHASE 2 | Build Temporary MOT Trestle to EB Tunnel and then Shift the EB Traffic onto New EB North Approach/MOT Trestle

- Shift the East Bound Traffic to the New Structure
North Trestle Bridge Phases

**FINAL PHASE | Final Configuration**

![Diagram of Chesapeake Bay with labels for West and East Bound lanes.](image)

**West Bound:**
- 2 General Purpose Lanes
- High Occupancy Toll Lanes
- Partial High Occupancy Toll Lanes

**East Bound:**
- 2 General Purpose Lanes
- High Occupancy Toll Lanes
- Partial High Occupancy Toll Lanes

---

North Bridges and North Island Expansion

**Schedule of Activities**

- Work to begin after JPA approval
- Last activity September 2024
- Additional 6 months to remove remaining structures

**Vessels on Water**

- Barge operation 500’ from expansion area
- Barge anchoring 1000’ from expansion area
- Spud barges used in water depths >4.5’ MLW
- +/- 15 Working vessels at peak
- Crane barges, up to 350’
- Supply barges, up to 350’
HRBT Expansion Project Maritime Interface

- North Trestle Bridge
- Tunnels
- South Trestle Bridge
- Willoughby Spit/Bay

Tunnels

Norfolk Harbor Entrance Reach

Stratigraphic Legend:
- Zone of Jet Grouting for TBM
- Ground Improvements
- Proposed zone of ground improvements
- Top of roadbed
- Top of retaining wall
- Break-in/break-out block
- Stratigraphic Legend:
  - A1: Material Type
  - A2: Material Type
  - A3: Material Type
  - A4: Material Type
  - A5: Material Type
  - A6: Material Type
  - A7: Material Type
  - A8: Material Type
  - A9: Material Type
Tunnels

Schedule of Activities

- Work to begin completion of South Island Portal
- TBM assembly begins Sep 2021
- Boring begins early 2022
- TBM turnaround early 2023
- Boring complete Spring 2024

Vessels on Water

- Two pile driving barges 195'
- One supply barge 195'

HRBT Expansion Project Maritime Interface

- North Trestle Bridge
- Tunnels
- South Trestle Bridge
- Willoughby Spit/Bay
South Trestle Bridge Phases

**Phase 0** | Current Configuration

- TO HAMPTON
- Chesapeake Bay
- **East Bound:** 2 General Purpose Lanes
- **West Bound:** 2 General Purpose Lanes
- TO NORFOLK

**Phase 1** | Build the Majority of the New South Approach

- TO HAMPTON
- Chesapeake Bay
- Jet Grout Trestles
- Tunnel Boring Machine
- Temporary Dock
- **4 or 8 Lanes Depending on the Conflict with the Existing**
- TO NORFOLK

LEGEND:
- Maintenance of Traffic (MOT)
- Permanent Bridge Structure
- Temporary MOT Trestle
- Temporary Construction Trestle
- Demolition of Existing Bridge Structure
- Existing Tunnel
- New Tunnel
- Island Expansion
South Trestle Bridge Phases

**PHASE 2** | Build a Temporary MOT Trestle and Shift Traffic to Connect to the EB Tunnel

- TO HAMPTON
- Chesapeake Bay
- Hampton Roads

**LEGEND**
- Maintenance of Traffic (MOT)
- Permanent Bridge Structure
- Temporary MOT Trestle
- Temporary Construction Trestle
- Demolition of Existing Bridge Structure
- Existing Tunnel
- New Tunnel
- Island Expansion

Move Existing EB Traffic to MOT Trestle

South Trestle Bridge Phases

**PHASE 3** | Build a New Approach to the EB Tunnel While Traffic is on the Temporary MOT Trestle and then Shift the EB Traffic onto New Structure

- TO HAMPTON
- Chesapeake Bay
- Hampton Roads

**LEGEND**
- Maintenance of Traffic (MOT)
- Permanent Bridge Structure
- Temporary MOT Trestle
- Temporary Construction Trestle
- Demolition of Existing Bridge Structure
- Existing Tunnel
- New Tunnel
- Island Expansion

Maintain EB Traffic on MOT Trestle/Existing EB Approach during this construction phase, and before it shifts to new structure

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South Trestle Bridge Phases

**PHASE 4**  
Build a Temporary MOT Trestle and Shift Traffic to Connect to the WB Tunnel

- **Legend:**
  - Maintenance of Traffic (MOT)
  - Permanent Bridge Structure
  - Temporary MOT Trestle
  - Temporary Construction Trestle
  - Demolition of Existing Bridge Structure
  - Existing Tunnel
  - New Tunnel
  - Island Expansion

- **Chesapeake Bay**
  - **Move Existing WB Traffic to MOT Trestle**

- **Hampton Roads**
  - **TO HAMPTON**
  - **TO NORFOLK**

South Trestle Bridge Phases

**PHASE 5**  
Build the New Approach to the WB Tunnel While Traffic is on the Temporary MOT Trestle and then Shift the WB Traffic onto New Structure

- **Legend:**
  - Maintenance of Traffic (MOT)
  - Permanent Bridge Structure
  - Temporary MOT Trestle
  - Temporary Construction Trestle
  - Demolition of Existing Bridge Structure
  - Existing Tunnel
  - New Tunnel
  - Island Expansion

- **Chesapeake Bay**
  - **Maintain WB Traffic on MOT Trestle/Existing WB Approach during this construction phase, and before its shift to new structure**

- **Hampton Roads**
  - **TO HAMPTON**
  - **TO NORFOLK**

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South Trestle Bridge Phases

**PHASE 6**
Demolish the Existing Bridge Structures and then Complete the South Approach

**FINAL PHASE**
Final Configuration

**LEGEND**
- Maintenance of Traffic (MOT)
- Permanent Bridge Structure
- Temporary MOT Trestle
- Temporary Construction Trestle
- Demolition of Existing Bridge Structure
- Existing Tunnel
- New Tunnel
- Island Expansion

**West Bound:**
- 2 General Purpose Lanes
- High Occupancy Toll Lanes
- Partial High Occupancy Toll Lanes

**East Bound:**
- 2 General Purpose Lanes
- High Occupancy Toll Lanes
- Partial High Occupancy Toll Lanes

Chesapeake Bay

Hampton Roads

TO HAMPTON

TO NORFOLK

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400 of 560
**South Bridges and South Island Expansion**

**Schedule of Activities**

- Work to begin after JPA approval
- Last activity September 2024
- Additional 6 months to remove remaining structures

**Vessels on Water**

- Barge operations 500’ from expansion boundary
- Barge anchoring 1000’ from expansion boundary
- Spud barges used in water depths >4.5’ MLW
- +/- 25 working vessels for South Bridge at peak
- +/- 15 working vessels for South Island at peak
  - Crane barges, up to 350’
  - Supply barges, up to 350’

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**HRBT Expansion Project Maritime Interface**

- North Trestle Bridge
- Tunnels
- South Trestle Bridge
- Willoughby Spit/Bay
Construction Staging Area

Willoughby Bay Bridge

SEGMENT 3C - WILLOUGHBY BAY BRIDGE CONSTRUCTION
**Willoughby Bay**

**Schedule of Activities**

- Work to begin after JPA approval
- Last activity December 2024
- Additional 3 months to remove remaining structures

**Vessels on Water**

- Spud barges used in water depths >4.5' MLW
- +/- 15 Working vessels at peak
- Crane barges, up to 350'
- Supply barges, up to 350'

**Dredging**

<table>
<thead>
<tr>
<th>Area (SF)</th>
<th>Volume (CY)</th>
<th>Dredge Depth (ft)</th>
</tr>
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<tbody>
<tr>
<td>150,000</td>
<td>16,700</td>
<td>3</td>
</tr>
<tr>
<td>15,000</td>
<td>1,670</td>
<td>3</td>
</tr>
<tr>
<td>14,000</td>
<td>1,560</td>
<td>3</td>
</tr>
<tr>
<td>4,000</td>
<td>450</td>
<td>3</td>
</tr>
<tr>
<td>~45,000 (Willoughby Spit)</td>
<td>~7,225</td>
<td>N/A – Debris Removal</td>
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</tbody>
</table>
Possible Mooring and Anchorage Areas

1) Anchorage Area - Hampton Flats
2) Mooring Area – within 1000’ of Willoughby Bay extension work
Navigable waterways
Nationally significant commercial use
Nationally strategic government use
Intensive recreation use

Significant on-water construction activities

Communication and Coordination Required

Therefore

Navigation Safety Risk Assessment and Tunnel Construction Plan recommended

Key Elements of the NSRA

Marine Traffic Survey
- Accounts for all vessel traffic
- Segments traffic by size, type, and time
- Includes the waterway areas over the tunnel, tunnel approaches, other areas in which on-water construction, staging, or storage may occur (such as anchorages)

Changes in Vessel Movements
- Analysis of likely vessel movement changes due to project
- Sensitivity analysis
- Recovery time to return to normal operations

Weather Conditions
- Any navigation related impacts due to tide, current, weather and seasonal storms

Marine Casualty Assessment
- Assessment of historic casualties
- Assessment of marine casualties for disruption periods
- Assessment of marine casualties for recovery periods
Activities Analysis

- Description of activity – what/where/when/anticipated disruption period
- Reason activity cannot be completed without impacting navigation
- Other options considered for activities impacting navigation
- Explanation of activity’s role in TCP, necessity, and how it minimizes impact on navigation

Overall Plan Analysis

- Describe how
  - Sequencing or timing of construction activities
  - Effort to minimize/avoid/reduce navigation impacts due to disruption
- Describe effort to minimize/avoid/reduce navigation impacts due to marine casualties

Objectives of the NSRA and TCP

- Provide comprehensive understanding of current and forecasted vessel traffic
- Identify best/least disruptive times to schedule movement of construction vessels
- Identify risk mitigating measures to minimize potential hazards to navigation
Preliminary AIS Data from 2017

Preliminary AIS data by size

<table>
<thead>
<tr>
<th>Length Range</th>
<th>Map</th>
<th>Length Range</th>
<th>Map</th>
<th>Length Range</th>
<th>Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 65'</td>
<td><img src="image1.png" alt="Map" /></td>
<td>65' to 150'</td>
<td><img src="image2.png" alt="Map" /></td>
<td>150' to 600'</td>
<td><img src="image3.png" alt="Map" /></td>
</tr>
<tr>
<td>150' to 600'</td>
<td><img src="image4.png" alt="Map" /></td>
<td>Greater than 600'</td>
<td><img src="image5.png" alt="Map" /></td>
<td>Unknown</td>
<td><img src="image6.png" alt="Map" /></td>
</tr>
</tbody>
</table>

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Preliminary AIS Data by Type

Vessel Presence by Size and Hour of Day

Hourly Vessel Presence by Size
Discussion

- Proximity of working vessels to federal channels / vessels
  - North Island expansion and Hampton Creek Approach Channel
  - Jet grouting trestle (approximately 960’) construction and marking (1100’ from the Navigation Channel)
  - Phoebus Channel
- Coordinating movement of working vessels across navigable channels
- Confirm access to marine casualty data for NSRA requirement
- Outreach to waterways users (Bridge Permit survey, public meetings, marina notifications. Other?)
- Regular Marine Events?
- Impacts on CG operations?
- Other?